

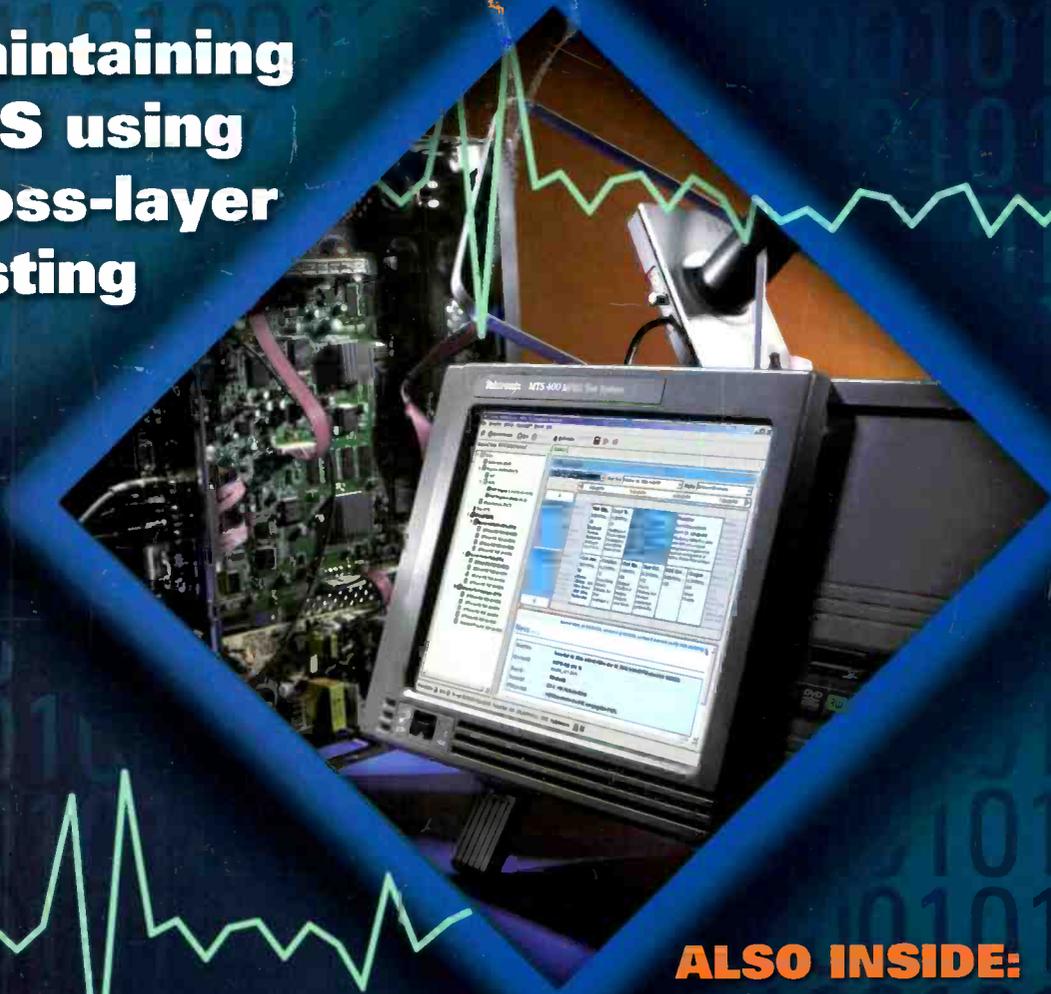
Broadcast Engineering®

NOVEMBER 2006

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TEST & MEASUREMENT

**Maintaining
QoS using
cross-layer
testing**



ALSO INSIDE:

BASIC MAINTENANCE

Little mistakes can bite

MOVING VIDEO FASTER

The new platform: IPTV

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Fresh workflows in HD: Part I

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10:06 a.m.

Legal department clears
content of interviews



10:06 a.m.

Assistant annotates on-camera
interviews as they are captured



10:06 a.m.

Editor cuts rough sequence with
placeholders for interviews

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10:06 a.m.

*Designer previews graphics over
lo-res proxies of incoming footage*



10:06 a.m.

*Producer selects best takes
and marks INs and OUTs*

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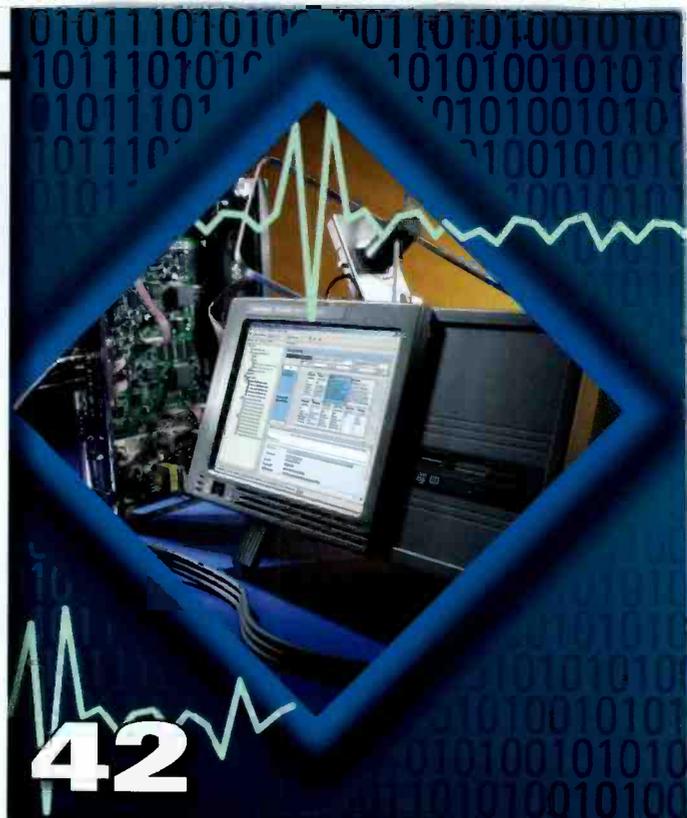
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Three post-production houses choose fresh, new workflows to digitally finish projects.

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THIS MONTH'S FREEZEFRAME QUESTION

In comparison with MPEG-4 Part 2, a H.264 codec has few profiles. Name those profiles and their key applications, such as streaming, broadcast, etc. Question taken from Cliff Wootton's book, "A practical guide to video and audio compression."

Readers submitting winning entries will be entered into a drawing for *Broadcast Engineering* T-shirts. Enter by e-mail. Title your entry "Freeze-frame-November" in the subject field and send it to: editor@prismb2b.com. Correct answers received by Jan. 1, 2007, are eligible to win.



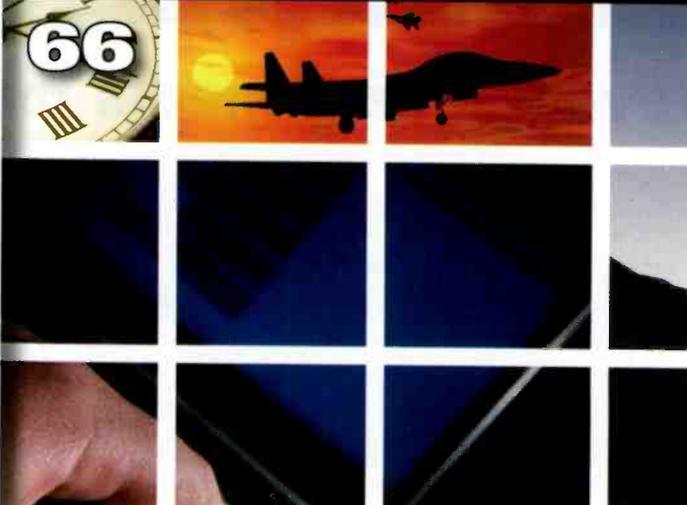
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ON THE COVER:

The reality of IPTV may be just around the corner for North American viewers.



55



66



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Panasonic ideas for life

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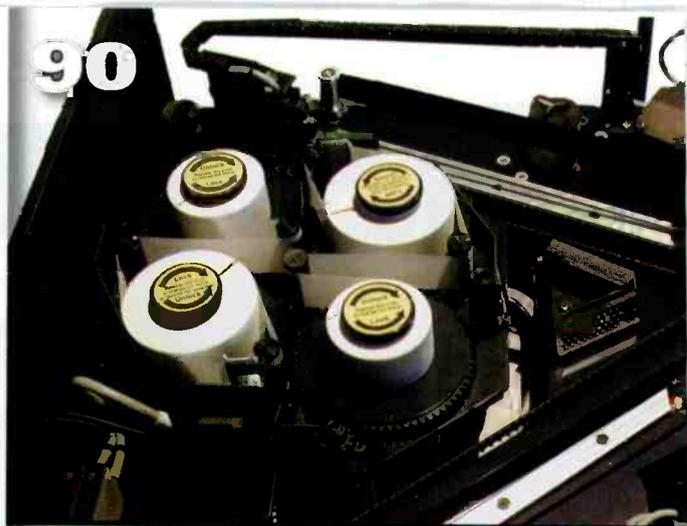
JULY'S FREEZEFRAME ANSWER

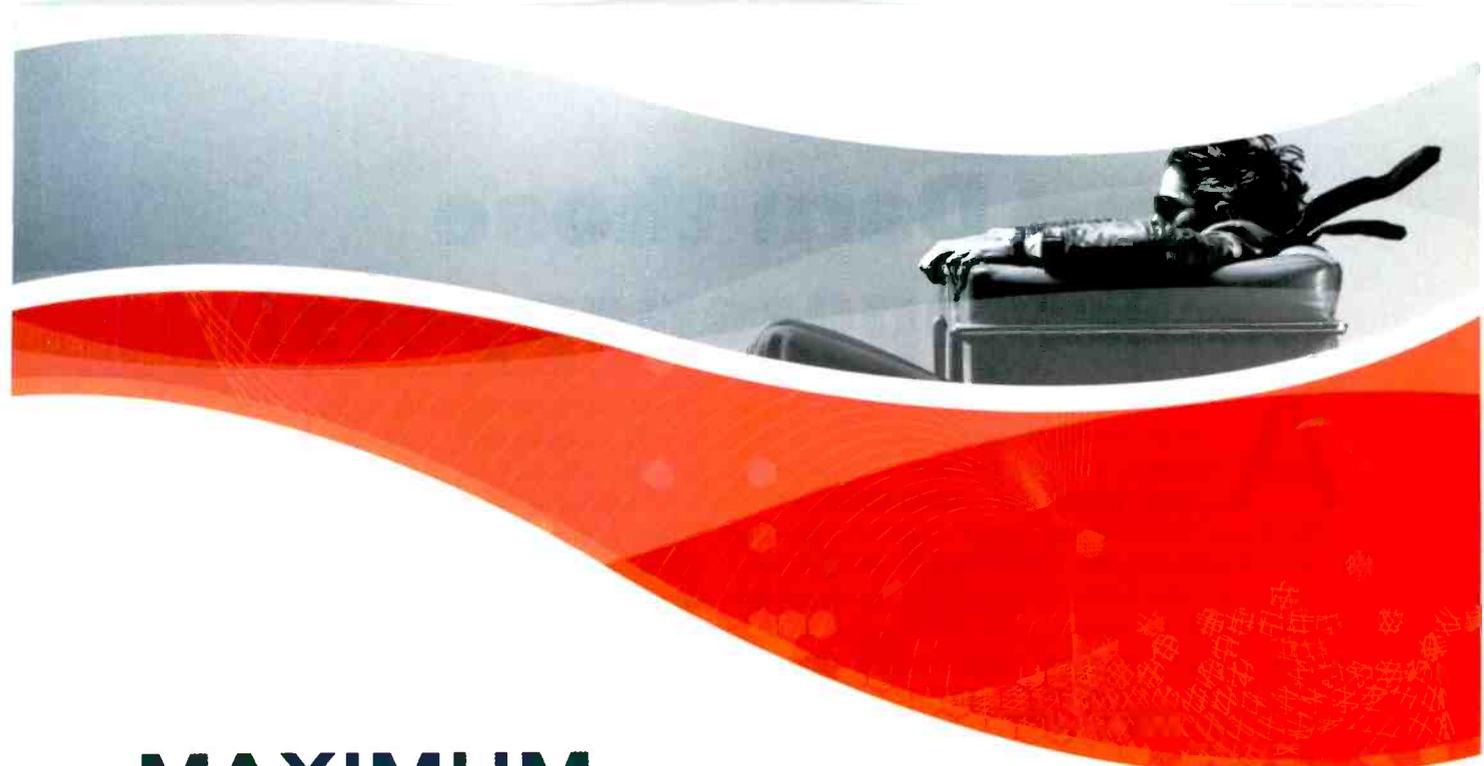
- Q. Name the seven layers of the OSI protocol.
A. The OSI model has seven layers, shown below. (Layers are shown from top to bottom, and winning entries had to be presented in the same order.)

Application
Presentation
Session
Transport
Network
Data link
Physical

JULY WINNERS:

Eric Clark, Chuck Condie, Tim Costley, Ed Fraticelli, Terry Lindgren, Rich Lohmueller, Terrence Thomas





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 D-5



 HDCAM



 DVCPRO HD



 DVPRO HDV



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Darn those whippersnappers!

At the recent *Broadcast Engineering News Technology Summit*, I learned that today's media managers and engineers don't recognize what younger people want in video delivery. In fact, many of us in the 40-plus age bracket are pretty dense when it comes to packaging attractive content for young viewers.

Television today is how we're used to it: linear and single channel. If you want to watch "CSI," you sit in front of your television at 9 p.m. every Thursday night. The most-watched local segment, the newscast, is just as structured. The newscast starts on the hour. Weather follows at 13 minutes after the hour and sports at 19 minutes after the hour. It's the same sequence every time. Today's news broadcast model hasn't changed in 50 years!

While older viewers are content with this program-

multitasking and tech-savvy audience, broadcasters must change. Content needs to be repackaged, multistreamed and user-selectable.

The summit's Wednesday's keynote speaker was David Payne, senior vice president and general manager for CNN.com. He said today's content needs to be supplied in new ways if broadcasters hope to attract the younger audience.

"Younger audiences demand a different experience," he said. "Give them what they want on the schedule they want."

This audience is saying, "Give me something I can use and don't make me wait," Payne said.

This is especially the case for news. More than three out of five online TV viewers cite personal convenience as the major reason for watching TV broadcasts online. These viewers are heavy news consumers, with 62 percent of them logging on just for news.

Young viewers also no longer see traditional television as their primary source for news information. Payne noted that during the close 2004 elections, CNN.com had 650 million page views in a single 24-hour period. Those viewers were not satisfied with letting the four big networks decide what information would be presented.

So, what's the solution? First, take this test. Go to www.secondlife.com. If you would enjoy such an activity, then you may have the mindset for programming to young viewers. If on the other hand, you think it's just a video game, you might fall into the clueless generation. In that case, maybe www.aarp.com is more your speed.

Payne said that broadcast managers must have the courage to change. They must actively seek young staffers who can put content into presentations that will attract this audience. The first step, Payne said, is to know what these viewers want — and older managers may literally be unable to do that.

BE



ming model, younger viewers are less willing to adapt to a scheduled TV life. As a result, they are finding alternative ways to watch television.

The most common way to best the system is to use a personal video recorder (PVR). The initial popular model was TiVo. In fact, many people use the term TiVo to refer to any type of PVR. TiVo in common speech is both a noun, "I have a TiVo," and a verb, "I'm going to TiVo 'CSI' tonight." The technology has become so popular that more than 18 percent of American homes have a PVR. But even this technology has failed to meet the demands of young viewers.

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Send comments to: editor@prism2b.com

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Perky news

Dear editor:

My ex-wife frequently preferred “style over substance.” That’s a big part of why I divorced her.

I think you’re dead-on in your August 2006 editorial on packaging — especially as it related to Katie Couric. I must admit, I really liked Couric on “The Today Show,” but I’m not so sure about her anchoring the “CBS Evening News.”

Did you catch her request at the end of her first broadcast? She asked the viewers for help finding an appropriate catch phrase. As stupid as Dan Rather’s “courage” was, you can bet he didn’t hire a focus group to come up with it.

Oh, Uncle Walter! Now I know why you introduced her in a voiceover and not on-camera. I wouldn’t have been able to keep a straight face either!

Name withheld by request

DVD authoring

Craig Birkmaier:

Recently, my company created a DVD on our Pioneer PRV-LX1 DVD hard drive system. We tested that DVD in every laptop and DVD player in our facility to make sure it played properly and experienced no problems.

When we gave the DVD to our client, it skipped on his laptop. We told him that no DVD would play on every laptop. If it was an old computer with an underpowered video card or processor, it could skip.

We suggested that the best option would be to play the DVD in a DVD player. We even lowered the bit rate (grudgingly, because we didn’t want to lose quality).

The client is concerned that if he orders 10,000 DVDs, there is no way to ensure they won’t skip. What is the best way to guarantee DVDs don’t skip, and what would you suggest as the optimum bit rate for most DVD players?

David Hardy
Take One Productions

Craig Birkmaier responds:

When it comes to the world of DVD authoring, I am no expert. But I have been involved with a number of CD-ROM and DVD projects, and these issues always seem to come up.

The short answer is that outside the world of dedicated DVD players, there are no guarantees. There are too many variables in terms of per-

formance, in a properly configured system. When a machine is not configured properly or is infected with a virus, all bets are off.

I asked a colleague, Randy Tinfow, president of DVD replication company Image Plant, to address your questions. Tinfow said there are two issues: average bit rate and maximum bit rate. The difference between the two is key. In his experience authoring for Fortune 50 companies and broadcast entities, an average video bit rate of 6.5Mb/s with a maximum of 7.5Mb/s allows for high quality and minimizes the possibilities of hesitations in playback.

Tinfow keeps the maximum within 2Mb/s of the average so that data does not have high spikes. For example, if the average rate is reduced to 3.2Mb/s, the max rate is dialed down to 5.2Mb/s.

This raises an issue with DVD-R systems. While most systems offer a range of MPEG-2 encoding options, they may not limit the peak bit rate. If this is the case, it may be necessary to encode the source material using an encoder that provides this level of control.

Compatibility of DVD-R media isn’t perfect. Not all DVD-ROM drives or DVD set-top players will play back DVD-R, with older players having the most problems. Some drives will play a brand of DVD-R perfectly and won’t play other brands well. It’s impossible to generalize and say “this media will work,” because even the highest quality media will have an unpredictable compatibility profile.

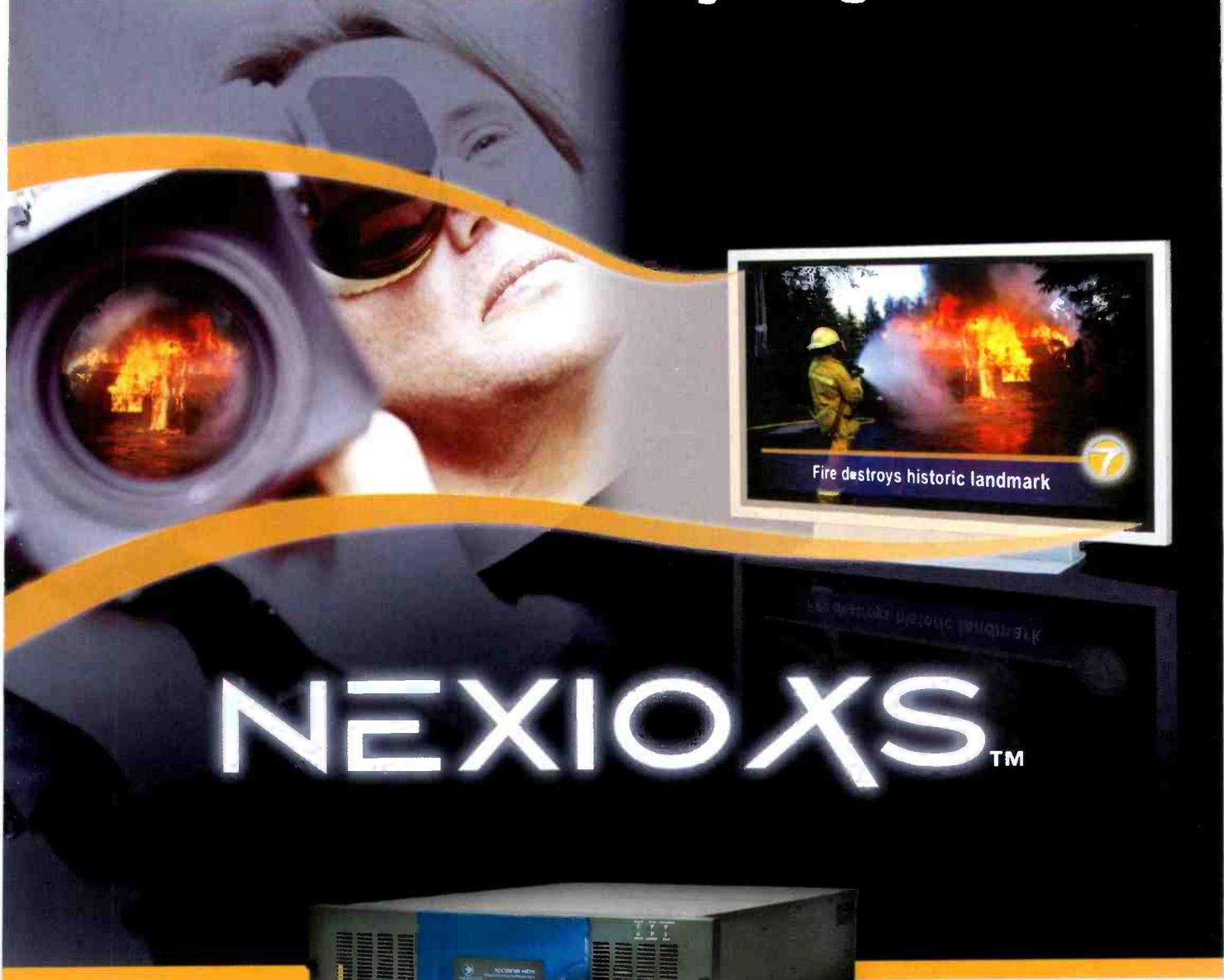
For quantities of 10,000 or more, disc replication is the way to assure reliability and minimize cost. Always require the client to review a disc and approve it in writing before proceeding with the manufacturing run. **BE**

Test Your Knowledge!

See the FreezeFrame question of the month on page 6 and enter to win a Broadcast Engineering T-shirt.

Send answers to editor@prism2b.com

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Boxed thinking

The industry must address STB issues.

BY CRAIG BIRKMAIER

Our family had a garage sale recently, providing the necessary incentive to unload a ton of junk that had accumulated around the house and in a rented warehouse. Among the items that were sold was a late '80s 26in television, which had been replaced by a late '90s HDTV-capable rear-projection television, and later by a 2004 HDTV-capable DLP-based rear-projection television.

The old 26in television had been living out its days in our daughter's bedroom. But her acquisition of a 32in LCD panel with an integrated ATSC receiver landed the old TV in prime garage sale territory.

We got \$30 for a 20-year-old television that will probably still work on Feb. 17, 2009 (aka the day that analog screens will be filled with snow rather than free-to-air television programming). If the buyers are among the demographic of TV homes without a multichannel service subscription, they will need to buy an ATSC set-top box (STB). Perhaps the new owner will get a coupon from the government to help defray the cost



Broadcasters need to start looking at ATSC STBs as an opportunity to take back control. Otherwise, traditional broadcasters may go the way of old TVs.

of the new digital receiver.

One thing is certain: Even with that coupon, it will likely cost more than \$30 to buy an ATSC STB to re-

ceive digital broadcasts. The coupons will entitle the bearer to \$40 toward the purchase of a digital-to-analog converter.

Each household in the United States can apply for two coupons, until the subsidy authorized by Congress has been exhausted. Earlier this year, Congress authorized \$890 million for these subsidies, with the potential to add \$500 million if there is sufficient demand.

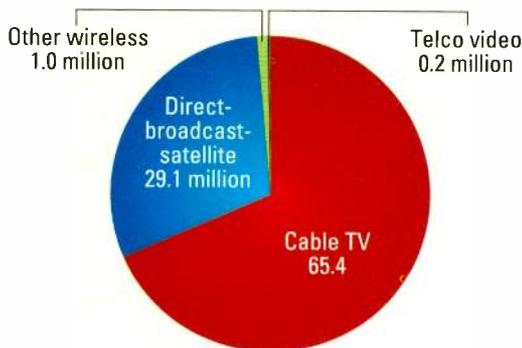
Empty promises?

For nearly a decade, manufacturers of consumer electronics and STBs for cable companies have assured Congress that a bare-bones ATSC STB — one designed to output an interlaced signal compatible with older televisions — would cost about \$50. To date, no company offers such a box at that price.

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

U.S. multichannel subscriber forecast, end of 2006

By year's end, 29.1 million consumers will receive satellite services.



Source: Kagan Research

www.kagan.com

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Currently, a new ATSC STB, if you can find one, exceeds \$200. Discontinued models may be found at clearance prices. Or you can buy a DTV tuner card for a PC, or a tuner that interfaces with a PC via a USB 2.0 interface. These tuners cost a bit more than \$100 (PC not included).

Today's boxes are designed to output both SDTV and HDTV signals, which accounts in part for their high-

Other reasons that these boxes are difficult to find are related to the hit-or-miss characteristics of ATSC reception with indoor antennas. While many of the early problems with multipath have been overcome with advanced equalizer designs, an outdoor mast-mounted antenna is still necessary at many locations. At other locations, reception may be unreliable or even impossible.

The Sinclair Broadcast Group has been airing promotional announcements ... and has created a Web site to help other broadcasters promote the DTV transition.

er price. One Gainesville, FL, retailer noted that a small number of people bought these boxes for HDTV-capable monitors. However, now that new digital televisions featuring integrated ATSC receivers are available, there is no demand. A quick survey of consumer electronics retailers in Gainesville turned up only one with an ATSC STB in stock.

Web links

- National Telecommunications and Information Administration
www.ntia.doc.gov
- NPRM on Digital-to-Analog Converter Box Coupon Program
www.ntia.doc.gov/ntiahome/frnotices/2006/couponprogram_nprm_07202006.htm
- Sinclair Broadcast Group HDTV promotional site
www.myfreehdtv.org
- Casting for DTV Business Models, January 2002
http://broadcastengineering.com/mag/broadcasting_download_casting_dtv/index.html

Reception issues have led several industry associations to call for minimum standards for the boxes in a subsidy program administered by the National Telecommunications and Information Administration (NTIA). The NTIA issued a Notice of Proposed Rule Making on July 26.

On Sept. 25, the Consumer Electronics Association (CEA), NAB and Association for Maximum Service Television (MSTV) filed joint comments in response to the rule making. The organizations recommended minimum performance requirements for eligible converter boxes, the features set for the basic converter boxes that would be eligible for the coupon program.

The organizations also recommended that functions such as electronic program guide navigation and smart antenna interfaces should not preclude converter boxes from obtaining approval under NTIA's program. (See "Web links.")

The DTV vacuum

The legislation authorizing the digital-to-analog converter coupon program also includes \$5 million for consumer education. This amount has been criticized within the broadcast industry as being insufficient.

Perhaps broadcasters deserve a bit of criticism for not promoting the DTV transition. Have you ever seen a promotional announcement in an NTSC broadcast, attempting to educate viewers about the DTV transition? How about stories during a station's newscast covering the DTV transition?

The Sinclair Broadcast Group has been airing promotional announcements under the banner of "My Free HDTV," and has created a Web site to help other broadcasters promote the DTV transition. (See "Web links.") The promotional announcements can be branded and used by any broadcaster.

Broadcasters have done little to develop the potential of digital broadcasting. They still rely on multichannel competitors to reach the majority of their audience. The primary new revenue stream that broadcasters have created comes from the retransmission consent agreement for their signals, delivered via the sophisticated digital STBs of their competitors.

Rather than depending on the government to help consumers' reliance on free-to-air broadcasts to deal with the DTV transition, broadcasters could use this opportunity to offer an alternative to the increasingly expensive multichannel services. The key is offering better, free STBs that would allow broadcasters to deliver a variety of new paid services alongside free broadcasts. The opportunity to deliver paid content, including movies, to local cache for on-demand consumption could easily pay for the boxes.

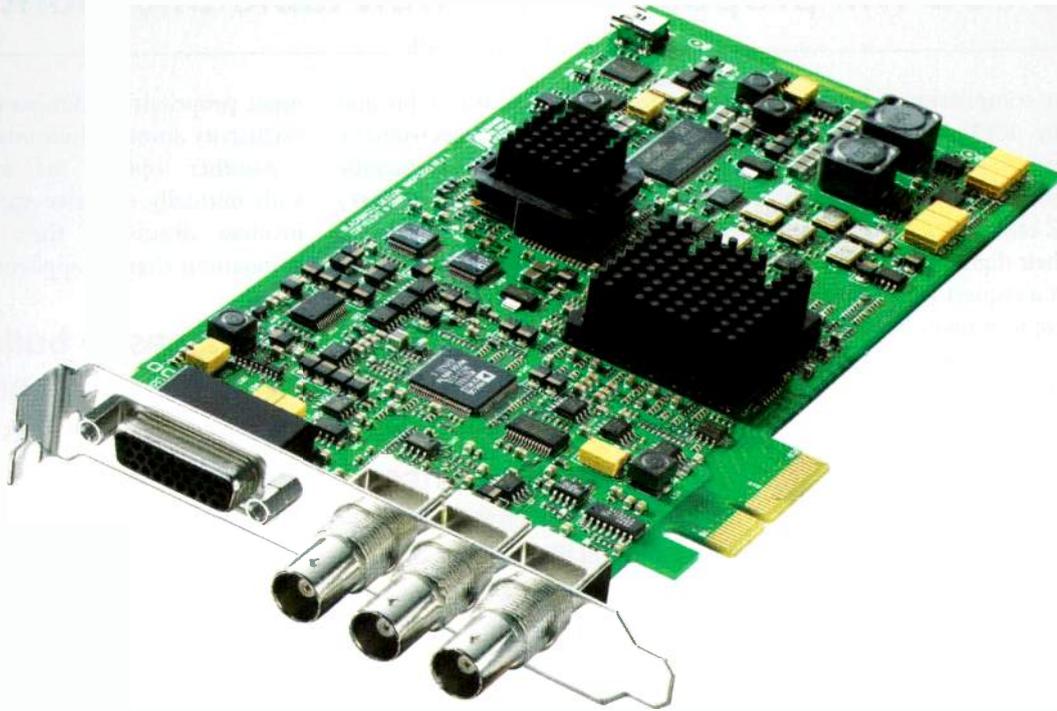
If broadcasters ignore this opportunity, I suspect there will be a lot of old televisions sitting on the curb on Feb. 17, 2009.

BE

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



Send questions and comments to:
craig_birkmaier@prisimb2b.com



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DTV allotments

The FCC will propose a final draft table this month.

BY HARRY C. MARTIN

The commission is finalizing the DTV Table of Allotments and should have a proposal ready this month.

The FCC required TV licensees to build out their digital facilities by July 1 or submit a request for a waiver because of circumstances beyond their control. The commission is currently reviewing the more than 100 such waivers filed.

The commission released a public notice in August announcing the end of the third round DTV election. The FCC reported that only six stations had not received a final DTV allotment. These stations will receive their DTV allotments in a subsequent proceeding.

That proceeding will likely involve a Notice of Proposed Rule Making, which will include the FCC's final version of the DTV Table of Allotments. The rule making will invite

Dateline

Dec. 1 is the filing deadline for renewal applications and EEO program reports for TV stations in Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island and Vermont. This deadline also applies to TV translators, LPTV and Class A stations in those states, although translators and LPTV stations that do not originate programming do not have to file EEO reports.

Dec. 1 is the deadline for TV stations — but not for TV translators, LPTV or Class A stations — in the following states to file their biennial ownership reports: Alabama, Connecticut, Georgia, Maine, Massachusetts, New Hampshire, Rhode Island and Vermont.

parties to review that draft table and submit comments. It is expected to be released this month and will include the technical specifications of every DTV allotment. The commission will seek final comments on these allot-

ment proposals to eliminate mutual exclusivity among applicants.

Another option for applicants with mutually exclusive applications involves dismissing their pending companion channel applications and

The FCC required TV licensees to build out their digital facilities by July 1 or submit a request for a waiver because of circumstances beyond their control.

ments and will likely discuss the final steps in the DTV transition, including the procedures to be used by stations flash cutting on their existing analog channels.

TV translator, LPTV and Class A DTV singletons

In June, the commission opened a limited window for existing licensees of TV translator, LPTV and Class A stations to file applications for a second digital channel. The window permitted parties to submit engineering proposals for new secondary stations on which to construct their digital facilities.

After analyzing the proposals for potential conflicts, the commission released a public notice listing the applications that were not mutually exclusive, i.e., those that conflicted with other submissions. For such singleton applications, parties needed to submit a Form 346 application in October, which provides the detailed legal and engineering qualifications of the applicant.

Applications that were mutually exclusive were subject to a future auction, with the coveted channel going to the highest bidder. Those applicants will need to wait until a future public notice, which will open a limited window for submitting settle-

ment proposals to eliminate mutual exclusivity among applicants. The submission of such a flash-cut application stands a greater chance of being processed and granted, and will permit the licensee to convert to digital operations within three years of approval.

KidVid compromise approved

In response to a settlement reached between TV industry representatives and children's TV advocates in January, the FCC has adopted new standards governing the amount of required core children's programming in multicast DTV programming. According to the compromise, known as KidVid, no more than 50 percent of a station's core children's programming counts toward meeting the additional multicast programming guideline. In return, broadcasters do not have to count cross promotions as commercial time, and the FCC has relaxed its restrictions on the promotion of Web sites during children's programs. **BE**

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

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Aliasing issues

Here's what to do when conversion gets messy.

ALDO CUGNINI

With the growing use of multiple video formats, a fundamental understanding of sampling rate conversion will provide insight into the quality and operation of format converters. However, before delving into format conversion itself, it makes sense to understand a few fundamentals of image processing and digital signal processing (DSP).

Digital signal processing

While the principles behind DSP have been known for more than half a century, it was not until the proliferation of digital integrated circuits in the '70s that hardware encompassing digital processing became practical. Since then, further advances in memory size and processing speed have made DSP hardware realizable and economical.

Although the topic of sampling is familiar to many readers, there are certain details of the process that may be elusive. It is well known that a sig-

nal must be sampled at a rate at least twice as high as the highest frequency component — Nyquist's theorem — or aliasing will result. However, the manifestation of this aliasing is not as well known, especially for video. For example, Figure 1 on page 22 shows five cycles of a sinusoidal signal. Nyquist says to sample this at least 10 times over this interval.

When sampled at less than that, the resulting signal will have a frequency

the other components of the signal at that frequency.

Another way of looking at this is that the sampling process creates repeat spectra in the frequency domain, i.e., the original signal spectrum will repeat, centered at multiples of the sampling rate. Thus, the input signal must be band-limited so the repeat spectra do not overlap.

How do these artifacts appear on video signals, or images? One useful tool for analyzing image processing systems is the zone plate. (See Figure 2 on page 22.) This 2-D sinusoidal frequency sweep essentially covers all spatial frequencies in an image. The typical zone plate starts

Understanding sampling rate conversion will provide insight into the quality and operation of format converters.

less than that of the original, meaning it has been aliased, and no amount of processing will retrieve the original signal. Information about it has been lost, and the alias will overlay

at zero frequency in the center and progresses linearly to a maximum frequency at the edges, ideally one-half the sampling rate. (The spatial sampling rate is the number of pixels per picture width and picture height. Note that for most video, the spatial sampling rate will be different in the two dimensions, as the aspect ratio is rarely 1:1.)

In an imaging system free from artifacts, the concentric circles will be uniform as they increase in frequency toward the outer edges. However, almost all imaging systems will produce aliases that will appear as repeats of the bull's eye pattern. With interlaced scanning and subsampled chrominance, the repeats become more complex. Today, a zone plate pattern is often available in digital signal generators, providing a tool to critically evaluate digital video systems.

Rate conversion challenges

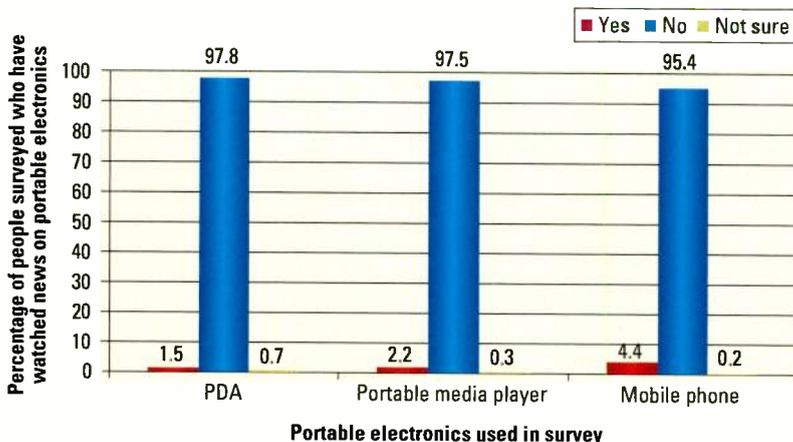
When changing image resolution, the number of samples per image

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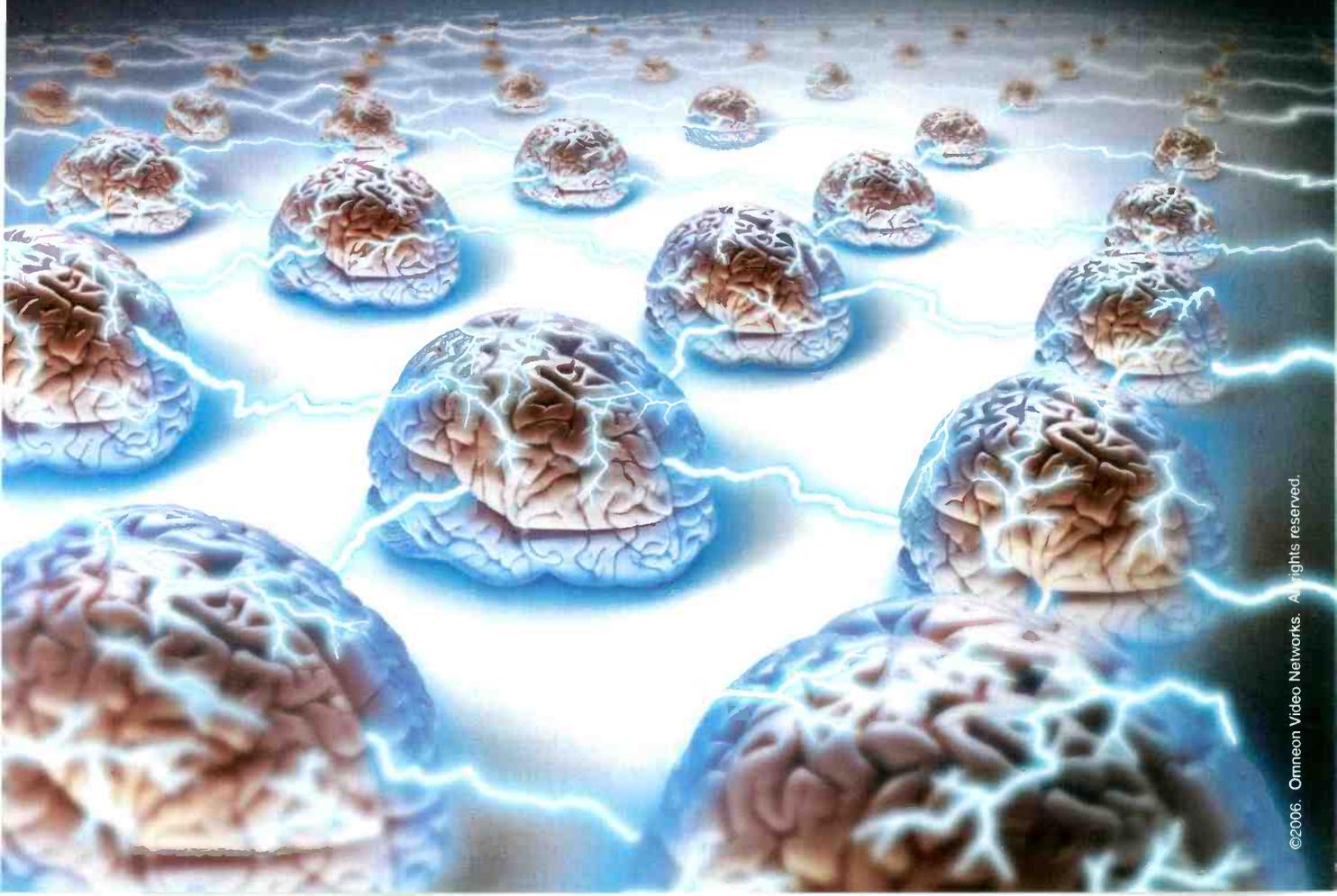
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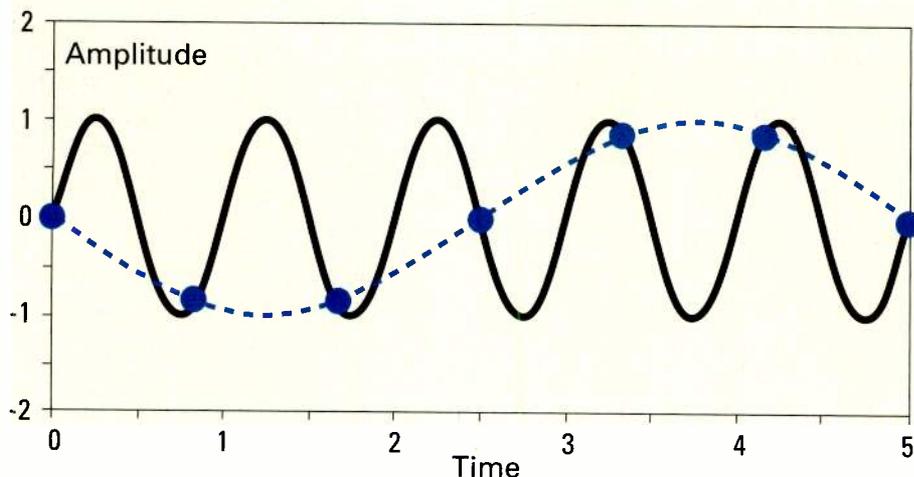


Figure 1. The five cycles of a sinusoidal signal should be sampled at least 10 times over this interval.

must be altered both in the horizontal and vertical dimensions. For example, let's start with a fictitious 1280 x 960 image and downconvert it to a 640 x 480 image. In this case, the sampling rate must be decreased both horizontally and vertically by one-half. If one were to simply throw away every other sample (a process called decimation) when the original image had frequency components out to one-half the original sampling rate, then this decimation would result in aliasing in the final image. Figure 3 on page 24 shows this effect in the resampled image. While the difference here may seem subtle, keep in mind that with motion, the alias pattern will scintillate and be distracting.

It's important to realize that lowering the sample rate is, in effect, resampling the image. In order to satisfy the Nyquist criterion, it is necessary to first low-pass filter the image and then decimate the result. The key here is in how to do this filtering. Ideally, it should be a brick wall filter so no aliasing is produced and the maximum picture resolution is maintained. Quantization noise in the signal will also fold due to aliasing, with the noise floor increasing as a result.

However, the ideal filter has practical problems. It is impossible to realize such a filter without a long delay (due to the many calculations, or taps) and without causing a certain amount of ringing in the signal. Thus, we would like to approximate the behavior of such a filter, but put an upper bound on the artifacts that are produced. The

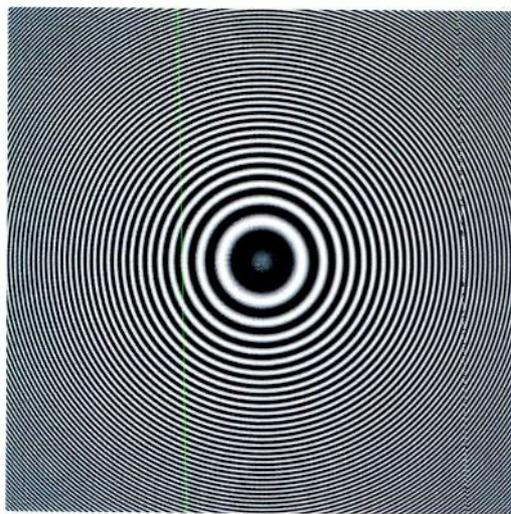


Figure 2. The zone plate illustrated here analyzes image processing systems with a 2-D sinusoidal frequency sweep that covers all spatial frequencies in an image.

simplest such filter is a linear interpolator, but this still allows considerable aliasing, as this process is a filter with an extremely slow roll-off. A better filter is the $(\sin x)/x$ filter, which provides

a superior roll-off with a few more calculations. Keep in mind that this filtering must be done both vertically and horizontally, and often with different scaling factors. In addition, a conversion from progressive to interlaced scanning may be needed — but that's beyond this month's topic.

Upsampling

When converting from a lower to a higher resolution image (or when increasing the audio sampling rate), an upsampling process is used. In the case where an integer upsampling is performed, the process first involves zero-padding the samples, or adding a series of zero samples in between the original samples. In the frequency domain, this creates repeat spectra between the original signal and the new sampling rate. A low-pass filter is then used to smooth the signal, removing the repeat spectra.

The previous examples illustrate the process of changing the sampling rate by an integer factor. When a noninteger change is required, one of various methods can be employed. If a rational factor is needed (e.g., 3:2), then upsampling (in this case, by three) and downsampling (by two) can be cascaded. In practice, these steps are usually combined and performed at the same time, with a computational savings due to some samples being discarded.

Audio has its requirements, too

Rate conversion also applies to audio — with even stricter requirements. The ear is much more sensitive to distortions than the eye, especially when signals approaching pure tones, such as those of many musical instruments, are produced.

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In order to minimize audible artifacts, the lengths of the filters may be quite large. But with sampling rates much lower than those needed for video, the overall complexity (and cost) will be much less.

With audio signals, there may also be a more frequent need for asynchronous rate conversion (e.g., where

the source and destination sampling rates are unrelated). One such case could be where the destination requires a specific sample rate, locked to a reference frequency, and the source sampling rate is determined by a free-running clock, as in a recorder. If the two rates are very close, one could simply lock the playback mechanism



Figure 3. The right-hand image illustrates the aliasing that decimation creates in resampling the left-hand image. Image courtesy Thomas Svoboda.

to the new clock. But this is only acceptable if the change in timing (and pitch) is negligible. Assuming one wants to keep the signal in its digital form, the conversion system may have to convert on the fly, with interpolation or decimation carried out as needed on a sample-by-sample basis. One such solution will let the two clocks slide, until a sample must be

With audio signals, there may also be a more frequent need for asynchronous rate conversion.

added or dropped to maintain synchronization. Depending on the approximate conversion ratio needed, different algorithms for interpolation (filters) can be used.

In future articles, we'll discuss how sampling rate conversion is used in format conversion, and how video artifacts arise from the different elements. For now, the principles described here should give a better appreciation of processes that can affect the final quality of your video and audio signals.

BE

Aldo Cugnini is a consultant in the digital television industry.

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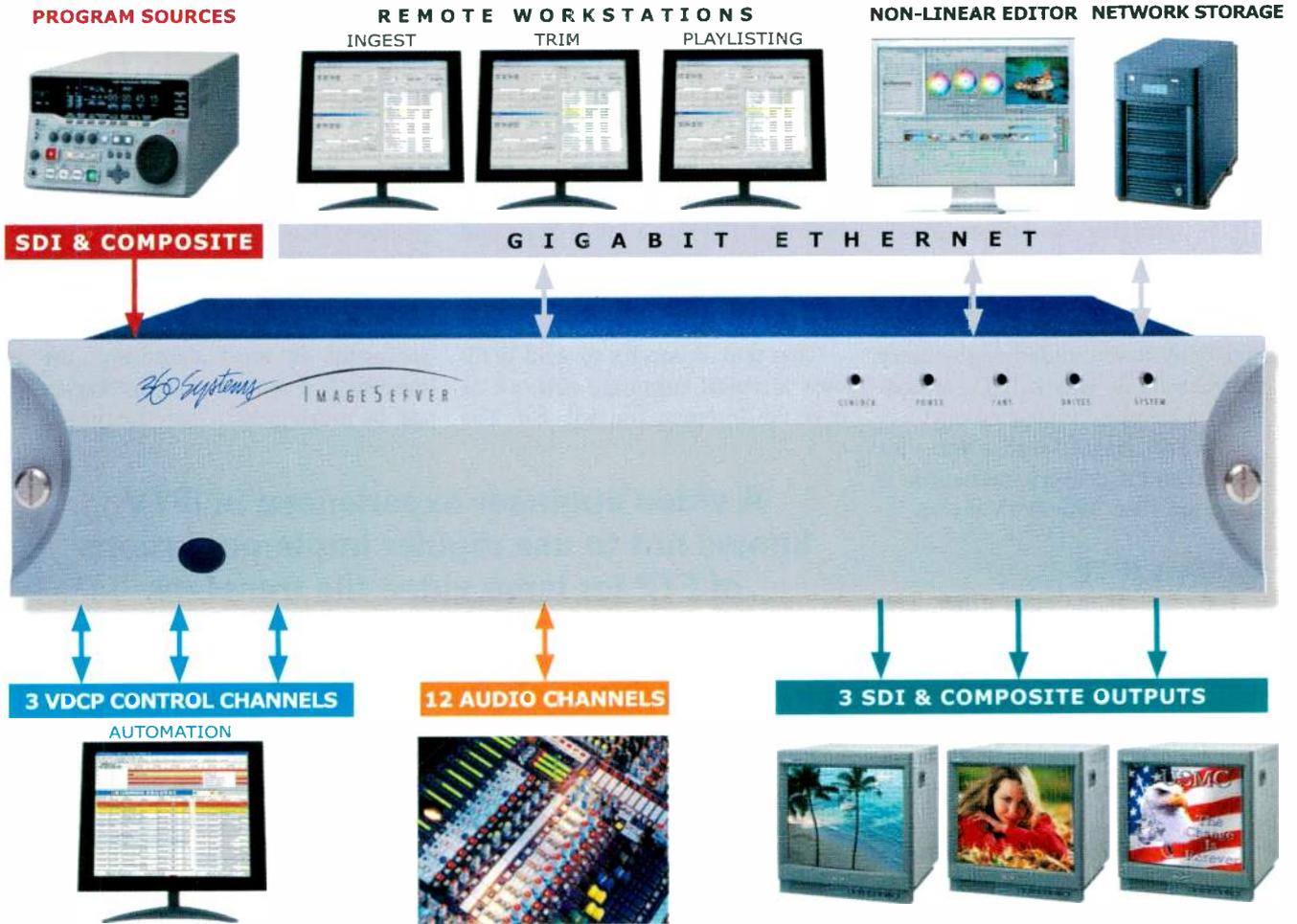
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IPTV is gearing up

Driving data from A to B faster requires a tech shift.

BY BRAD GILMER

IPTV is one of the most talked about topics in our industry. It is changing workflows, lowering costs and providing new opportunities. Yet the only difference between traditional television and IPTV is the underlying delivery mechanism. So why is IPTV considered such a powerful technology?

It is important to realize that a lot more than the delivery mechanism is changing. (See "Why IPTV thrives.")

Defining IPTV

Before reading any further, you should be aware that the IPTV terminology is evolving. Some people use the term IPTV to refer to video over IP. Others use IPTV to refer to delivery of content to the home, while reserving video over IP for professional applications.

While both of these terms correctly refer to IPTV, using the abbreviation VoIP to mean video over IP should be avoided at all costs. VoIP is used in the telecom industry to indicate *voice* over IP.

Is IPTV all hype?

Some people in the industry believe that IPTV is a lot of hype and that it will never be successfully used for broadcast-quality video. I think they are wrong.

That said, if you try to send IPTV over a typical corporate network or over the Internet, you will fail. The

Control Protocol (TCP) over IP. TCP over IP frequently suffers from congestion collapse. If a link is congested, TCP will cut transmission rates by 50 percent until it finds a speed at which the transmission of packets is successful. In most algorithms, the time for TCP to reach full speed again can be much greater than the time it

A video engineer experienced in IPTV knows not to use regular implementations of FTP for large video file transfers.

cause of the failure will depend on what you are trying to do.

For example, if you are trying to FTP a large video file, the transfer will fail because FTP does not support the transfer of large files (files larger than 2GB), or because the traffic throttling mechanisms in FTP all but guarantee that a large transfer will fail in most situations. (See Figure 1.)

FTP exchanges files over any network that supports Transmission

takes to throttle back. This is one of several reasons why TCP transfers may fail.

If you are trying to stream a live, high-bandwidth feed over the Internet, the characteristics of the network will likely result in numerous dropouts and perhaps in a complete failure of the link. But a video engineer experienced in IPTV knows not to use regular implementations of FTP for large video file transfers and that

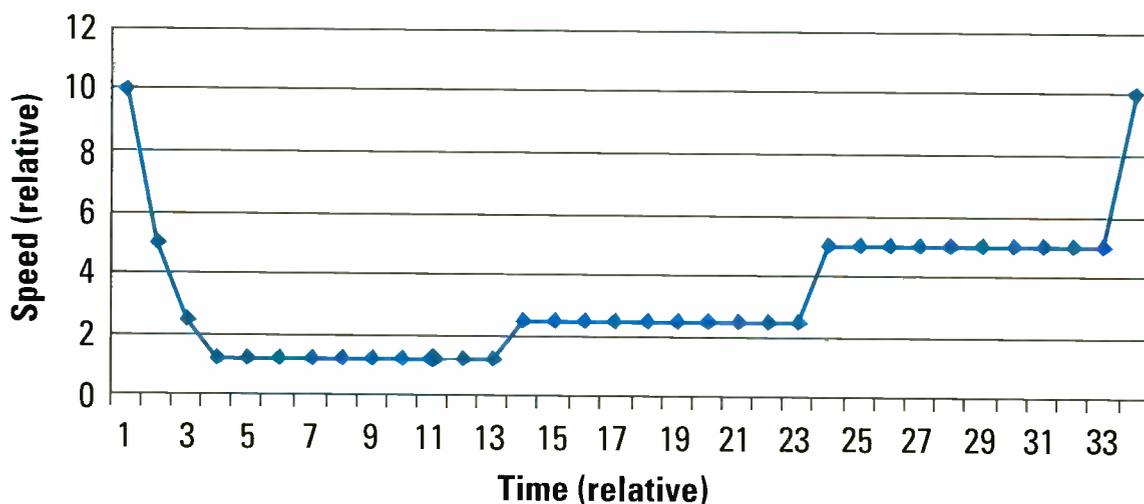


Figure 1. An example of Transition Control Protocol (TCP) transfer time over a congested network

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error correction will be required to transmit IPTV over the Internet.

Human error

Broadcasters have been using IP-based video transport for several years. Most of these broadcasters use specialized private networks, in many cases employing their own dark fiber-optic cables. IPTV has been used extensively to broadcast Olympic, football and baseball games.

Once the initial configuration is complete, IP-based contribution networks can operate for many days or weeks without a single error. The greatest source of errors in these networks comes from humans. People take equipment down for maintenance, expecting that end users will not notice the disruption as the network re-routes packets to their final destination. This may work for most IP-based traffic, but it definitely does not work for IPTV.

IPTV in the studio

IPTV has been deployed in the studio for some time now. Since the

Why IPTV thrives

- IP connectivity is available at a price that makes delivery of video economically viable.
- Switches, routers and other networking hardware have advanced to the point where it is possible to send multiple IPTV feeds through this equipment.
- Millions of consumer applications are driving the deployment of advanced networking protocols, which allow Internet backbone providers to manage the commingling of IPTV with data and voice traffic without unfairly impacting any of these services.
- Broadcasters have recognized the benefit of using self-routing packetized technology in their facilities.

1980s, graphics departments have been exchanging images over computer networks. Now, broadcasters include high-performance networks as a critical part of their broadcast

working with nonblocking switches. A nonblocking switch never runs out of capacity. Analog and digital video routers can be used 100 percent and never miss a beat. This is because



Broadcasters today often rely on internal IP-based storage and networking technology to support data rates exceeding 1.2Tb/s.

core. File transfer of content between devices is common, and streaming real-time broadcast-quality video and audio over IP infrastructures is also frequently used.

One reason for broadcasters' success at employing IPTV in the studio is the broadcaster controls the entire network. This allows the network de-

signer to ensure the network meets the demands of the on-air environment. Proper network design can make the difference between reliable IPTV transport and an unreliable network, which results in unhappy end users.

conventional cross-point routers switch inputs to outputs without sending the video over a common buss. With IP switches and routers, however, data travels across a common backplane. This means that all port traffic is aggregated onto the backplane. For example, a five-port

The commingling of IPTV, voice and data in these networks is good news for broadcasters.

signer to ensure the network meets the demands of the on-air environment. Proper network design can make the difference between reliable IPTV transport and an unreliable network, which results in unhappy end users.

Core backbone capacity

It's also important to have adequate capacity when building a studio network. Broadcasters are used to

100BASE-T switch would need a backplane capacity of 500Mb/s to be nonblocking.

Switch and router manufacturers may decide to employ lower bandwidth backplanes, particularly in large, inexpensive switches, as a way to reduce cost. The designers know most applications will not constantly require 100 percent capacity all of the time. However, IPTV is a demanding application.

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When transferring a file or sending a streaming IPTV feed, there are few if any breaks in data transmission. If you are using a blocking switch or router, you may quickly run out of backplane bandwidth if IPTV applications are used on a large number of the devices ports. That's why it is imperative to know the backplane capacity of the devices in your core network. The way the network device handles queuing can also significantly affect IPTV.

It is essential to have adequate capacity on links between IPTV devices and network switches and routers. This is also required between core network devices. One of the best ways to achieve this is to aggregate bandwidth across multiple network interfaces, often called teaming. Teaming allows multiple Ethernet interfaces to act as a single, high-capacity interface. Of course,

core network devices will need to be sized appropriately. In IPTV applications, this may mean spending extra money to purchase nonblocking devices.

Delivery to home

Some of the most exciting developments in IPTV are occurring in delivery to the home. Research and development investment has spurred major technology advancements in the areas of forward error correction (FEC), advanced network protocols, compression, and the commingling of IPTV, voice and data services all on one IP core network. Many of these developments will find their way into the professional broadcast space.

Much of the work on FEC and compression will directly affect broadcasters. For example, new FEC algorithms may allow broadcasters to achieve the required quality over

what are now considered to be unreliable IP links. Compression technologies under development continue to push HD rates down to the sub 8Mb/s range, and it is likely that those rates will be cut in half in the near future.

The commingling of IPTV, voice and data in these networks is also good news for broadcasters. The technologies that allow different services to coexist on a single network means that there will be hardened commercial solutions, which will allow broadcasters to transport IPTV, voice and data on a common infrastructure between facilities. **BE**

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

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HD in post, part I

Three post-production houses choose fresh, new workflows to digitally finish projects.

BY L.T. MARTIN

Ever since film was replaced by video as the mastering medium of choice, editors have been exploring the best way to finish projects using digital technology. Now that high-definition post is mainstream, modern NLEs offer several options for posting, including desktop computer software, a combination of software and hardware acceleration, and powerful proprietary hardware processing.

Each approach features its own advantages. Three of these approaches are illustrated in the case studies that follow.

PlasterCITY

Thanks to the rapidly increasing power of computer processing, Apple's Final Cut Pro software is able to accomplish video mastering at a level previously possible only with a much higher capital investment. In Los Angeles, PlasterCITY Digital Post facility has found ways to use the editing software with great efficiency in online and offline editing, specializing in creating digital intermediates for independent films.

Five years ago, PlasterCITY's founders Michael Cioni and Ian Vertovec were considering establishing a high-end post-production workflow. They selected Final Cut Pro for its ability to online 8-bit HD video, which was not as common then as it is now. With AJA Video as a technology partner, they could equip their facility with Final Cut Pro workstations and AJA video cards for a fraction of the cost of a hardware-based nonlinear post house.

This has led the team to the concept of HD digital intermediate, by mastering onto Sony 4:4:4 HDCAM SR tape. They use it on two or three



PlasterCITY's online/offline edit bays are chock-full with HD-editing goodies, including Apple's Final Cut Studio and Shake, as well as Adobe's After Effects and PhotoShop.

feature films each month, in addition to posting "The Sarah Silverman Program" for Comedy Central.

Each of PlasterCITY's 10 online/offline edit bays use the latest univer-

maximize the power of multitasking a project without the overhead of large investments in tape decks. In fact, PlasterCITY only has one tape deck per tape format. And the post

PlasterCITY leverages the software-based capabilities of Final Cut Pro to maximize the power of multitasking a project without the overhead of large investments in tape decks.

sal version of Final Cut Pro for Macs. One bay is dedicated to color correction, another to audio and the rest to online/offline editing. The program handles each editing process with the same software functionality.

PlasterCITY writes its own code for 20 percent of in-house processes. The team leverages the software-based capabilities of Final Cut Pro to

house can distribute processing-intensive operations such as composite rendering among 10 Apple workstations being fed by a large SAN using grid-style computing.

Recently, the team used this system to master the HD digital intermediate for Chris Paine's feature documentary, "Who Killed the Electric Car?" narrated by Martin Sheen

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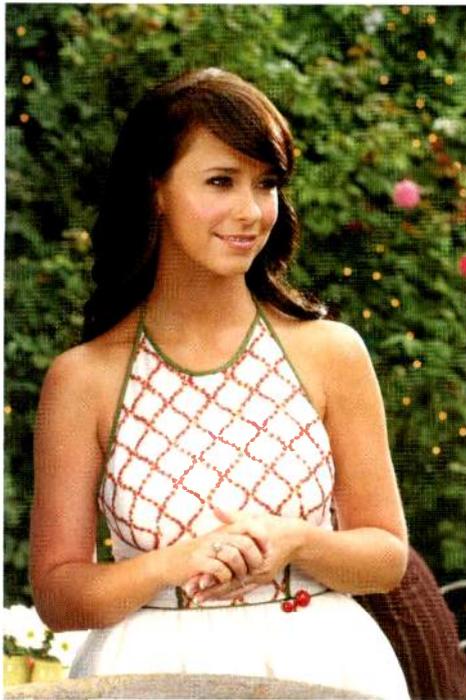
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back into the editing application. It became a one-click round-trip.

These time-savers were essential to meet the project's tight deadline. The entire online process was accomplished in less than four weeks, and *PlasterCITY* finished six weeks before screening at the Sundance Film Festival.

Keep Me Posted

Avid Technology's NLEs use a combination of software running on either Windows or Mac platforms along with the company's acceleration technology called DNA, short for digital nonlinear accelerator. This pairing offers the advantages of

effects created offline on an Avid Media Composer into the mastering system.

Because more than 90 percent of prime-time programming is cut on an Avid, this represents a significant savings in cost and time. More of the detailed work that only a few years ago was relegated to the online suite can now be accomplished in a far less expensive offline environment. Before Total Conform launched on the Symphony, however, that offline version was considered a rough cut that producers had to monitor through the mastering process in order to recreate it properly.

Now, even keyframed motion effects and complex 16:9 AniMatte composites can be polished while offline and brought directly into the finishing process with minimal tweaking. On one of last season's episodes of CBS' "Ghost Whisperer," Peterson found the new SpectraMatte keying tool in the Symphony Nitris to be invaluable. Working under tight deadlines, it let him make last minute changes in elaborately composited shots without having to send them back to the visual effects shop that created them. Thanks to the power of the system's Nitris acceleration, Peterson could analyze images down to the pixel level to control edge spill and make sure even the finest hairs came through the compositing process intact.

Peterson also mastered episodes of the dead-case crime series, "Bones," for FOX. Here, he ran into the challenge of some elaborate multispeed effects, where the video's motion was ramped up and down. Not that long ago, this would have required massive amounts of disk space and an



Keep Me Posted employed the Avid Symphony Nitris' SpectraMatte key tool for last-minute changes on CBS' "Ghost Whisperer."

and released by Sony Pictures. The team used Adobe After Effects, Apple's Shake and Final Cut Pro to take footage — Web streams, DV video and 8mm film — and convert it into 1080i HD through KONA video cards to match the production's film transfers created by E-Film.

Because the film is about cars, one unique challenge was the legal need to blur more than 400 license plates. The team used Final Cut Pro to send the blur to Shake and then brought it

an editing user interface with hardware-based mastering capabilities.

Keep Me Posted, a division of FotoKem Laboratories, recently added an Avid Symphony Nitris to its compliment of high-end mastering systems at its Burbank, CA, facility. Editor Erik Peterson uses the Symphony with its Nitris accelerator to finish prime-time television episodic programming. He uses the system's Total Conform feature, which brings all of the editing decisions and ef-

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expensive online session. Today, the offline editor of “Bones” was able to create the effects while the producers were still making creative decisions, and the final version was then re-assembled automatically with Total Conform in Keep Me Posted’s Symphony Nitris system.

FOX also wanted to experiment with Avid’s DNxHD compression codec, which enables the final master to be compressed down to SD bandwidths and be transported and stored

ware and the post house’s own extensive storage capability with a PC for system control creates the power to handle the most demanding video formats and the flexibility to access a massive number of files.

The HD edit bays at Milagro Post include Quantel eQ edit systems with QColor panels attached for color correction as well as the eQ FX

integrated into local and national Ford advertising campaigns.

Because car models change annually, this material has a short shelf life, yet it has to be constantly accessed for new commercials. In the rarefied atmosphere of car commercials, every eye-catching frame is critical to the success of a given spot, and all matte and compositing work

In the rarefied atmosphere of car commercials, every eye-catching frame is critical to the success of a given spot, and all matte and compositing work has to be at the highest quality and resolution possible.



Milagro Post uses the Quantel Pablo color corrector to master in 2K on iQ systems.

within a conventional infrastructure. The highest DNxHD rate — 220Mb/s — was used to compress episodes of “Bones.” And Peterson reports that even with that reduced amount of data, the high-definition images were visually indistinguishable from native HD. The ability to reduce the storage needed for HD shows without sacrificing quality could have an influence on how future shows are distributed and archived.

Milagro Post

At Milagro Post, located just outside of Detroit, 13 Quantel workstations help the team meet the challenging needs of the motor city’s image-conscious automobile industry. Quantel’s use of proprietary hard-

desktop application for effects creation. The team can master in 2K on Quantel iQ systems with the help of the new Pablo color corrector, which can handle up to 4K files. All Quantel applications use the same software interface with the differentiation in their capabilities coming from the hardware attached to them.

Recently, the group put its system’s capabilities to the test by creating running footage packages for Ford. This involved 120,000ft of 35mm film containing glamour shots of the latest car models in various locations. Milagro Post imported all of this through a Spirit 2K datacine into its 64TB film SAN using Rorke drives. All of this was accessed by the iQ. Eventually, this material will be

has to be at the highest quality and resolution possible.

Having it all available online in real time means clients don’t have to waste time while tape reels or RAID servers are changed between projects. It also allows the color specialist at the Pablo console to tailor the look of each selected shot to the specific commercial. As a side benefit, the color-correction system adheres to the 3-D color space specifications required by the Digital Cinema Initiative for digital cinema releases, another service that Milagro Post can provide thanks to its Quantel hardware-based approach.

Post review

Of course, when you’re making a wish list for the ideal HD post-production system, you must take cost into account. But, as the competition in digital post heats up, there are software and hardware to meet increasingly sophisticated needs. And the field is by no means limited to the three workflows illustrated here. In the December issue of *Broadcast Engineering*, I’ll offer additional case studies to help guide you through other solutions.

BE

L.T. Martin is a freelance writer and post-production consultant.

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digitalemotion

Pattern directions

Model measurements for antenna patterns may not be the best solution.

BY DON MARKLEY

Today, especially for DTV facilities, directional antennas primarily provide protection to the service areas of other stations. Measurements of outgoing and incoming interference are based on the patterns of all stations involved, as contained in the FCC's database. Those patterns are normally derived from the operation of the antenna in free space.

To confirm the accuracy of antenna patterns, stations can perform measurements using either a full-scale antenna on a range or using a model in an anechoic chamber. Full-scale ranges have almost disappeared from use. For years, RCA, Harris, Dielectric and RFS each operated a range for full-scale measurements of horizontal and vertical antenna patterns. But today, those ranges no longer exist. To my knowledge, only Jampro still operates a full-scale range.

Measuring antenna patterns

It is beyond the scope of this article to argue the relative accuracies

of model measurements vs. full-scale range testing. The main point is to recognize that the commission will accept either method.

Normally, patterns filed with the commission are based solely on calculated values. Television stations do not have to file measured pattern values with their license applications, whereas FM stations must provide documentation of pattern measurements.

assumption of free space is pretty realistic.

The problems occur when other conditions exist, such as when an antenna is side-mounted on a tower. The omnidirectional antenna will no longer be omnidirectional, and the exact shape of a directional pattern will be changed.

The amount of such change can be determined but it isn't easy. One good method routinely used in FM

The patterns submitted to the commission are based on the TV antenna operating in free space, without respect to the mounting structure or other items in the area.

The patterns submitted to the commission are based on the TV antenna operating in free space, without respect to the mounting structure or other items in the area. When dealing with a single antenna top-mounted on a tower placed far from other towers or antennas, the

service is to perform the measurements with the antenna mounted on a section of the tower.

Another method is to use models with transmission lines passing through the aperture. Ladders, conduits, climbing safety devices and other hardware are included in the model. If all nearby conditions are accurately considered, both the modeling measurements and the calculations will produce a fairly accurate version of the antenna pattern.

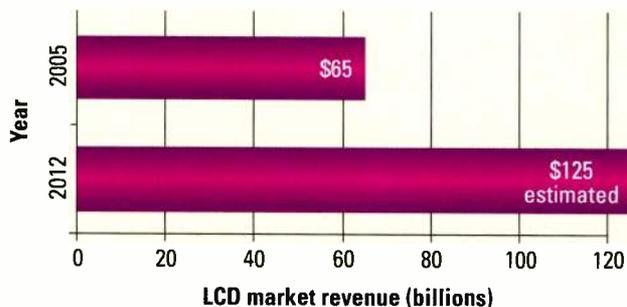
Consider an antenna mounted on a solid surface, such as the cylinders on the Sears Tower. It is obvious that the cylinders will significantly affect the radiation on the opposite side of the antenna. Moving vertically, antennas are mounted on the individual towers in the aperture of antennas on the other tower. A number of parameters will affect the antenna pattern, including the frequency of the radiated signal and the size of the tower members.

FRAME GRAB

A look at the consumer side of DTV

LCD television revenue growth

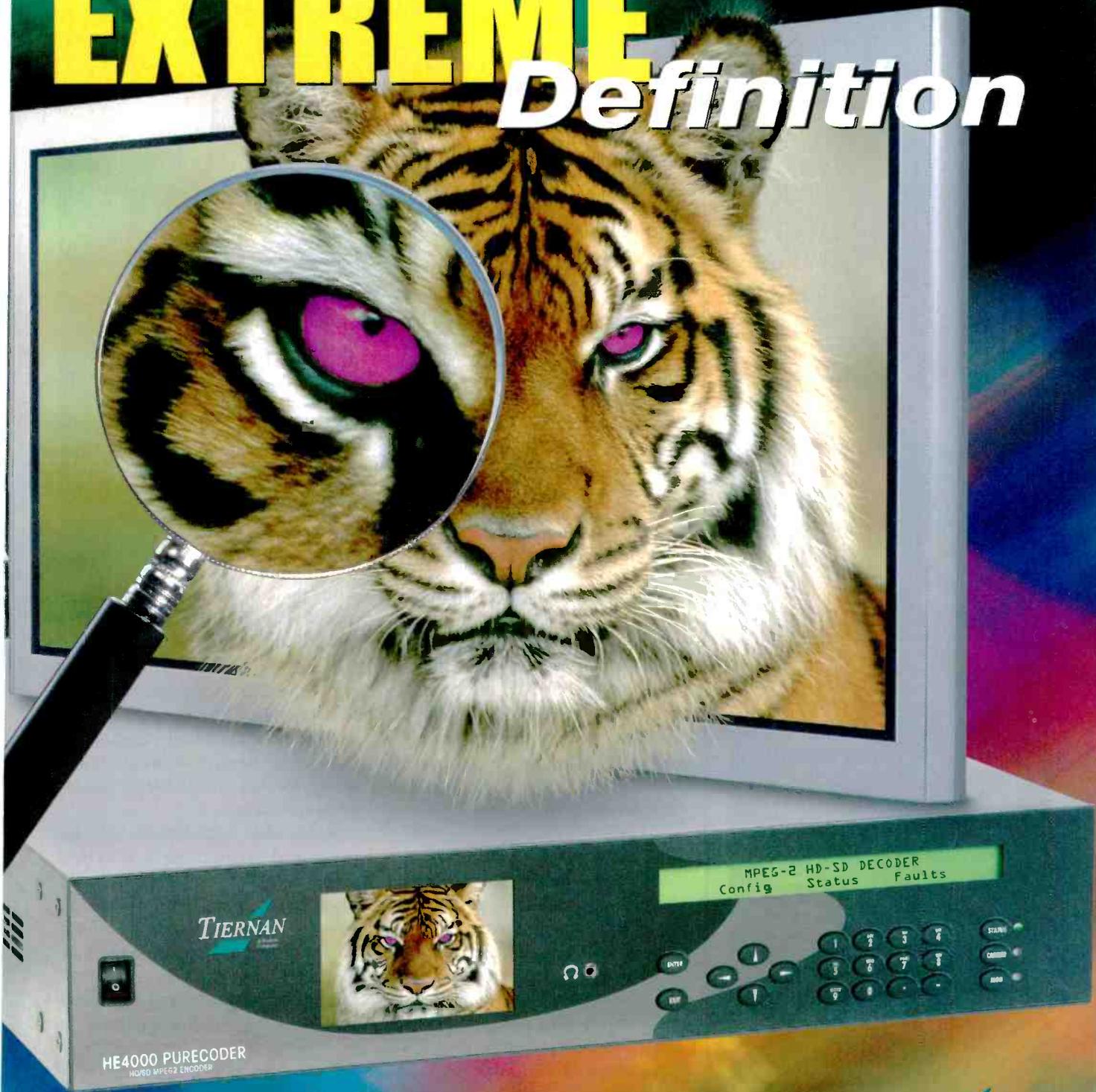
LCD televisions generated an estimated \$65 billion in 2005.



Source: Frost & Sullivan

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Jampro Antennas conducts full-scale tests of antennas on towers at its 700 acre range near Sacramento, CA.

The most affected area is where the tower members approach one-half wavelength at the operating frequency. In FM service, that point has long been considered. And 4ft to 5ft face towers are avoided in the antenna aperture. In such cases, an omnidirectional pattern can be changed by as much as 3dB. The same type of effect can occur to TV signals.

Defining a true pattern

So what is the real pattern? Is it the theoretical calculated pattern, the measured free space pattern or what actually occurs when the antenna is mounted on a large structure or in the vicinity of other antennas?

Other types of antennas can also affect directional antenna patterns. Slot antennas normally look like a big piece of pipe at frequencies significantly removed from the antenna of concern. On the other hand, panel antennas are wideband in their operation and are much more significant re-radiation sources.

Years ago, licensees were concerned about the effect of towers mounted on the same structure. An early example was the John Hancock Tower in Boston, where two towers supported multiple antennas. A

study done by Andrew Alford determined that the antennas' placement created a saw-tooth pattern in the radiation pattern. The size and number of the teeth in that saw tooth was a function of the frequency involved and the distance between the towers. This effect relates to the multiple antennas located on a T-bar or candelabra structure.

Reasonable calculations can be performed to determine how to best locate antennas on a structure or a tower. In the case of multiple antenna structures, those calculations should be performed to determine the best mounting configuration so that all stations will obtain the best possible performance from their antennas.

Scattering programs

These calculations are essentially beyond the normal function or abilities of most consulting engineers. Such an undertaking usually requires a handful of engineers directly involved in the design and construction of transmitting antennas. The calculations are extremely complex and should be performed by computer programs that are proprietary to the manufacturers.

You can analyze the impact of

reflecting surfaces in the vicinity of a transmitting antenna by using various scattering programs. Those programs use the transmitting antenna pattern, the frequency involved and the physical characteristics of the structures as inputs. This includes whether the structure is solid, as in a cylinder or microwave dish, or broken, such as a tower. The result will usually be a pattern. Variations of more than 10dB over small azimuth angles are normal. Fortunately, when all the re-radiated signals are combined and incorporated into the actual station service calculations, they tend to average out.

Final measurement

The purpose of performing these calculations is to show that two separate antenna patterns can exist. The first pattern is the calculated pattern the commission wants in the application. In a lot of cases, this pattern might best be described as far from reality. However, the commission doesn't have the means to investigate it and usually accepts the pattern data offered.

The second pattern is the real one. It considers the actual operation of the antenna and the physical environment surrounding the antenna, rather than free space. This pattern realistically describes how the station will perform. It is not simple to obtain this pattern, but it can be determined by providing antenna manufacturers with data about the real world conditions where the antenna will be mounted.

Most stations don't want to spend the money to determine the realistic pattern and will evaluate the performance of the transmitting system by the TV set in the manager's family room, which is operating on cable fed by a fiber-optic system. If the manager is happy, all is well in the world. **BE**

Don Markley is president of D.L. Markley and Associates.

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IPTV

T & M CHALLENGES

BY JON HAMMARSTROM

The reality of IPTV may be just around the corner for many North American viewers. And hundreds of thousands of viewers in France and Hong Kong already receive broadcast-quality video delivered via IP to their homes.

IPTV is not a revolutionary concept. It is an evolutionary transition of broadcast television that presents some significant challenges despite the marriage of two well-understood technologies — IP and video compression. For service providers, it is an opportunity to gain additional revenue using existing infrastructure and to develop a growth strategy around well-defined technologies and an established service model.

In most cases, IPTV will not be offered as a standalone service, but as part of a triple-play package. The IPTV element of the triple-play market is relatively immature when compared to other transmission infrastructures supporting video (i.e. cable and terrestrial broadcast systems). The focus, therefore, in initial network pilot deployments and during new service rollouts, has been on getting the systems to work.

QoS foundation

IP is now widely deployed for internal distribution in broadcast and network operations facilities. Test and analysis for internal distribution can be distinctly different from that required for IP delivery directly to the home (i.e. IPTV). Test strategies during IPTV initiation, establishment and rollout will vary, but all will be targeted to ensure quality of service.

The organizations involved in IPTV deployments are at varying points along the implementation curve. But in general, those responsible for the system face a three-part problem of design, deployment and management.

In the process of designing components for use in the network and in the home, including set-top boxes, designers and manufacturers must ensure standards compliance and interoperability. There are too many standards, formats and sources of network traffic to leave this to chance or to take shortcuts in the process.

A triple-play network needs to assure availability of network resources and

bandwidth to deliver video services. However, overall network bandwidth is finite, and so it is equally important that unnecessary pathways can be torn down successfully. This requires test equipment capable of establishing and testing the IP pathway and providing statistics on network jitter and packet loss.

In the process of new service deployments, the initial concern is getting the system to work. Once the basic network design considerations are met, the next step is looking at what goes in and comes out of the network.

Having established that the IP pathway can be reliably set up, it is then essential that the video data pushed into and received from the pathway is correct. This requires monitoring and analyzing of transport streams (TS)

The media delivery index for IPTV networks predicts expected video quality based on network level (or IP) measurements.

at the output of encoders, multiplexers and headends to ensure the source material is correct.

At the receiver end, similar monitoring and analysis will ensure that there has been no degradation to the video as it passes through the system. Those responsible for installation and commissioning will require video expertise and trusted tools to make the correct compressed video measurements for

Large-scale IPTV deployments are still in the early stages

Today, there is only a handful of network operators globally that has deployed IPTV systems with more than 250,000 subscribers. For the most part, IPTV deployments have been limited in scale and targeted to select markets, but they are being positioned for significant expansion.

There is still a lot to be learned about ensuring quality of service in large scale systems, while rolling out significant new services, incorporating new technologies, and especially when combining video with voice and data over a single IP network.

both multi-program transport stream (MPTS) and single-program transport stream (SPTS) systems.

As initial problems of early deployment are solved and operations scale up for full IPTV system use, the need for system management and test requirements will shift toward

video quality based on network level (or IP) measurements. It is independent of the video encoding scheme and is a lightweight, scalable alternative to measurements that decode and examine the video itself.

MDI is the ratio of media delay factor (DF) to media loss rate (MLR), which is the number of packets lost in one second. The DF indicates how long a data stream must be buffered (i.e. delayed) at its nominal bit rate to prevent packet loss. MDI is typically displayed as two numbers separated by a colon — DF:MDR.

MDI is defined by the European Telecommunications Standards Institute (ETSI) in RFC 4445. It recognizes impairments in the IP layer and offers a general idea of network jitter. While MDI infers video quality, it does not provide specific measurements related to video quality.

The MDI-DF can give a measure of congestion in a network by showing usage level and detecting when queuing happens in network components. It is also useful to know how much of the queue buildup is due to video packet bunching and to have an indication of whether the session bit rate can handle the required MPEG TS bit rate.

A good MDI does not mean a faultless IPTV transmission. And a bad MDI can be unrelated to video quality. The best solution is to use MDI and MPEG layer protocol test in conjunction (i.e. as cross-layer measurements).

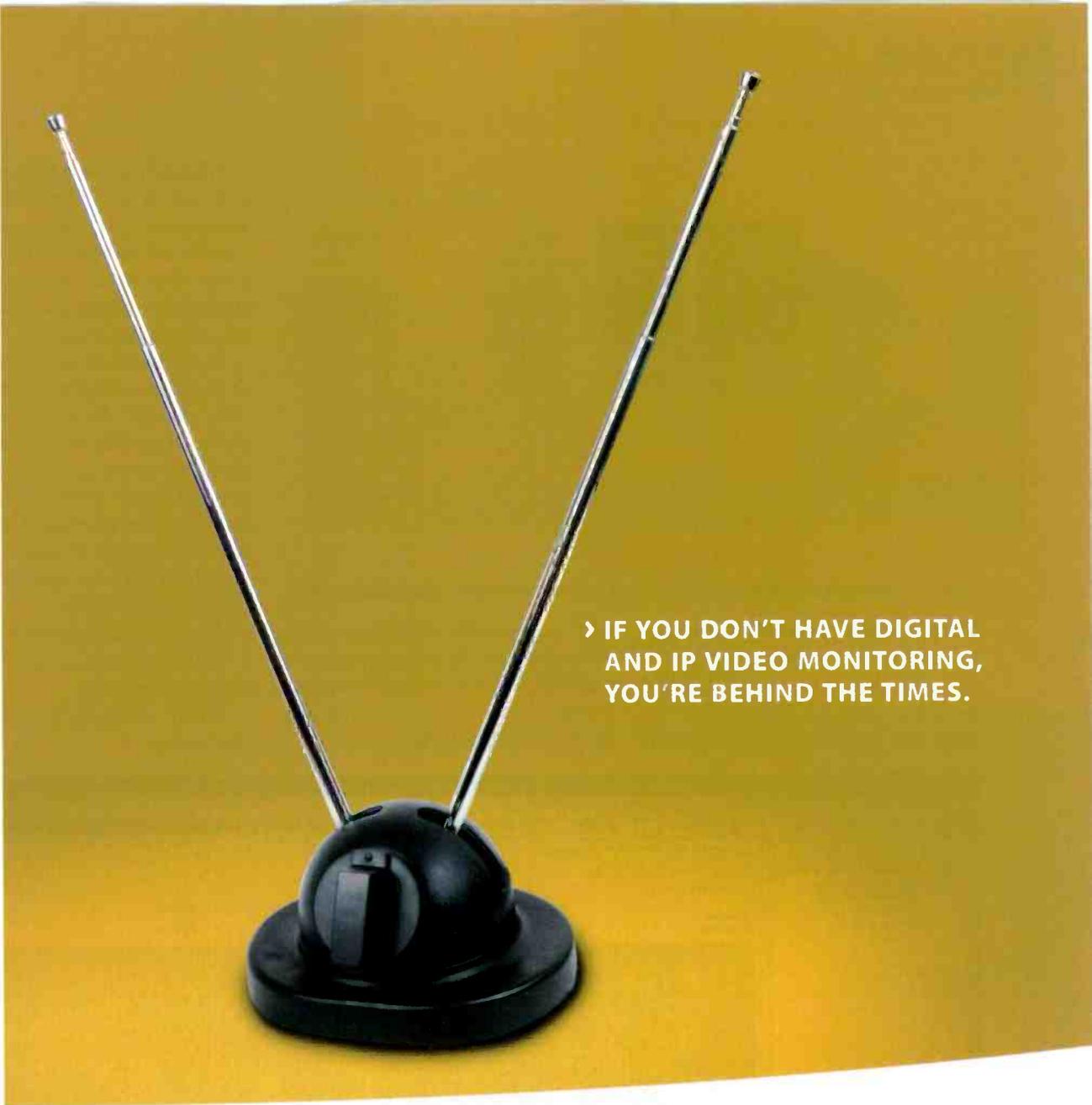
networkwide monitoring as part of a large service assurance system. Test strategies and equipment must lead to fast and correct solutions to ensure that the highest quality content is always delivered.

QoS measurement using MDI

The media delivery index (MDI) for IPTV networks predicts expected

Triple-play networks have yet to fully converge

Video, data and voice are generally handled in separate networks and by separate teams, only converging deep into the network. Point solutions will allow operators to monitor and test the most critical points within their IPTV network. And because IPTV is a technology that will force IP network engineers to consider video issues and video engineers to consider IP network issues, it is important to choose a test and monitoring solution that provides visibility of both domains and correlation between them. This will enable faster problem identification, isolation and resolution with minimal impact on the end-user experience.



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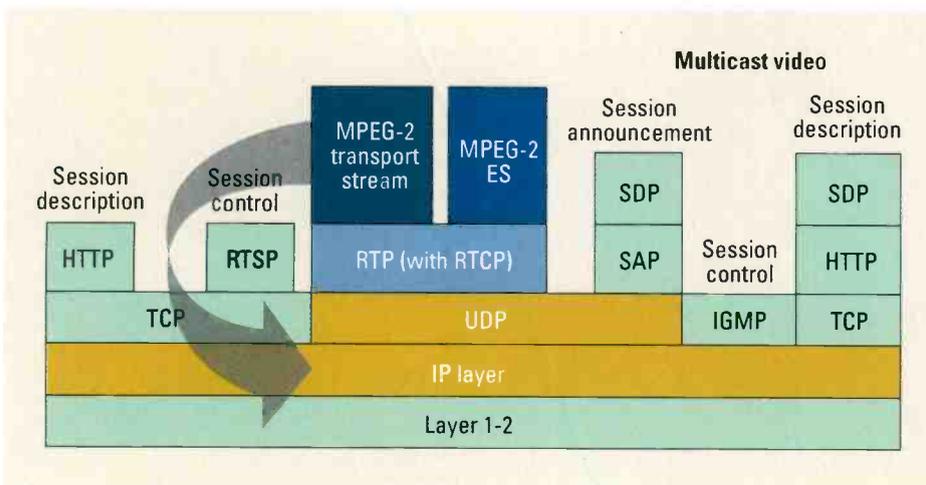


Figure 1. Cross-layer correlation allows you to see how events affect one another.

Cross-layer measurements

A 2001 ETSI technical report, TR 101 290, defines a set of standard evaluation tests for digital video systems that can be performed repeat-

edly and provide consistent results assuming reasonable management of variables. The tests to detect transport stream corruption and network jitter are useful MPEG layer tests.

It is best to perform these in conjunction with IP tests throughout the network. Cross-layer testing is useful when monitoring both the IP and MPEG domains to trace and track performance degradation before the problem gets too serious. (See Figure 1.)

It is possible to detect video errors at a user site with MOS techniques or even a visible check. However, these methods provide no indication of the problem's root cause. A problem that appears in one layer, medium or device may have been caused by a variety of seemingly unrelated problems elsewhere in the system. The root causes may include:

- dropped or out-of-order packets;
- traffic congestion on the IP network at aggregation; and
- core or access satellite feed problem due to rain.



Figure 2. Viewing a simultaneous graph display allows you to pinpoint problem spots before they worsen.

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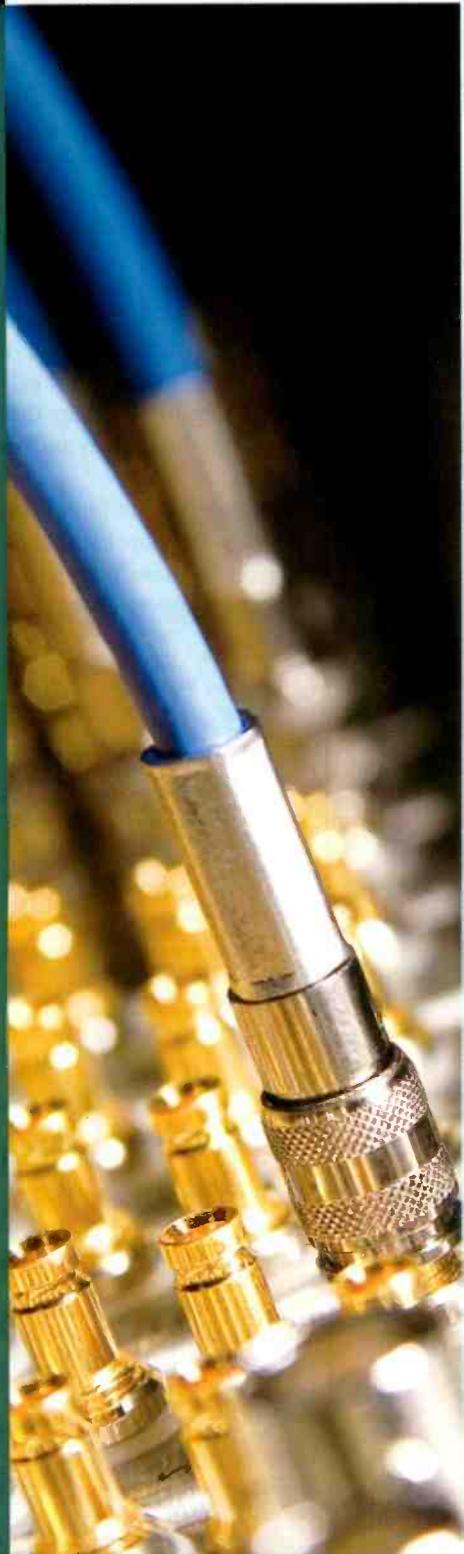


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Delivering video presents unique challenges

Video has intensive bandwidth requirements in a best efforts network. Video is intolerant to packet loss, out-of-order packets and resends. These issues will only increase as more video is carried through IP networks and HD and other services begin to demand increasing amounts of bandwidth. There is a lot of complexity associated with ingesting, storing, encoding, transcoding and multiplexing video streams for delivery to the home. There is little margin for error. And any errors that do occur have a high impact on the user experience.

Test and measurement solutions that provide information, not just data, offer insight to the analysis process in a variety of ways, including graphing jitter within the MPEG stream or at the IP layer and quantifying them.

Viewing graphical plots helps correlate events over time as they happen on one layer and allows users to see whether

they affect one another. (See Figure 2 on page 46.) This helps pin down the root cause to a specific layer, allowing a fault to be isolated and rectified.

Time stamping alarms, trace files and fault logs improve the operator's ability to backtrack intermittent faults to see whether an MPEG stream had an internal transport stream fault or whether the fault was related to an IP

event. (See Figure 3.) The TR 101 290 tests analyze many parameters on the MPEG layer. The specific parameters affected by dropped and out-of-order packets on the IP layer are the sync byte, continuity count (a four-bit rolling counter on a packet identifier basis) and cyclic redundancy check (CRC).

Most MPEG streams contain a built-in timing packet called the program clock reference (PCR). Graphing PCR inaccuracy and overall jitter gives a good indicator of a stream that may be suffering timing distortions due to packet burstiness or jitter. When combined with the simultaneous display of IP packet inter-arrival timing, an engineer can time-correlate the signal with PCR and with presentation time stamp (PTS) on elementary streams. This cross-layer check is also possible even

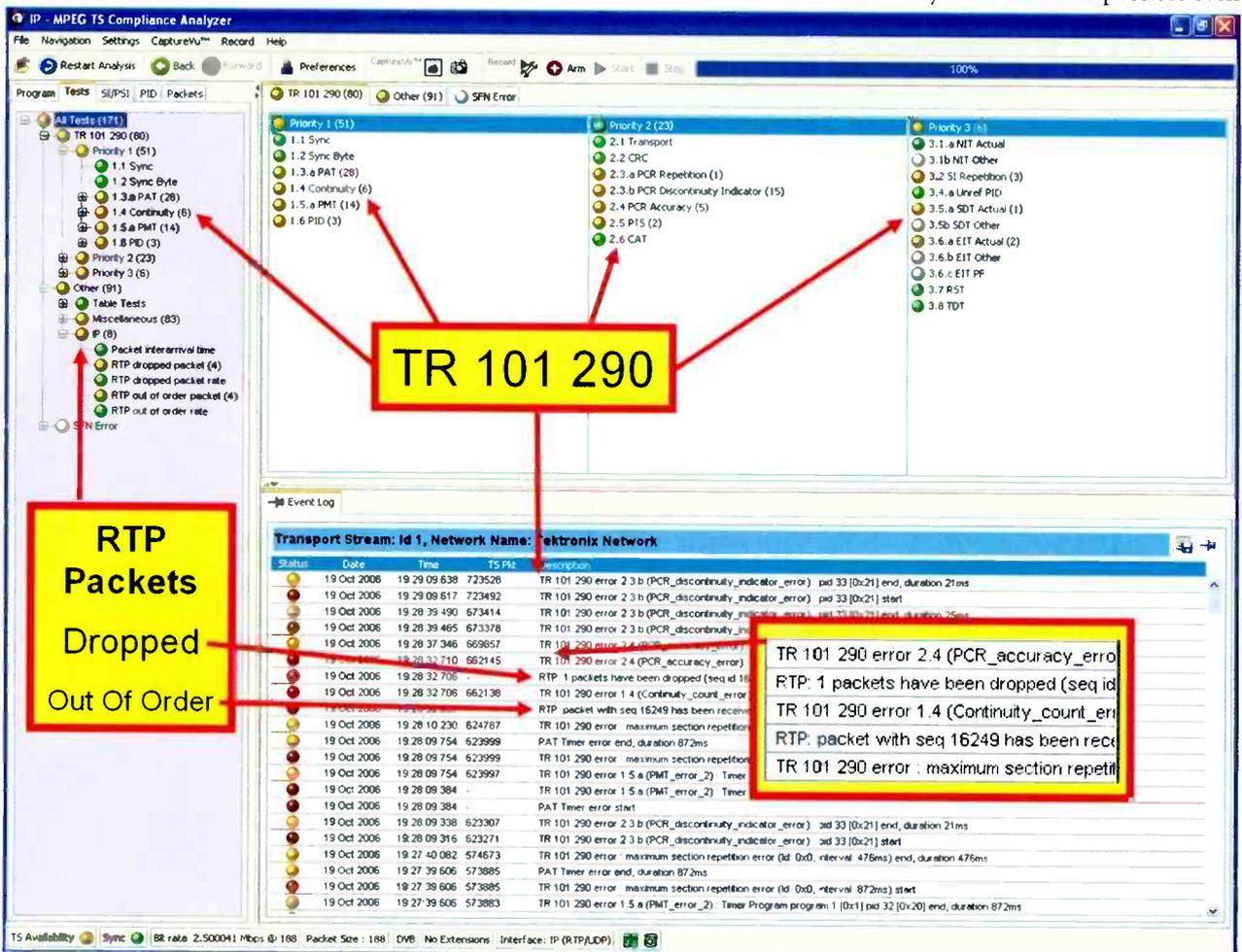


Figure 3. Error logging with cross-layer time stamps aids in resolving hard-to-trace faults.

if the TS does not contain a PCR. (See Figure 2 on page 46.)

PCR overall jitter (PCR-OJ) and PCR frequency offset (PCR-FO) can be compared with packet arrival timing stability to assess the source of IP or MPEG introduced jitter. There are defined acceptable limits for PCR but none for IP arrival interval. These are user defined, and test equipment should allow users to set limits.

For MPEG-4 transports that don't

strictly need PCR, some operators still establish a PCR feed, as it takes up little bandwidth and offers a fast indication of timing health.

Finally, a cross-layer test can extend to RF layers, where off-air content is acquired for delivery over IP networks. RF test probes can demodulate, decode and perform MPEG tests to detect whether timing (PCR) and jitter are already present on the downlink.

Final control

IPTV-specific video test and measurement operational parameters vary from network to network and operator to operator. They depend on many variables, including some not within the network operator's control. Establishing the correct operating parameters is an iterative process.

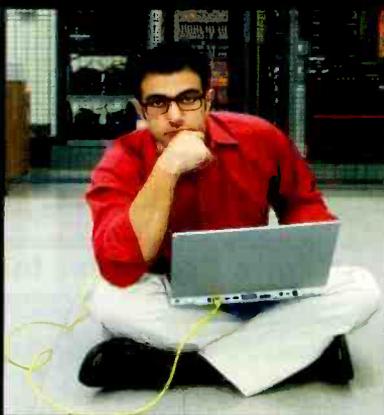
As organizations move into the challenging new space of IPTV, they will need to empirically develop a test strategy that delivers the QoS levels demanded by viewers. It's essential to select test and measurement tools with the appropriate depth of capability and user definable test parameters. It is critical to establish a correlation between events in one layer of the pipeline and another to provide a warning of impending disaster, or in the worst case, rapid disaster recovery. **BE**

Jon Hammarstrom is senior manager of video global marketing at Tektronix.

The advantages of cross-layer correlation

- Graph packet arrival interval (to show burstiness)
- Time-correlate packet arrival, PCR and PTS arrival interval graphs
- Identify underlying IP transport errors (CRC, dropped packet, out of order packet)
- Identify all TR 101 290 errors
- Time-correlate errors at IP, TS and RF levels to identify root cause
- Timestamp errors with layer identifiers in error logs

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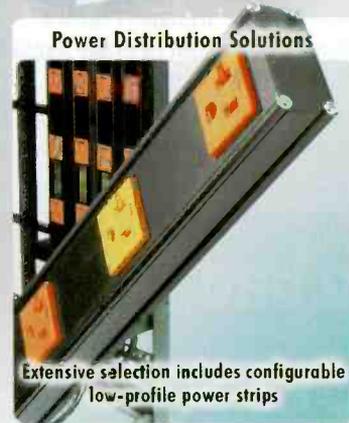


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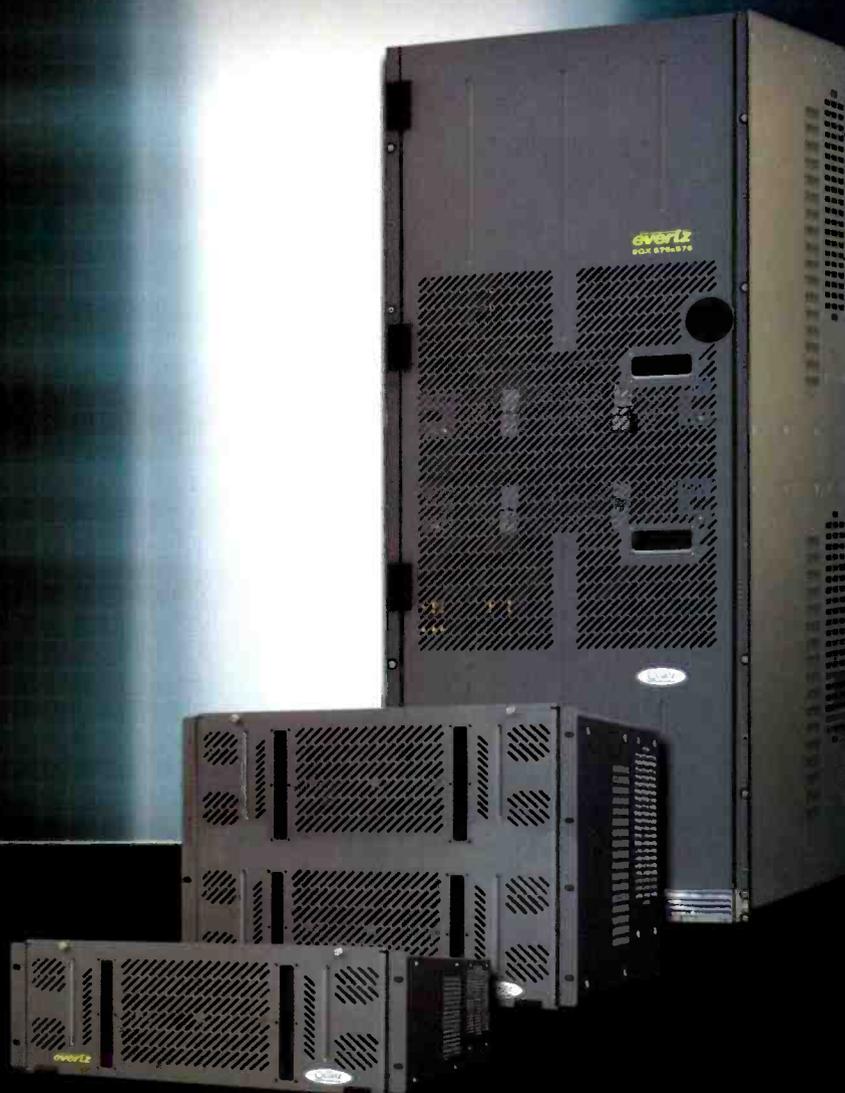
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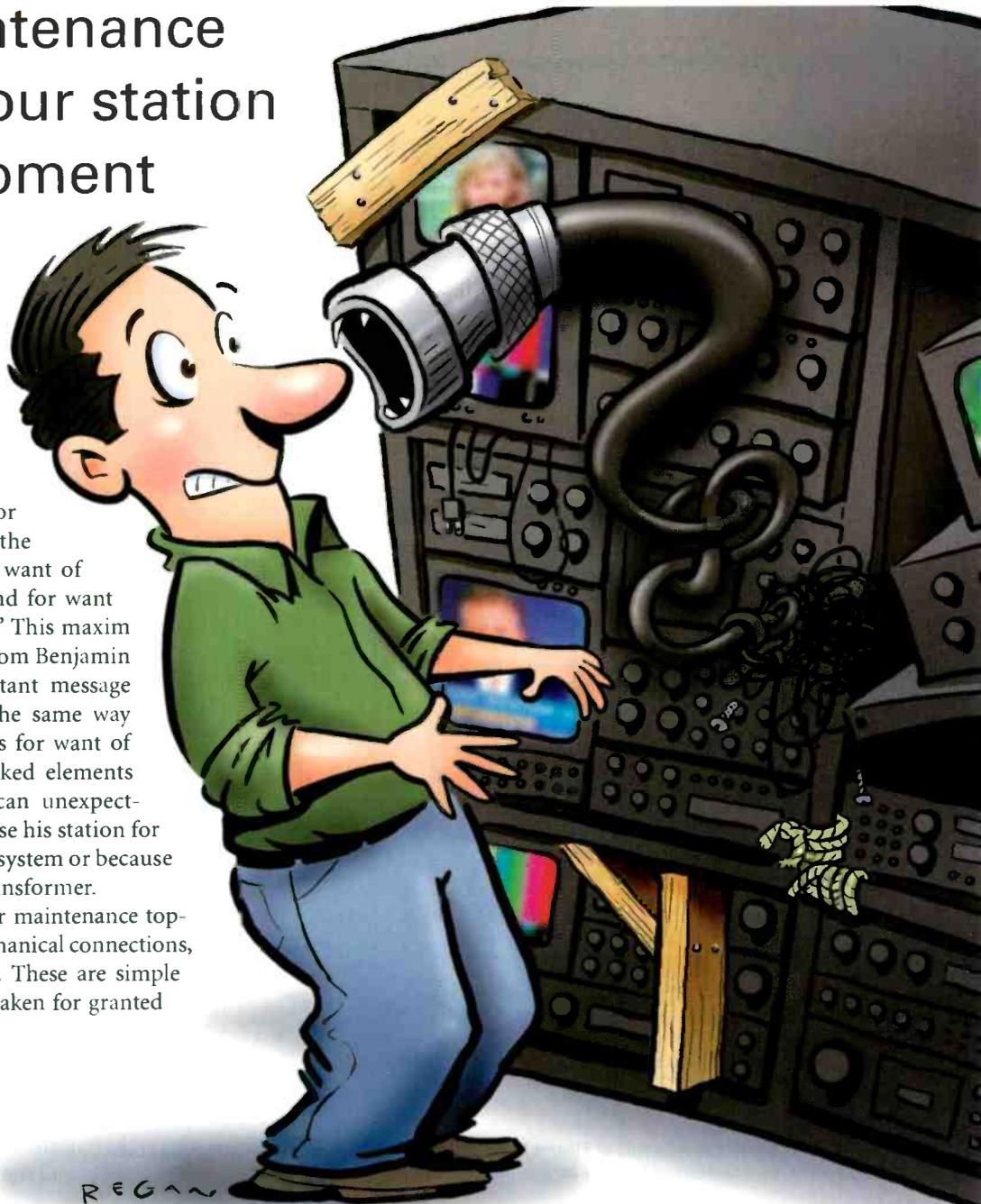
BITTE

Basic maintenance protects your station from equipment failures.

BY ROLIN LINTAG, CSTE

A little neglect may breed mischief: for want of a nail the shoe was lost; for want of a shoe the horse was lost; and for want of a horse the rider was lost.” This maxim about nails and horseshoes from Benjamin Franklin contains an important message for broadcasters. In much the same way Franklin’s rider was horseless for want of a nail, it’s the little, overlooked elements of basic maintenance that can unexpectedly cause a broadcaster to lose his station for want of a properly grounded system or because of a loose bolt on a power transformer.

This article focuses on four maintenance topics — proper grounding, mechanical connections, AC power and staff training. These are simple concepts, but they are often taken for granted until problems occur.



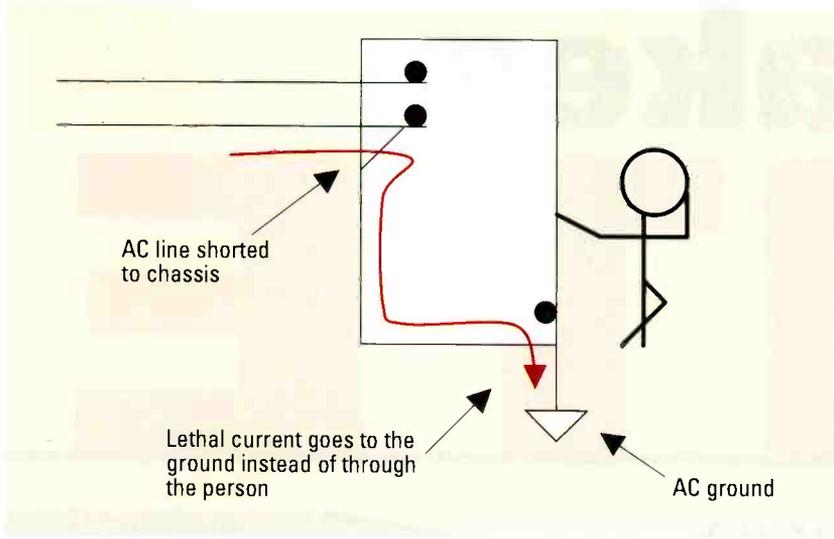


Figure 1. Ground systems prevent lethal currents from flowing through a person.

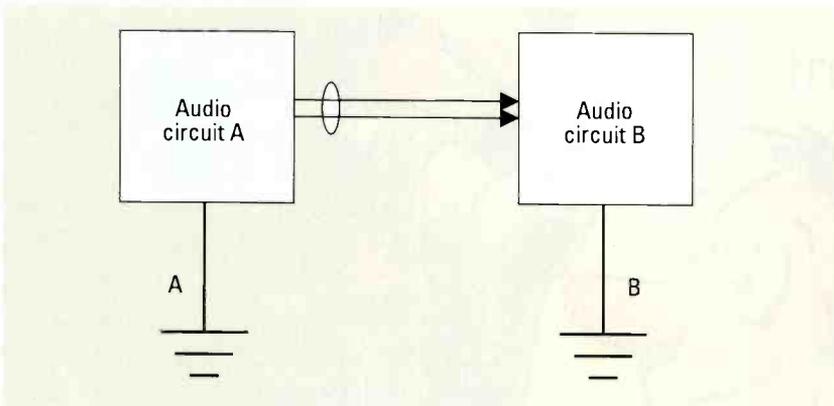


Figure 2. Audio system with separate grounding points

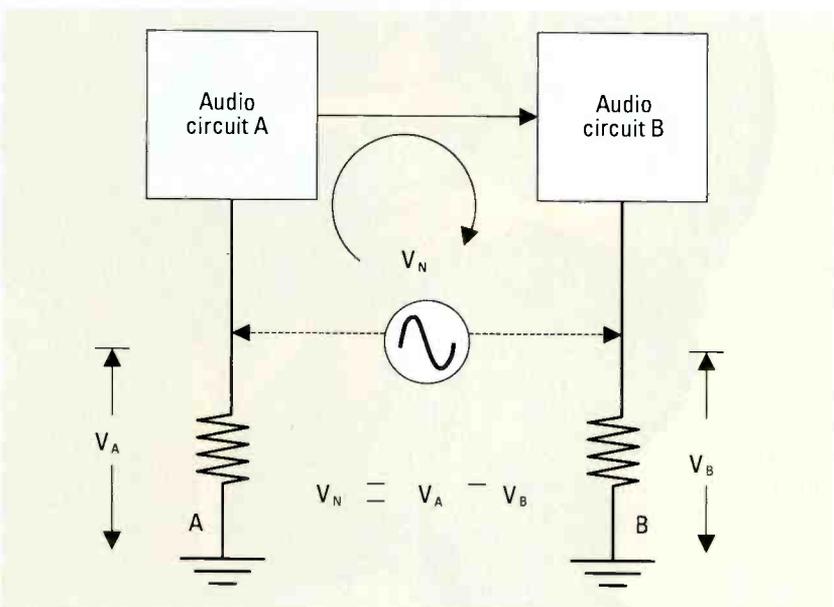
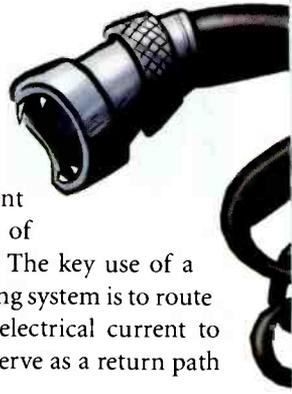


Figure 3. Equivalent circuit of Figure 2, where noise voltage V_N is added to the audio circuit and a condition known as group loop occurs



Proper grounding

Electric current seeks the path of least resistance. The key use of a facility grounding system is to route any unwanted electrical current to the ground or serve as a return path to the source.

Proper AC grounding provides protection by serving as a default current path instead of allowing current to flow through a person's body. (See Figure 1.) This protection is usually provided by the third, round pin on equipment plugs. It's important that the third prong of every AC plug be properly connected to a ground system so any unsafe current is diverted to ground.

A common ground system also helps prevent ground loops from developing in low-frequency circuits like audio. Figure 2 illustrates two circuits connected to ground at unrelated points. Figure 3 shows that a noise voltage then develops because of the difference in the voltage potential between the two grounding points, A and B. The noise voltage source (V_N) will therefore add to the audio signal, resulting in hum caused by the ground loop.

Hearing a hum on an audio circuit can indicate that a ground loop has developed. Check interconnecting cables and plugs, and you'll likely find the culprit.

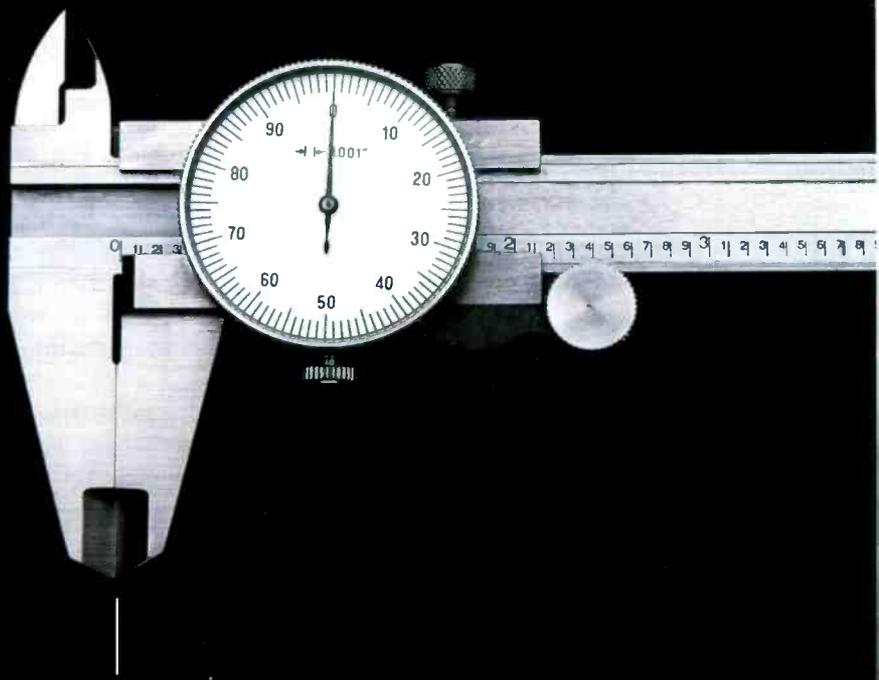
Instead of grounding each circuit at its nearest ground point, use a single point ground and tie the ground point of both circuits to the same ground point. This way, no ground loop develops.

Lightning protection

A good understanding of a grounding system is critical to preventing damage to your gear. In Figure 4 on page 58, note the simplified equivalent circuit of a lightning rod system connected to an earth ground. The lumped parameters jX_L and R represent the link's combined inductance and the resistance.

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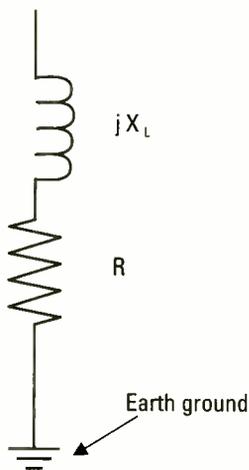


Figure 4. Simplified equivalent circuit of a lightning rod

At low voltage DC, most of the impedance to any current going to the earth ground is due to the resistance R . However, for a fast transient high voltage and high current such as in a lightning strike, jX_L becomes large, thereby helping to block the lightning current from shunting directly to ground.

Copper wires react to RF and lightning much the same. (See Figure 5.) In other words, high current and high frequencies can get shunted to the ground.

It's important to remember that for the lightning protection to be effective, jX_L should be minimized the same way as the resistance R .

Use large cables or copper straps to lower both the resistance and impedance of the ground path. Try to avoid folds and kinks.

Unnecessary turns of a copper strap increase jX_L .

Inspection and repair of the ground wires and their connection to the earth should be included as a regular maintenance routine because they tend to deteriorate.

This is especially the case with outside connections and on towers. Such maintenance may prevent mysterious equipment failures that seem to happen only during thunderstorms.

Install surge suppressors on indi-

vidual equipment that you want to protect, and do not rely on a single surge suppressor at the bulkhead panel. Distributing surge suppression throughout the station is a good investment to ensure that voltage spikes do not get through to the equipment.

Solid connections

Faulty mechanical connections can be another source of catastrophic failure. Worst-case scenario aside, smoke and fire aren't the kind of things you want in the transmitter building.

Figure 6 shows an equivalent circuit of a terminal strip with loose connectors. A resistance R appears between the terminals creating a voltage drop.

If the terminal strip is for a 24VDC relay, you might only experience intermittent failures. However, if the voltage is 25,000VDC, the result will be much different.

With voltages commonly found

the electrodes. When this happens, the spot overheating can cause premature tube failure.

Loose bolt connections on either the primary or secondary terminals of a power transformer can also cause intermittent problems and overheating. Sometimes this causes the loss of one phase of a three-phase circuit.

It is good practice to regularly check such contacts, as well as other bolted connections in transmitters and primary circuits. The goal is to find these kind of issues before they become failures. And remember to observe the proper safety precautions in dealing with possibly lethal circuits.

UPS equipment

The effort required to maintain accurate voltage and clean AC power may depend on how far your site is from the electrical company's power station. The first step in maintain-

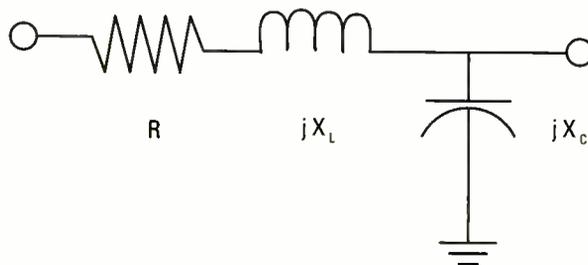


Figure 5. Equivalent circuit of a wire at RF

ing clean and correct AC voltages is to build AC power conditioning into your facility from the beginning. Cutting corners, such as relying on an inexpensive UPS system, will only cause

in power amplifier circuits, heat will quickly develop between the contacts. Depending on the amount of current flowing, heat will generate, and if sufficient, will cause a meltdown. This illustrates why it's so important to monitor temperatures and connections throughout a transmitter.

Finger stock and vacuum tube connections should be inspected carefully and often. It's imperative to have the proper amount of pressure from the stock flange and fingers stock to maintain good mechanical and electrical contact with the tube.

It is not uncommon for loose finger contacts to become welded onto

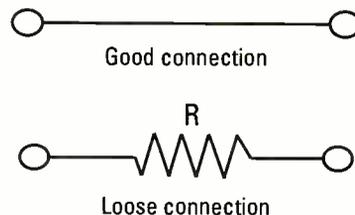


Figure 6. Equivalent circuit of a terminal with good electrical contact and loose contact



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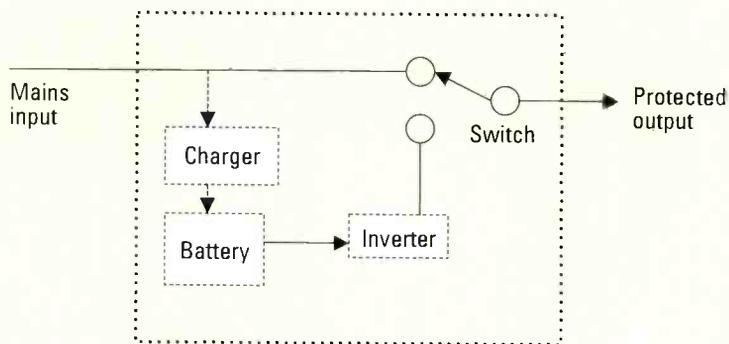


Figure 7. An example of a cheap UPS that switches to an inverter only after the loss of the mains input voltage is sensed

problems in the long run.

The typical cheap UPS units are not true online units because they only switch to battery and inverter configuration when a total power loss occurs. (See Figure 7.) A momentary dip or fluctuating main can cause the UPS relay to chatter, resulting in a host of problems for today's digital equipment. Trust me, you don't want this kind of

UPS feeding your control room.

A better UPS system continually draws power from its batteries, regardless of the mains status. (See Figure 8 on page 62.) In this case, the load side of the circuit never sees the source voltage. All load voltages are generated from the UPS, regardless of what happens on the source side. Critical equipment should always be connected to a

good UPS to ensure reliable operation.

Nuts and bolts

Human error causes equipment failures more often than we may want to admit. For example, by using the wrong tool, an engineer can over-tighten a bolt and nut beyond its

The typical cheap UPS units are not true online units because they only switch to battery and inverter configuration when a total power loss occurs.

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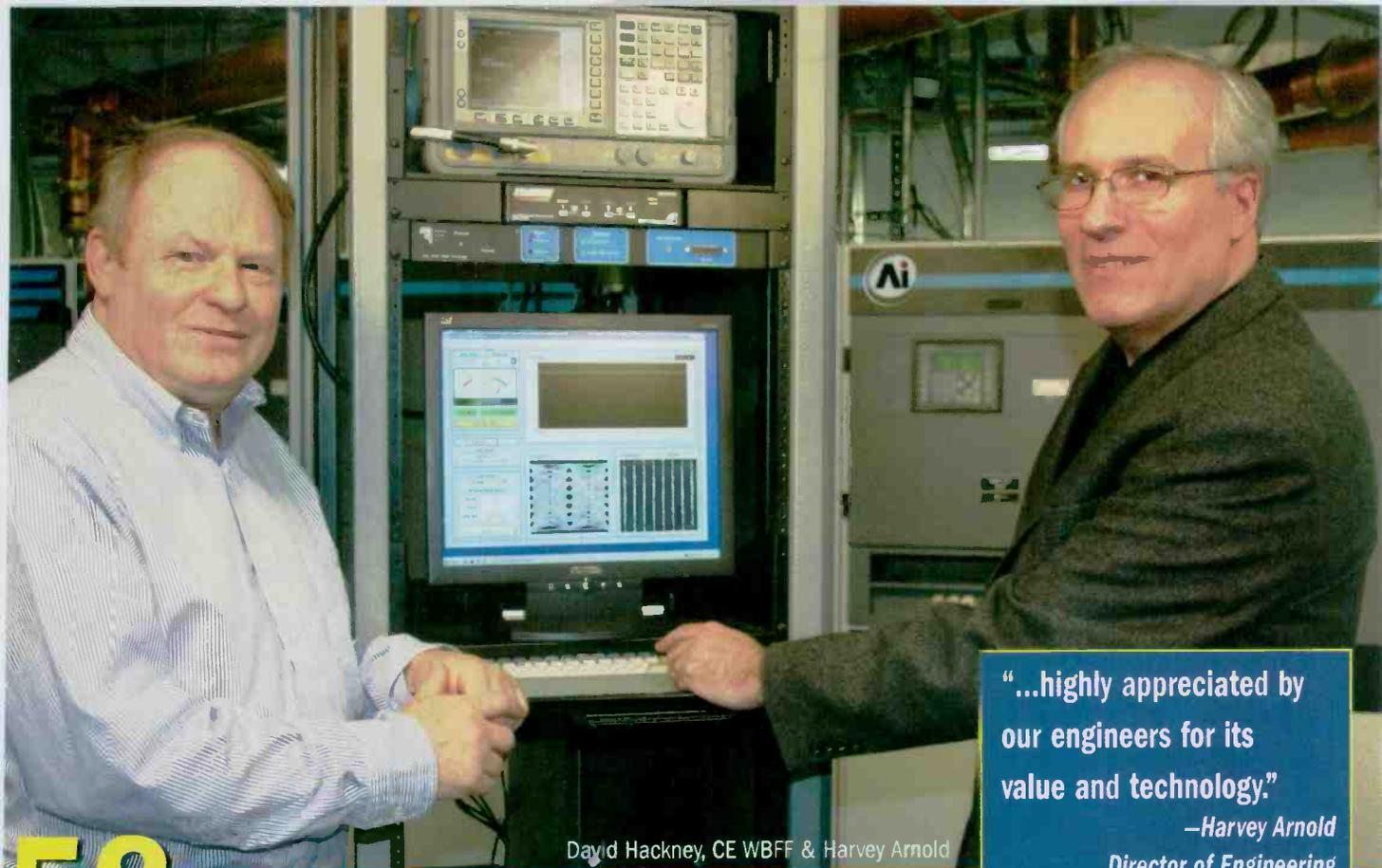
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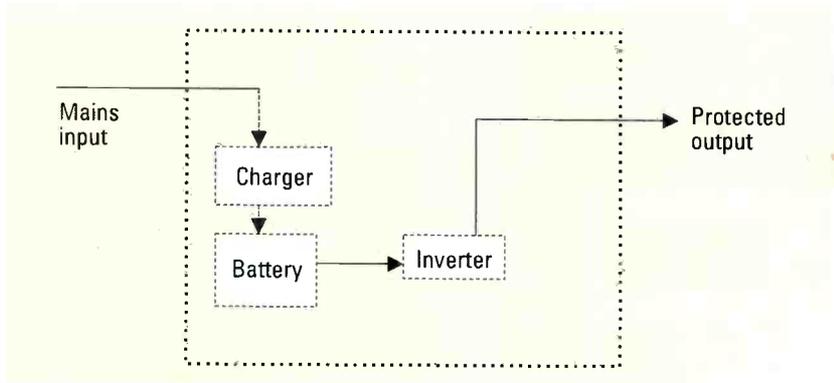
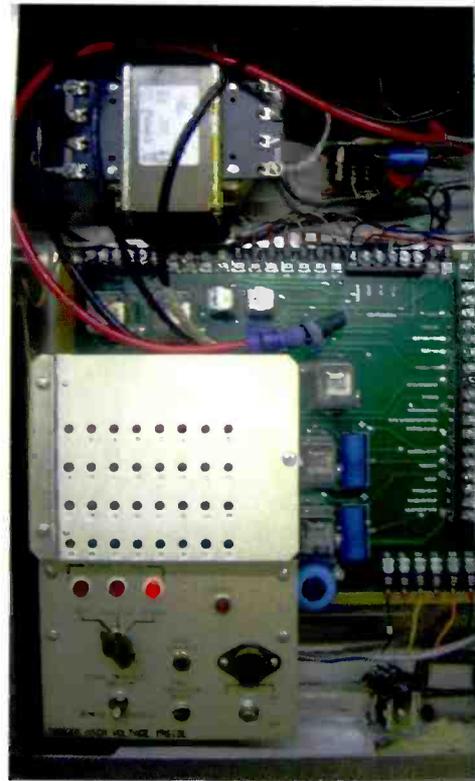


Figure 8. An example of a true online UPS that protects the output regardless of anomalies on the mains input



You can save your station thousands of dollars by checking the controller inside the building before calling in tower climbers to fix a tower light problem. Chances are good that you can fix the problem yourself.



The mechanical connections inside a beam transformer should be mechanically tight in order for them to be electrically sound.

capability. It's better for such a bolt to break during the process of tightening than give you a false sense of security, only to later fail. Such errors often happen on large units such as motors and fans and on outside equipment such as antennas and transmission lines.

Aluminum bolts used in some antennas, for example, are used for their strength and lightweight characteristics. However, never tighten them without a torque wrench. Tower crews

sometimes try to hurry an installation by not using a torque wrench. Unfortunately, those installations may fail as soon as a storm stresses the tower and antenna.

Waveguides also require an accurate torque wrench and proper nut tightening sequence. Tightening the bolts on a rectangular waveguide, for example, needs to be done properly to prevent buckling.

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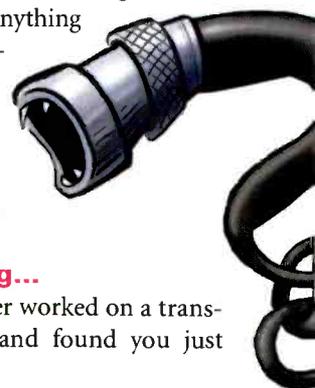
often use such waveguides. The proper way to tighten the flange bolts is to start at the middle of one side and tighten them, always moving outwards.

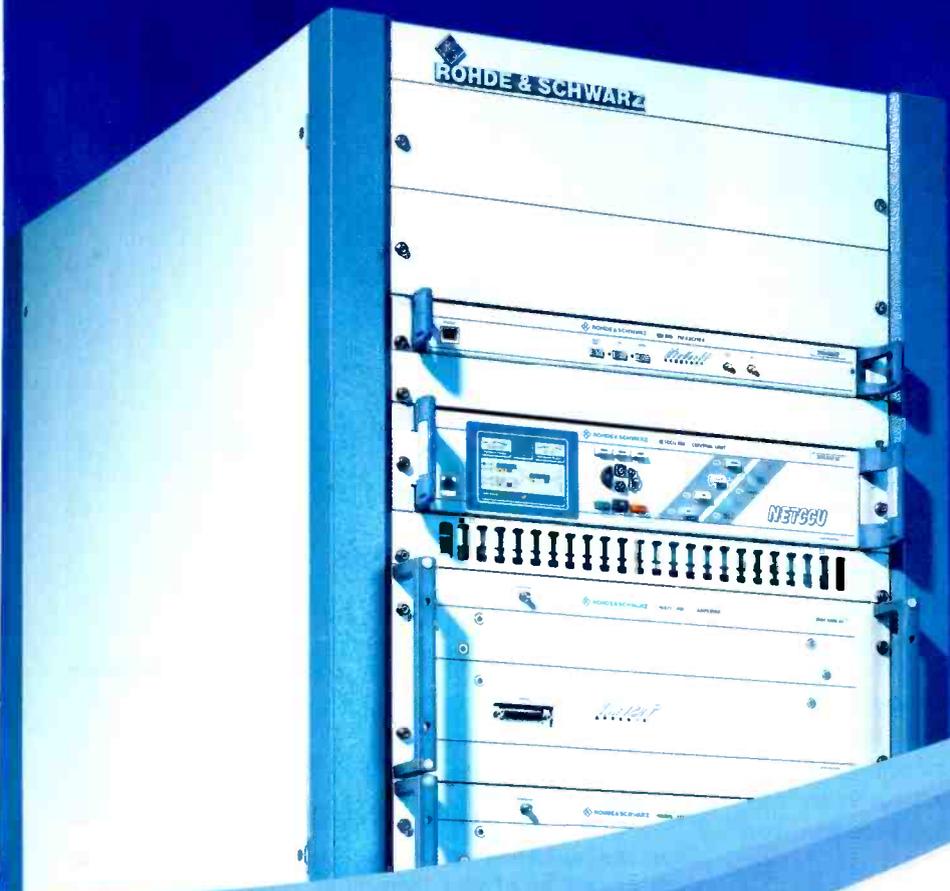
Overgreasing rubber O-rings on coaxial flanges can cause unstable transmission VSWR. Again, this is an error that an inexperienced tower climber might commit, and you won't discover it until a problem emerges.

Similar mistakes include forgetting to put O-rings in fittings or using a hammer or wrench to muscle a connection together. Hitting and denting anything along a transmission line will eventually cause failure.

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FEATURE

MISTAKES BITE

can't get the parameters right? Some engineers seem to delight in tweaking.

Sometimes, there are so many adjustments made, one overcompensating for another, that it's necessary to realign the entire circuit. A good rule to follow is if you don't know exactly what your tweaking will do, leave it alone until you do know.

Routine maintenance must be done, and often at night or on the weekend. Because the hours fall outside the normal workday, these tasks are often assigned to less-experienced engineers, often without supervision.

Two engineers should perform these tasks so that each can check the other's actions.

Don't let your station's future be damaged by a lack of staff training. Good engineers should train less-experienced engineers. Give back to the next generation of broadcasters by teaching them what you've learned. After all, don't you wish someone had prevented you from having to learn the hard way?

BE

Rolin Lintag, Certified Senior Television Engineer, is chief RF engineer for Victory Television Network in Little Rock, AR.



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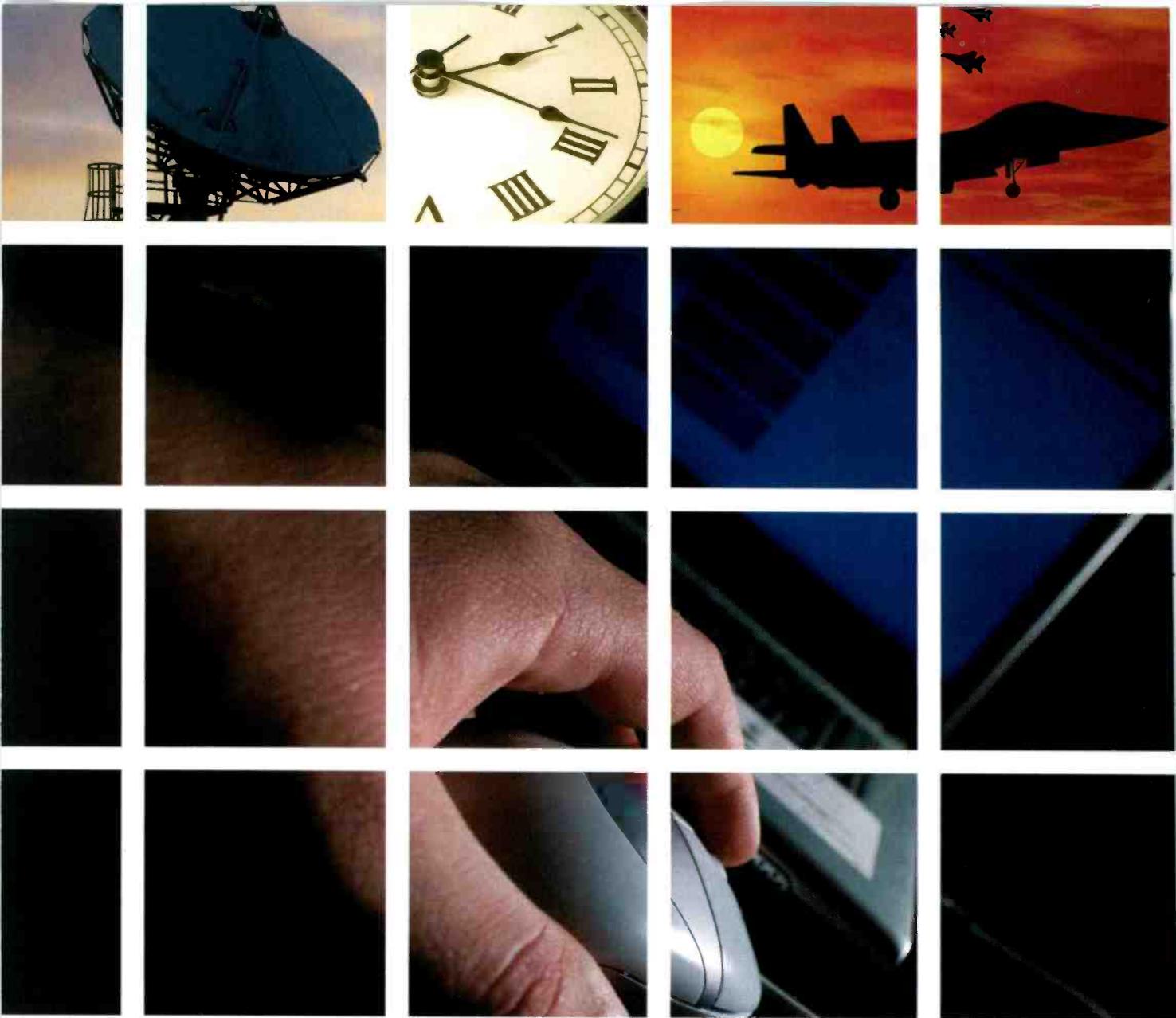


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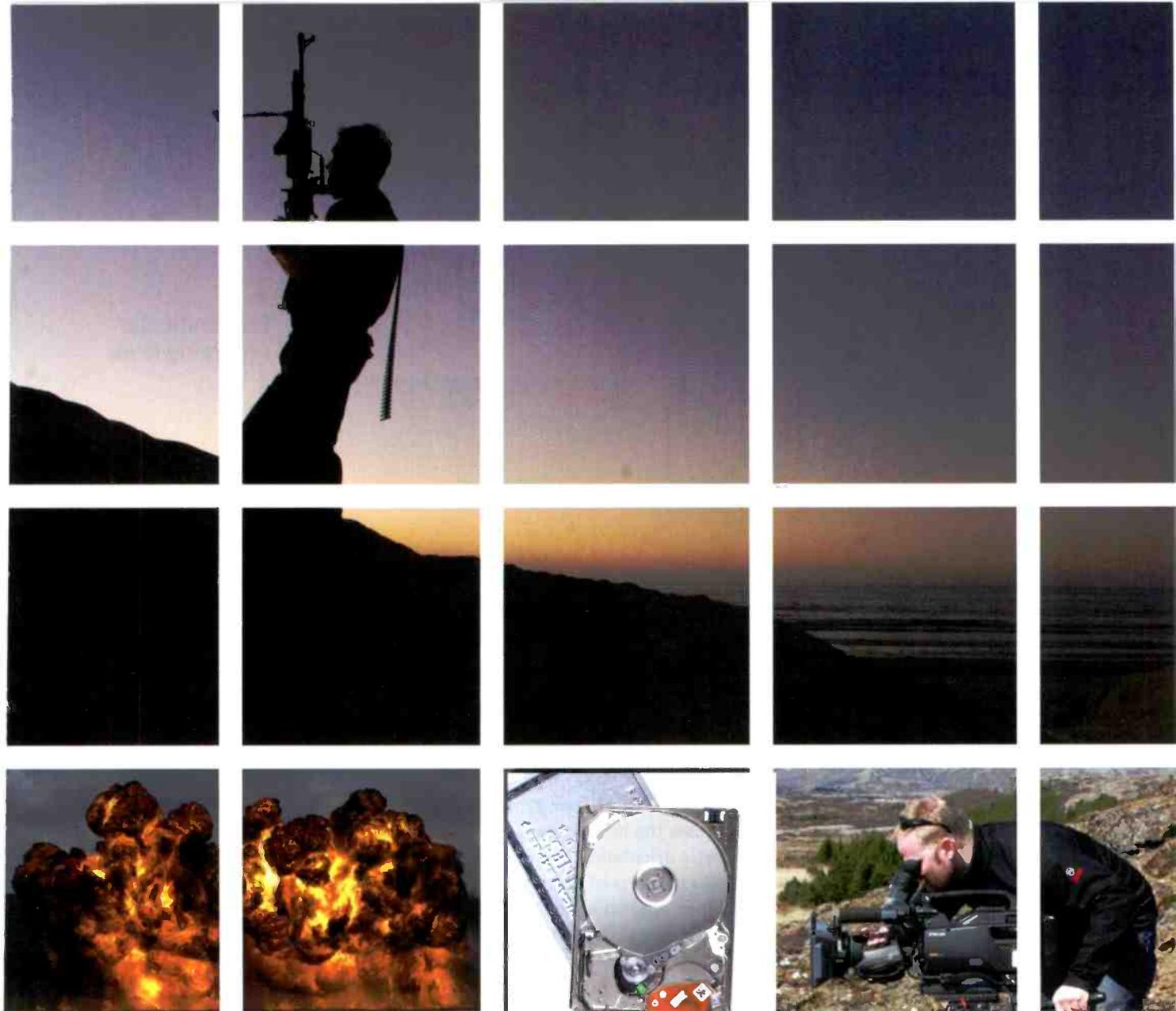
BY MACIEK BRZESKI

Whether reporting from the front lines of combat or delivering breaking news to worldwide audiences, the ability to gather and package story content on the go is a necessity for today's news

people. Immediacy is especially important in the online news battle to attract viewers. From a technology standpoint, the options for mobile video editing are drastically improving, thanks to advances in storage technology.

Mobile storage

Today, laptops are as capable as desktop systems for providing sophisticated video editing capabilities. One key factor in this capability is the increased storage capacity



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The storage industry's perennial

First commercialized in 2005 after 20 years of development, PMR represents a true paradigm shift in how data is stored on disk.

news person to edit large video files. Some laptops even provide systems with dual-drive configurations to further increase storage capacities. The storage industry continues to increase drive capacity by about 40 percent per year, meaning storage

push to increase storage capacity provides the foundation for the increasing mobilization of computing platforms. But until recently, the outlook was not nearly as bright. Drive manufacturers faced a potential end of the line for capacity in-

creases with conventional recording technologies.

However, thanks to the introduction of perpendicular magnetic recording (PMR) in the past year, hard drives continue to climb the capacity curve, and users can expect even more robust storage options for mobile video editing. First commercialized in 2005 after 20 years of development, PMR represents a true paradigm shift in how data is stored on disk.

Some history

When the first hard drive was shipped in 1956, it weighed 1241lbs, used 50 24in disks and stored 5MB of data. It had an areal density of

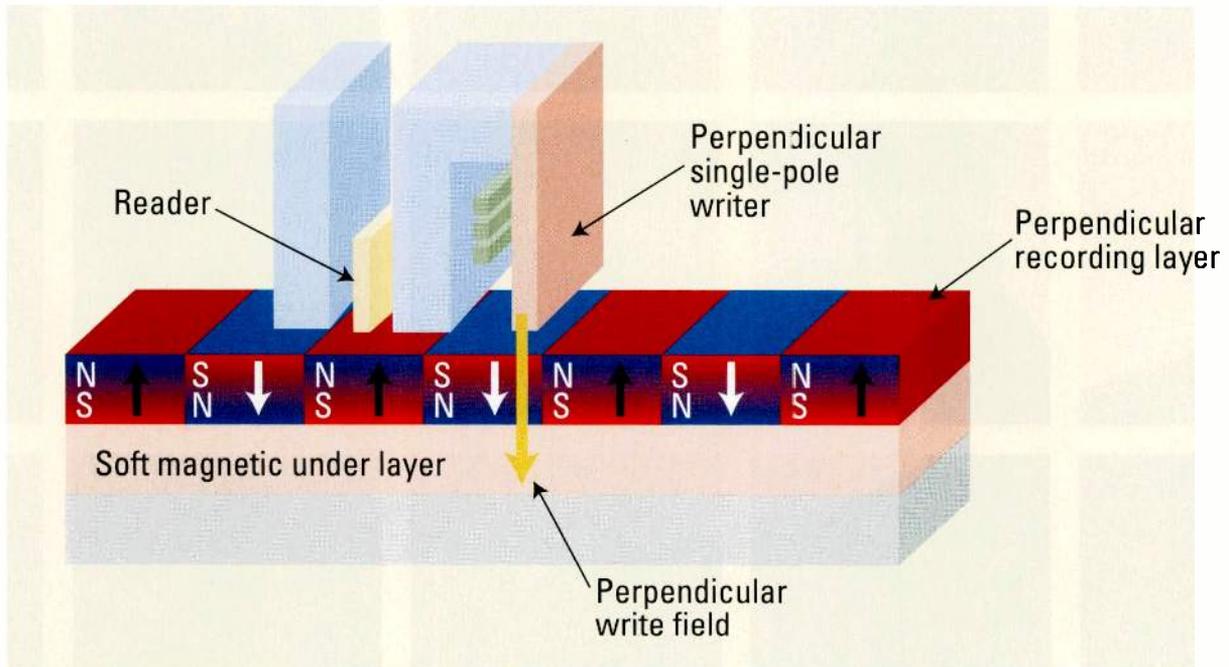


Figure 1. A perpendicular recording system is suitable for high-density recording because of the strong magnetic coupling between neighboring magnetic bits.

2000 bits/in². (Areal density is the numerical measurement of the number of bits stored per unit area on the disk surface. It is considered the most important parameter in driving the advancement of disk capacity and performance.)

For almost 20 years, drive manufacturers continued to increase storage by pushing areal density limits with conventional longitudinal recording, which stores data on a magnetic disk as microscopic magnetic bits aligned in a plane. Before the introduction of PMR, areal densities using longitudinal recording had surpassed 100GB/in². This resulted in drives providing 80GB of storage capacity per platter or 160GB in a dual-platter drive. Although advances in magnetic coatings continued to improve drive recording densities, the industry was approaching a technology barrier with longitudinal recording that would eventually slow further capacity increases.

Technology behind PMR

The scaling of the magnetic grains beyond today's density is constrained

by a physical energy barrier that causes the bits to change their magnetic orientation — similar to when two magnets of like poles repel each other. Known as the superparamagnetic effect, this orientational flip is

caused by a fluctuation of magnetization due to thermal agitation. Squeezing more bits onto the disk eventually leads to a point where the quality of the recorded bits begins to degrade. When this happens, the bits are no longer held in a reliable state and can change magnetic properties. The result is often scrambled data, which is not a good thing for anyone — especially a remote news crew.

To overcome the superparamagnetic effect, PMR introduces a fundamental change in how the magnetized grain cells reside on the disk

media. In doing so, PMR provides electromagnetic advantages that enable future advancements in data storage densities.

PMR uses magnetization forces that are perpendicular (standing up)

By standing the magnetic bits on end, perpendicular recording reinforces the magnetic coupling between neighboring bits.

to the recording plane, as opposed to the traditional longitudinal method, which only allowed for the bits on a drive to be parallel (lying down). (See Figure 1 above and Figure 2 on page 70.) By standing the magnetic bits on end, perpendicular recording reinforces the magnetic coupling between neighboring bits. This helps achieve a stable, higher recording density and, therefore, more storage capacity.

The additional capacity from PMR can be more easily understood by considering the analogy of placing

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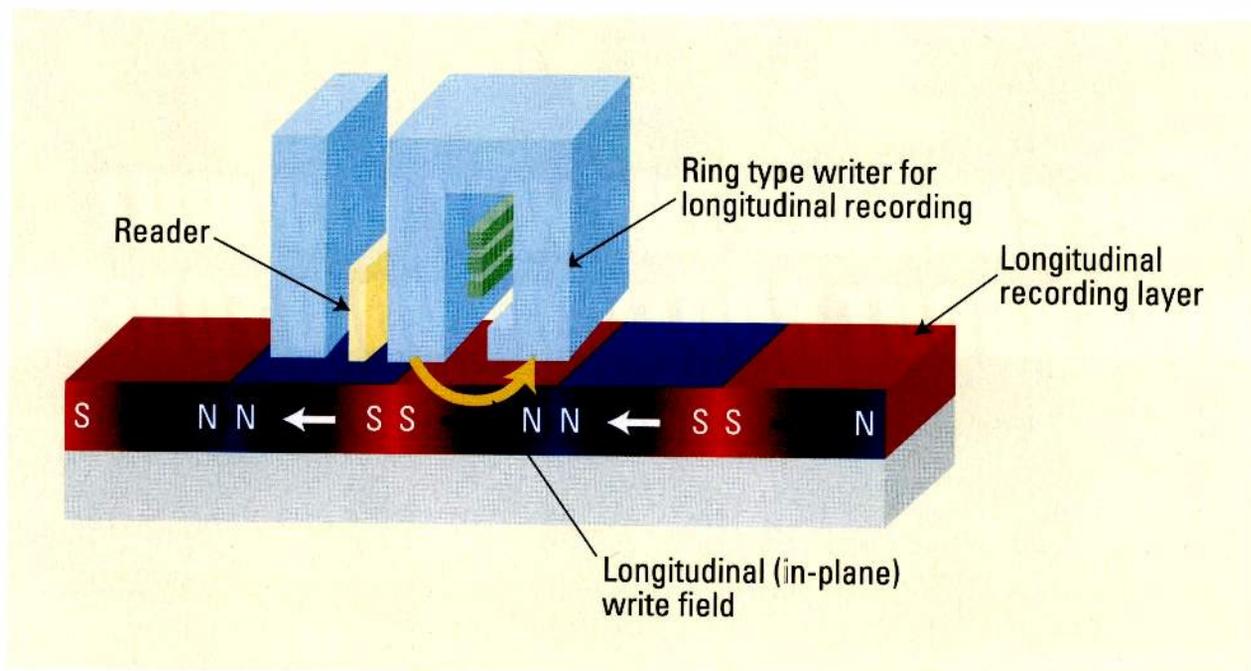


Figure 2. In a longitudinal recording system, recorded magnets repulse and weaken each other.

books on a bookcase. By standing books on a shelf instead of laying them flat or side-by-side, more books will fit in the case. The same is true with PMR.

A closer look

In the late 19th century, perpen-

vances in perpendicular recording technology.

Increased storage capabilities

PMR is now projected to enable minimum compounded storage capacity increases of 40 percent annu-

PMR technology could soon provide recording densities of 1000Gb/in². This could result in mobile drives with 1TB of storage.

dicular recording was first demonstrated by Danish scientist Valdemar Poulsen. He discovered that sound could be recorded magnetically.

Perpendicular recording resurfaced in 1976, when Dr. Shunichi Iwasaki, president and chief director of Tohoku Institute of Technology in Japan, discovered density advantages with perpendicular recording for computer storage. Now considered the father of modern perpendicular recording, Dr. Iwasaki's initial work laid the foundation for today's ad-

ally, providing storage capacities in laptops previously associated only with desktop systems. A 100GB-per-platter PMR drive with an areal density of 178.8Gb/in² in a 2.5in form factor was released earlier this year.

Recent research has led experts to believe that PMR technology could soon provide recording densities of 1000Gb/in². This could result in mobile drives with 1TB of storage.

Besides today's reality of 200GB-plus 2.5in drives, new PMR technology could produce even smaller form

factor drives also with sufficient capacity to support mobile video editing on even more compact work stations. In the 1.8in-sized drive, the industry is projecting capacities to soon reach 100GB-plus. The result could offer field crews the capability of editing professional format digital video on ultra-portable notebooks weighing less than 5lbs. Likewise, smaller and higher capacity drives could be mounted on cameras providing direct-to-disk recording.

Thanks to rapidly increasing storage capacity, drive performance and the shrinking size of hard drives, video applications will no longer be tied to desktop systems. Users can expect that the introduction of PMR technology will greatly affect mobile storage over the next few years by providing up to 10 times more capacity than was previously possible. These improved storage solutions will open new doors for creating mobile video editing tools that can be housed in a briefcase — or even in your pocket.

BE

Maciek Brzeski is vice president of marketing at Toshiba Storage Device Division.



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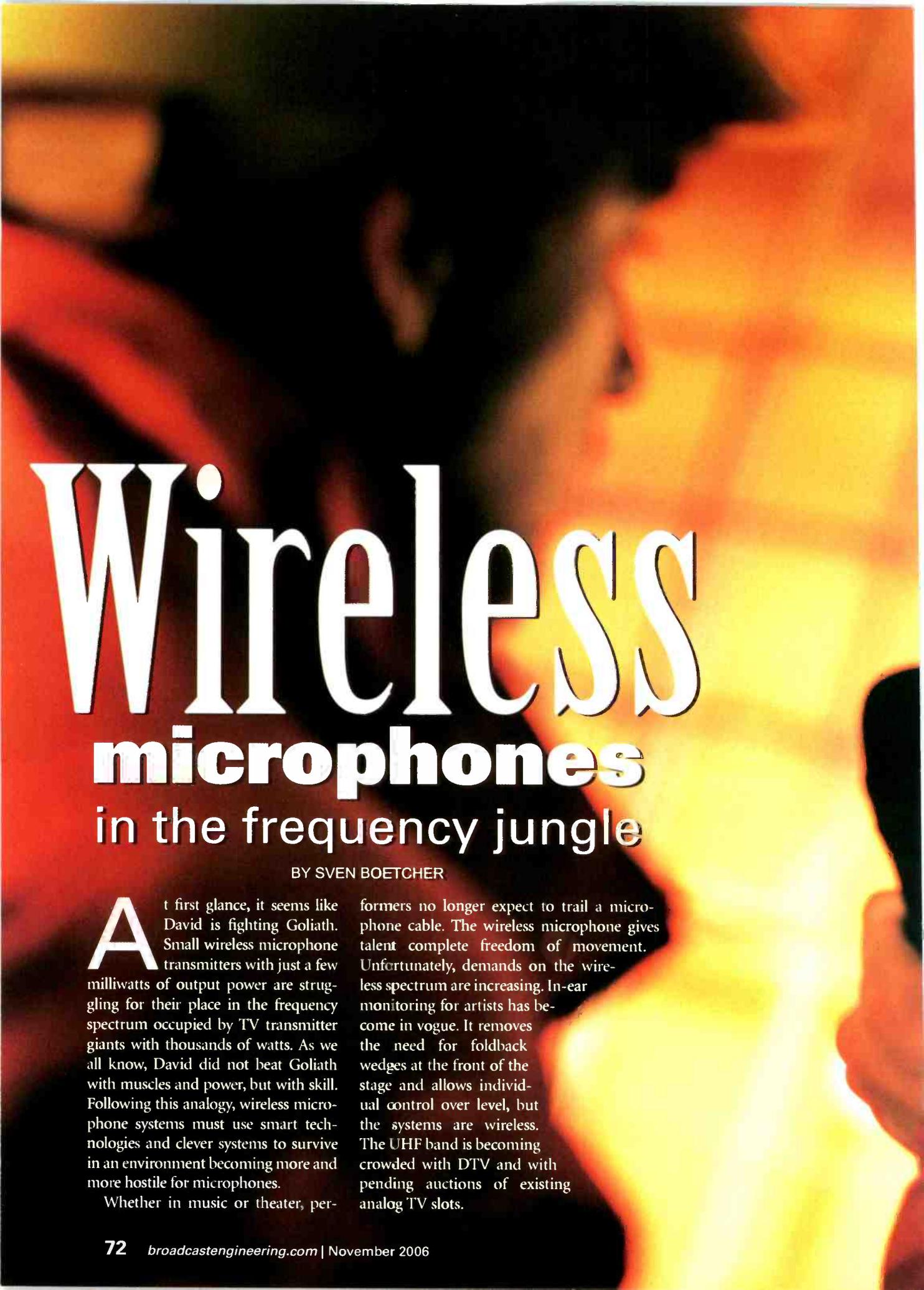
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Wireless microphones in the frequency jungle

BY SVEN BOETCHER

At first glance, it seems like David is fighting Goliath. Small wireless microphone transmitters with just a few milliwatts of output power are struggling for their place in the frequency spectrum occupied by TV transmitter giants with thousands of watts. As we all know, David did not beat Goliath with muscles and power, but with skill. Following this analogy, wireless microphone systems must use smart technologies and clever systems to survive in an environment becoming more and more hostile for microphones.

Whether in music or theater, per-

formers no longer expect to trail a microphone cable. The wireless microphone gives talent complete freedom of movement. Unfortunately, demands on the wireless spectrum are increasing. In-ear monitoring for artists has become in vogue. It removes the need for foldback wedges at the front of the stage and allows individual control over level, but the systems are wireless. The UHF band is becoming crowded with DTV and with pending auctions of existing analog TV slots.



Image courtesy Sennheiser Electronic

The DTT squeeze

Digital TV signals transmit in the same frequency band as their analog predecessors. Wireless audio systems are allowed to operate as secondary

users in vacant analog TV channels. In Europe and Africa, analog PAL television occupies only 7MHz of the 8MHz-wide UHF channel. (See Figure 1.) Until now, the remaining

1MHz gap has been used for production communication, reporters' transmitters and, to some extent, wireless microphones.

Therefore, before the introduction of digital terrestrial television (DTT), the UHF frequency band was shared between analog TV transmitters and wireless audio transmission equipment. (See Figure 2.) However, a DTT multiplex completely occupies an 8MHz channel, which means that the 1MHz gap is no longer available. (See Figure 3.)

Following the introduction of DTT transmissions alongside existing analog channels, the spectrum available for wireless microphones is severely limited in many countries. (See Figure 4 on page 76.) In practice, the frequency spectrum in major cities is crowded. Figure 5 on page 76 shows a spectrum sweep taken during planning for the 2004 Olympics in Athens.

In rural areas, there may be sig-

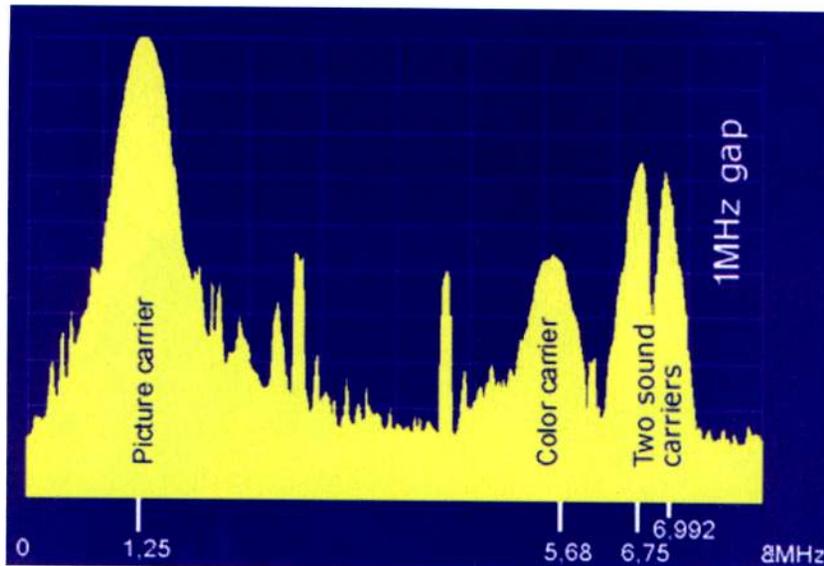


Figure 1. Analog PAL TV channel, showing 1MHz gap

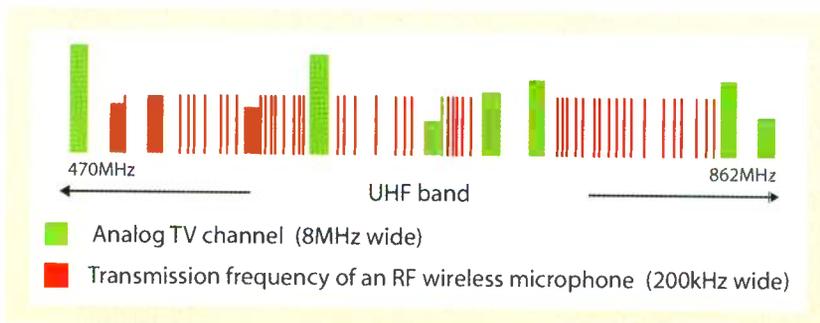


Figure 2. Spectrum of analog TV channels and wireless audio transmission equipment in UHF band

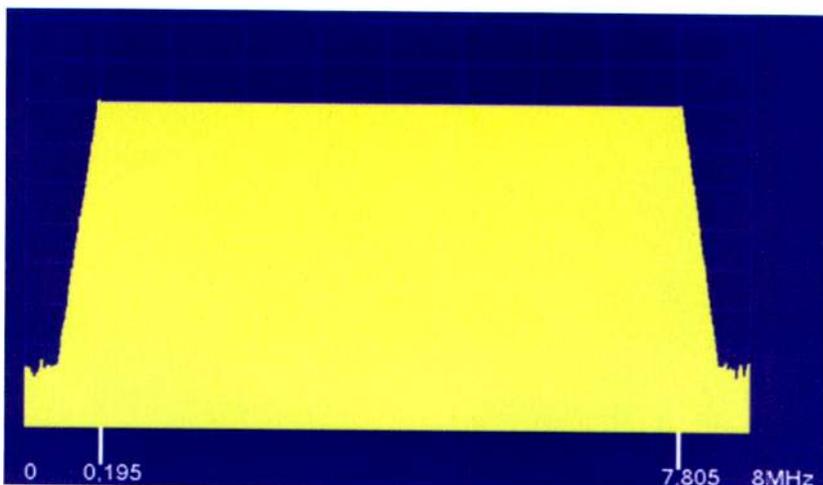


Figure 3. DTT multiplex, showing completely filled 8MHz bandwidth

In such a crowded spectrum, no kilohertz can be wasted.

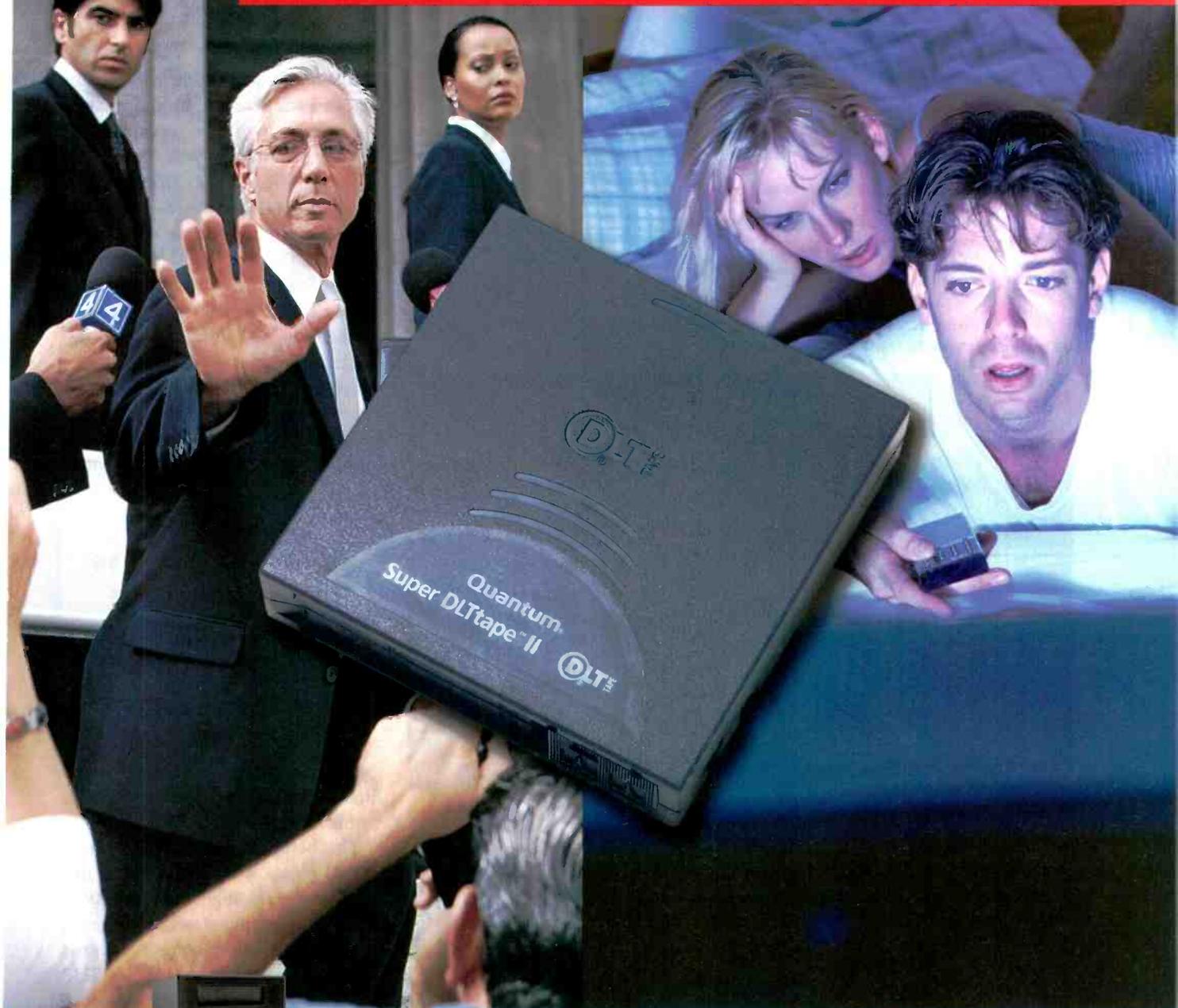
nificantly fewer transmitters on-air, so the field strength average is less. However, TV productions, live concerts and musicals are usually staged in metropolitan areas.

As many governments plan to auction off the analog TV channels after digital switchover, the spectrum available for wireless microphones could be even less as demands for wireless communication increase. A musical production in a theater may require 60 wireless microphone channels. Broadcast productions and concerts often require a similar number of channels.

Frequency efficiency

In such a crowded spectrum, no kilohertz can be wasted. And it becomes more necessary to pack transmitting frequencies as close as possible in the spectrum while not reducing the

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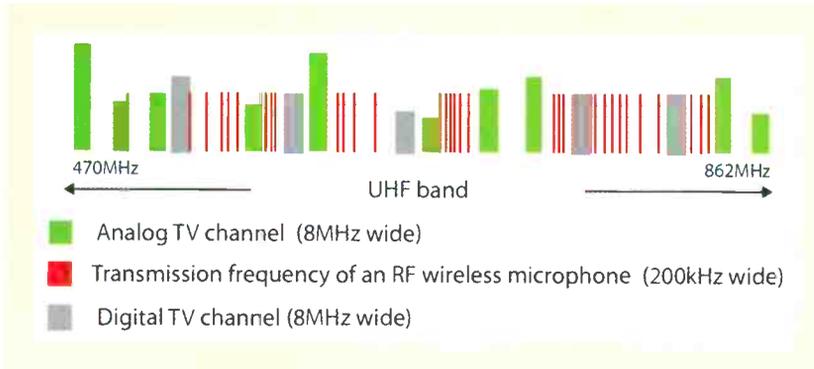


Figure 4. Current use of the UHF range by analog and digital TV channels, as well as by wireless audio transmission equipment

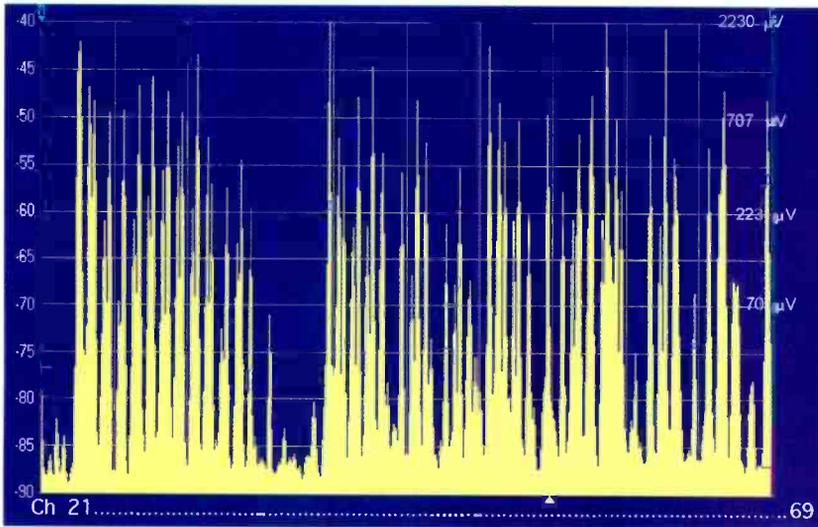


Figure 5. Analog and digital television signals in Athens, 2004 Olympic Games

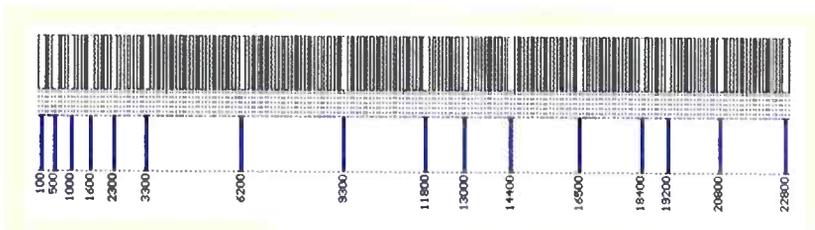


Figure 6. The blue lines indicate the frequencies that can be used free of intermodulation. The black lines indicate intermodulation products.

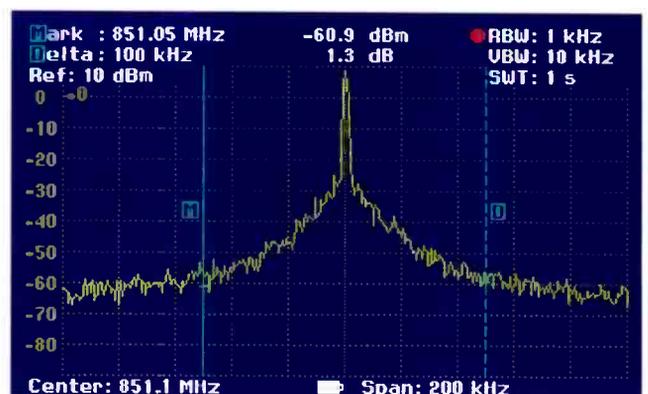
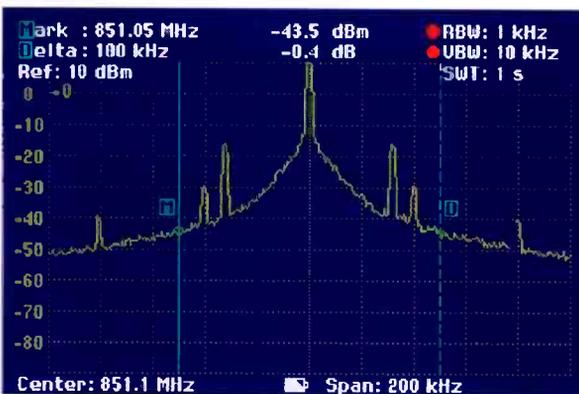


Figure 7. Spectrum of low-efficiency transmitter (left) compared with Sennheiser SK 5212 wireless bodypack transmitter

transmission safety of a system. This is not an easy task, taking into account that in a wireless microphone system there are many more unwanted signals than wanted signals.

Figure 6 shows 16 wireless microphone channels between approximately 1600 unwanted intermodulation products. Different RF signals mix on the nonlinear curve of any amplifier to make new unwanted signals — intermodulation. The different carrier frequencies produce not only harmonics (integral multiples) but also a large number of (odd number) sums and differences of integral multiples of the input frequency components. These

Different RF signals mix on the nonlinear curve of any amplifier to make new unwanted signals — intermodulation.

limit the number of usable frequencies within a certain band.

The better and cleaner the transmitted signal from the wireless microphone is, the higher the density of transmitting frequencies in a wireless system can be chosen. Figure 7 shows the spectrum of a Sennheiser SK 5212 bodypack transmitter compared to a transmitter with lower spectrum efficiency.

Operating a multichannel wireless

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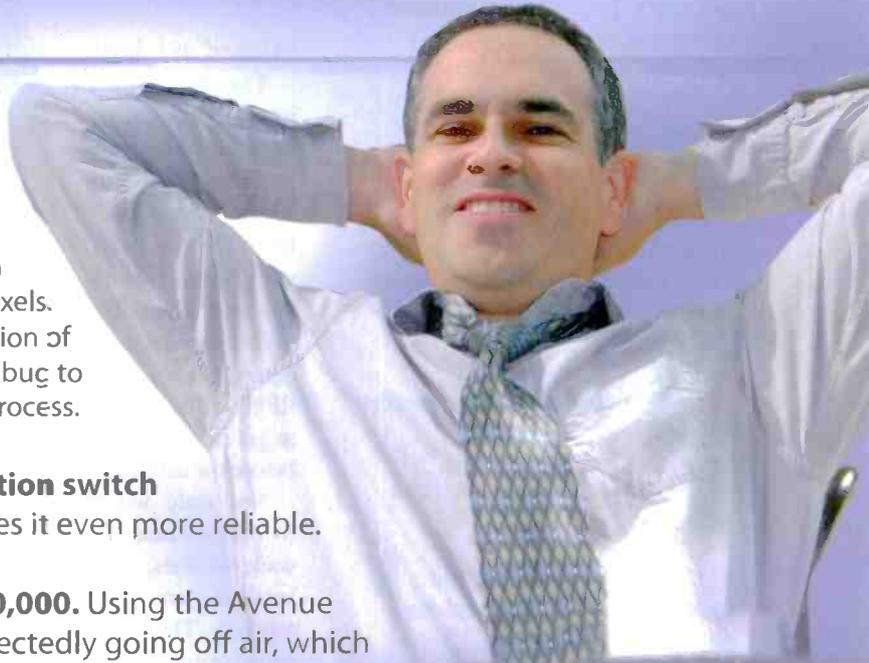
Superior circuitry detects black levels, TRS, audio presence, freeze and EDH for HD or SD signals. For ASI signals PIDs are evaluated. You set the parameters for when a switch occurs. You might decide 10 seconds of signal below 12 IRE or 14 seconds of no embedded audio should cause a switch to the secondary feed.

You can use the **sophisticated detection system** to your advantage by adjusting the switch's parameters for *your* facility's needs. For example, the black detection system allows you to set both the threshold and the percentage of non-black pixels. But that's **not** all, you can also determine the portion of the picture to be considered. This allows a corner bug to be either included or excluded in the detection process.

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Signal Processing and Infrastructure – That's All We Do

microphone system in a crowded spectrum requires the right equipment, a high level of RF experience and detailed planning. A recent example was the 2006 Eurovision Song Contest, which used 54 wireless microphone channels and 16 wireless monitor systems.

Rules for wireless microphone use

- Place the antenna as high and near the scene as possible to get a direct line of sight between transmitter and receiver.
- Directional antennas can be used to suppress unwanted signals.
- Avoid any shielding of the transmitter antenna. For example, never bend the antenna between the body and the bodypack transmitter.
- Use low-loss cable between the antenna and receiver.
- Use a booster to compensate for cable losses.
- In a receiving system, put the booster directly behind the antenna in the RF cable.
- Do not overboost your system. For example, if you use only a short cable with 1dB or 2dB loss, a 10dB booster may overload the input stage of the receiver.
- Use only intermodulation-free frequencies calculated with special SIFM software.
- Never work in an occupied TV channel. This may reduce the working range and cause problems for TV reception.

The setup

The first step to set up a multichannel system is to check the frequency spectrum for available frequencies for wireless microphones. Ideally, the spectrum is scanned with a spectrum analyzer.

An alternative is to use a microphone receiver system that automatically finds available frequency slots. The selected frequencies need to be free from intermodulation. Calculating these frequencies requires a software application. Even in a mid-size system, billions of calculations are made to find intermodulation-free frequencies. Once the gaps in the spectrum are identified, then the frequencies can be calculated.

Filters are key

The problems of intermodulation can be eased by using receivers that are restricted to part of the UHF spectrum with steep fall-off bandpass filters. The performance is mainly determined by the quality of RF filters that are used. The purpose is to get rid of as many unwanted signals before the active part of the system.

Not only will the receivers have to operate near TV transmitters, but walkie-talkies, cell phones and other local devices should not block the receiver. The use of wireless in-ear monitoring adds to the potential for intermodulation interference. Great care, therefore, is required to produce highly selective filters providing the best rejection of unwanted signals to the receivers.

By taking these precautions, running a wireless microphone system in today's frequency environment is eminently possible. But the performance of a system and proper planning requires more attention to detail than ever before.

Future for frequencies

The worldwide approach to reduce the spectrum for broadcast and grant

licenses in the UHF spectrum to new services will severely effect the operation of wireless microphones. A common approach needs to be found to allow the future use of radio microphones in areas of RF background.

Every technical approach must be taken to make the systems as smart as possible and allow coexistence with other signals.



The SK 5212 wireless microphone body-pack transmitter from Sennheiser offers a switching bandwidth of 36MHz, which is freely selectable in the entire UHF range from 450MHz to 960MHz.

In the end, the allocation of bandwidth by government regulators is an obvious prerequisite to run a radio microphone system.

Finally, the David and Goliath of UHF are not enemies but companions, because where would a TV program be without wireless microphones? And what is a wireless microphone without its users in TV productions? The deployment of wireless microphone systems shows how spectrum can be shared with other users by careful product and system design. **BE**

Sven Boetcher is product manager for professional wireless microphones at Sennheiser Electronic, Wedemark, Germany.

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Panasonic's PT-DW7000U

WESH-TV brightens its image with new projectors.

BY DAVID RICHBART

In today's highly competitive broadcast market, TV stations are always looking for new ways to differentiate themselves from competitors.

In the past, the anchors at WESH-TV in Winter Park, FL, sat in front of a piece of glass with a working newsroom behind it. This setup had become outdated, and the station wanted a more dynamic and contemporary look. Installing new Panasonic projectors helped the station achieve this enhanced appearance.

Things to consider

The first step was finding a projector that was easy to install, could be used directly behind the main anchors and would never crash during a live broadcast. The projector also needed to have a high lumen output.

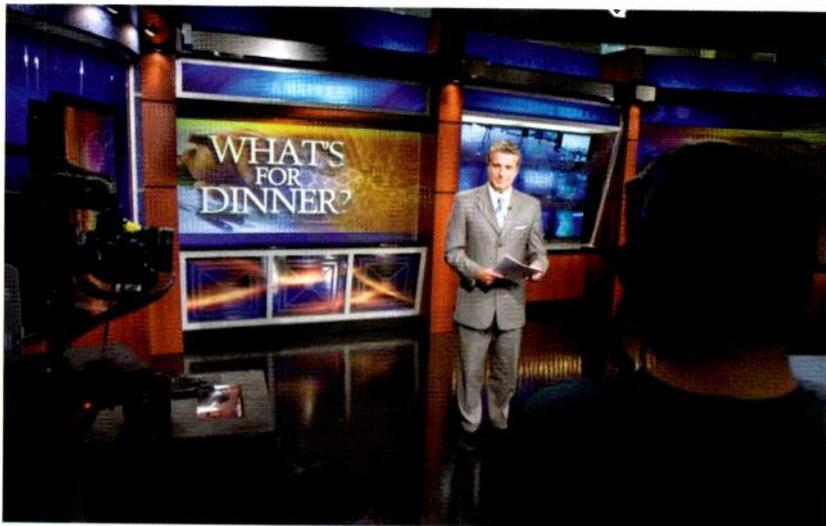
When you're watching a movie in your living room via a projector, you can turn down the lights to see the image more clearly. But that isn't possible in a TV broadcast environment. Broadcasters need a projector that produces a background image bright enough to be seen easily under the intense studio lights.

WESH evaluated several professional-grade projectors. The station chose to purchase two Panasonic PT-DW7000U projectors.

An easy installation

Working with Panasonic, the station met its installation deadline. A designer built the new set and created a tunnel for the projector to prevent any ambient light from entering.

The two projectors were then calibrated to the station's news set. Looking at the projector screen through the camera lens is an important step in calibration because it shows the image as viewers will see it.



Panasonic's PT-DW7000U combines 6000 lumens of brightness with 1366 x 768 WXGA resolution and theater-quality 4000:1 contrast ratio with the company's Dynamic Iris. The result is crisper newscasts.

The result: brightness

The projectors give the studio the dynamic look it needed. With two projectors, the station can now broadcast different backgrounds for different

If one lamp stops working, the other lamp provides enough brightness to maintain the background image and prevent the anchors from sitting in front of a black screen. Both projec-

Broadcasters need a projector that can produce a background image bright enough to be seen easily under the intense studio lights.

newscasts. For example, one unit can project the anchor's background image, and the second projector can cast a sports team's logo or other graphic.

The widescreen projectors also give WESH anchors the flexibility to either stand or sit without relying on switcher-generated, over-the-shoulder graphics. In addition, the station can differentiate its stories by using bolder, brighter graphics.

Both projectors have two lamps, which are critical to ensuring that they will not crash during a live broadcast.

tors output enough brightness to keep the studio lights fully lit, helping ensure that the audience sees crisp, high-quality images.

An added bonus of these particular projectors is their extended lamp life. Each lamp lasts about 1200 hours, exceeding the station's expectations. The new projectors are reliable and produce high-quality images, giving WESH a true edge above the competition.

BE

David Richbart is the unit manager for WESH-TV.



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JVC's DR-HD100

The 40GB hard disk recorder eliminates file transfer.

BY STEVE MULLEN

There's no doubt that as a linear, mechanical device, tape has shortcomings. The tape transport, especially with today's 6mm cassettes, certainly does look fragile and complicated. And although under most conditions it is reliable, it can require service.

The transport's read/erase/write head assembly is the most vulnerable part of the entire tape system. It requires cleaning and periodic head replacement. Even with proper maintenance, dropouts can and do occur, though current tape technology and manufacturing have dramatically decreased the probability.

Alternatives to tape

These issues have prompted engineers to develop alternative media systems. These proprietary systems offer a major financial advantage to their developers because videotape is now a commodity. The new media's price is determined by a single supplier.

Anyone considering the new media technology needs to contemplate the advantages offered by videotape. First, tape is cheap. If you need to record one hour, you only have to purchase an hour. Second, it is available everywhere in the world. Third, and most importantly, it is self-archiving.

Tape, therefore, fulfills three equally critical roles: recording, playback and long-term storage. It does the latter with neither additional costly devices nor extra labor. Moreover, it does not require archive media.

One alternative technology finding

favor is hard disk-based storage. Hard disks are a commodity. Today, drives under 100GB are dirt cheap. A 40GB 7200rpm drive costs less than \$50.

There are multiple ways hard disks can be used, including:

- Mounted in a proprietary, remov-

- Mounted in a proprietary, removable package, such as Iomega's REV drive, which is used by Grass Valley's Infinity camcorder.

- Mounted in a record/playback device that can be used with a camcorder, such as Hitachi's dockable Z-DR1 and

Focus Enhancements' FireStore drives. The Z-DR1 uses Mediapac drives in capacities from 20GB to 120GB.

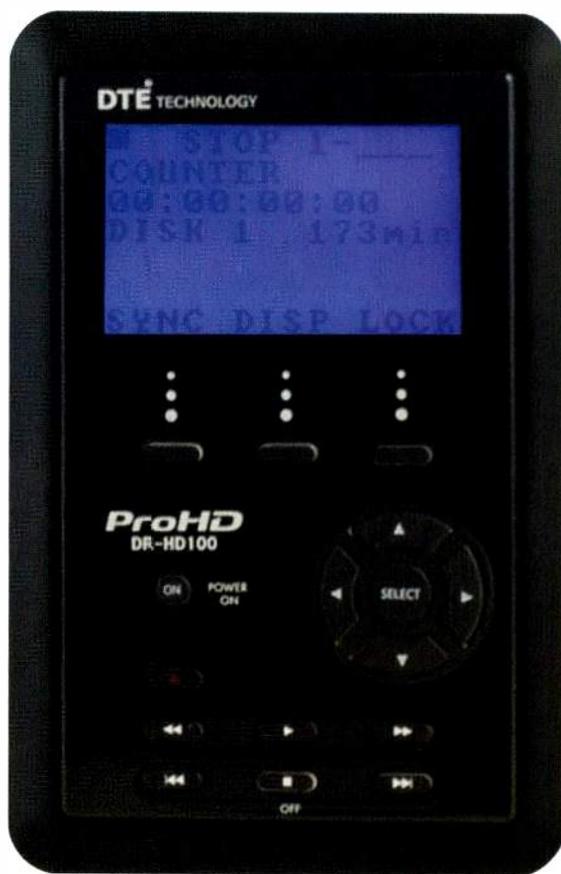
For the past month, I have been working with a Focus-built 40GB DR-HD100 from JVC. An 80GB version is also available. Both use 5400rpm drives that have an 8MB cache. While the DR-HD100 has firmware specific to JVC's GY-HD100, it can also function with other DV and HDV camcorders.

The 40GB drive holds three hours of DV and almost four hours of ProHD. A 10-second electronic shock cache helps prevent the loss of footage in rough conditions.

The 1.59in x 5.6in x 3.74in unit weighs about 1lb. The 90-minute Li-Ion battery can be recharged using the included worldwide charger or via FireWire. The player/recorder can also be powered by 15V DC, (7.5W) via a 3.5mm minijack.

No file transfers

Focus promotes the Direct-To-Edit (DTE) capability of the DR-HD100 by claiming that no file transfer is required. This means that when using DTE, the user imports captured files as clips, and the files remain on the drive. While this sounds good, if the DR-HD100 is disconnected from your computer or if it or your computer is turned off, all imported clips will



The JVC DR-HD100 attaches to the GY-HD100 camcorder and records files in the editing system's native file format.

able package and sold by the camcorder's manufacturer. Ikegami's HDN-X10 EditcamHD records using Avid DNxHD codec on Ikegami's 120GB FieldPak2.

- Mounted within a camcorder. JVC's Everio DV camcorders use built-in 30GB drives, and Sony's new AVCHD 1080i HDR-SR1 will also have a built-in 30GB drive.

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go offline and must be reconnected. While it takes time and requires space on your computer's disk, the more practical way to use DTE is to copy the files from the drive to your computer's hard disk.

DTE requires two capabilities to be in place. First, the DR-HD100's microprocessor and firmware must be able to generate a file wrapper around the data stream from the camcorder. In the case of ProHD, that means the HDV transport stream is demuxed to audio and video elementary streams. The elementary streams are then placed into a QuickTime file.

Second, the NLE must be able to import — not simply FireWire capture — the file format created by the unit. Apple's Final Cut Pro version 5.1.2, released in October, supports 720/24p, 720/25p and 720/30p QuickTime. (It cannot import M2T files.) The September release of enhanced DR-HD100 firmware supports QuickTime-based 720/30p. (For units without this firmware version, the update can be purchased.)

Issues

Despite the firmware enhancement, other open issues remain:

- Will the DR-HD100 work with Apple's 720/24p and 720/25p FCP

enhancement? Will another firmware update be required?

- Will Apple support the release of JVC ProHD camcorders that record 50p and 60p?
- When Apple releases support for 50p and 60p ProHD, will the DR-HD100 work with it? If so, will a firmware update be required?

While it takes time ... the more practical way to use DTE is to copy the files from the drive to your computer's hard disk.

- How can M2T files from a DR-HD100 be used with FCP?
- How can M2T files be FireWire "captured" from a DR-HD100?

Before looking at the last two questions, we need to examine the DR-HD100 as a recording device.

Setup menu

The unit's menu is linear and easy-to-use. Setup (e.g., time, date, UB set and DF/NDF) is performed using the setup menu. Use the control menu to select JVC GY-HD100 or syncro slave operation. Slave mode watches, via FireWire, a camcorder's record-pause

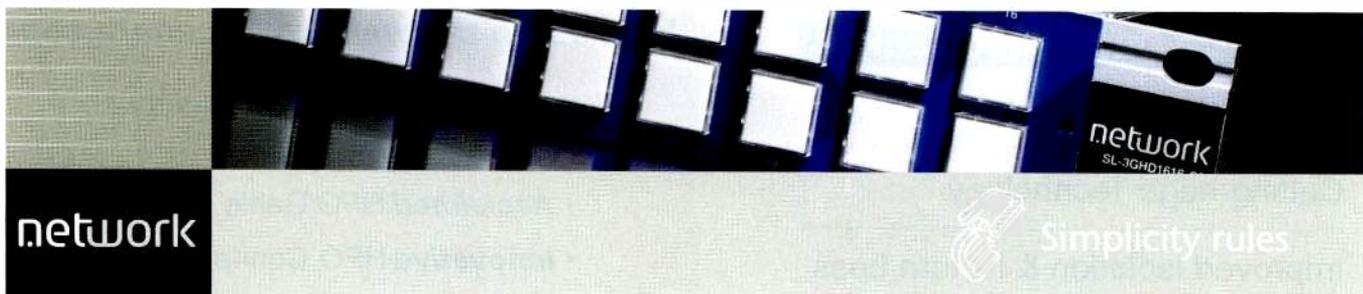
mode. (Slave mode worked perfectly with my JVC GR-HD1.)

Next, use the HDD mode menu to choose between DV and HD recording. If you choose DV, use the DV formats menu to select the recording format, which includes raw DV (four-channel, 12-bit, 32kHz audio is supported), AVI Type 1, AVI Type 2, Canopus AVI, Matrox AVI, QuickTime, Avid OMF, QuickTime 24p, AVI Type 2 24p and Pinnacle. If you choose HD, you use the HD formats menu to select between M2T and QuickTime.

The record menu selects between normal and retro-cache (up to 10 seconds stored in a memory buffer) recording. In normal mode, your camcorder's trigger toggles the DR-HD100 between record and record-pause.

Accessing material

To access M2T and DV recorded files, connect your computer via FireWire to the computer I/O port, and use the HDD mode menu to select DD drive. When operating in DD mode, the unit's hard disk mounts on your computer's desktop. Each recorded video segment appears as a



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file within a folder. Assuming the file is other than M2T, DTE operation is possible.

After recording DV clips, I used DTE mode with FCP (QuickTime), Premiere Pro (AVI Type 2), EDIUS 3 (Canopus AVI), iMovie HD (RawDV), and Avid's FreeDV (OMF). I also used DTE mode with FCP and QuickTime 720/30p. During all my tests, the DR-HD100 performed properly.

M2T files are directly accessible on the unit using DD mode. Because Avid's Xpress Pro provides a faster-than-real-time import of M2T with OMF, this is the recommended way of working with HDV.

Avid's Liquid 7.1 can directly import M2T files, so I was able to use Liquid in DD mode. Liquid provides three options when opening an M2T file: link (which uses the DR-HD100's drive), copy (which automatically copies the file to your computer's disk), and move (which moves the file and deletes it from the DR-HD100). Liquid supports ProHD 720/24p and 480/60p. Using Liquid, I was able to edit HDV at 24fps, 30fps and 60fps.

Should there be a delay in the support of ProHD 720/24p, 720/25p, 720/50p and 480/60p, there are two

non-DTE options that can be used with FCP. First, with the drive disk mounted on the desktop, use the MPEG Streamclip (www.squared5.com) application to process M2T files. Streamclip will convert HDV to linked M2V and AIFF files. (You can also transcode to AIC.) Unfortunately, time code will be lost during conversion. Then in FCP, define the sequence's HDV or AIC time base to match the frame rate.

Second, you can connect the DR-HD100 to your computer using

clips. Each recorded video segment will be placed into its own clip.

The verdict

The DR-HD100 works very well considering the delays imposed by Apple's lack of support for other than 720/30p. Looking over all the new media solutions, one option stands out for me: a camcorder that would use 70GB REV cartridges that can support a 100Mb/s to 125Mb/s data rate. A 70GB REV cartridge can hold nearly eight hours of ProHD video yielding a per-hour cost of less than \$10, making it about equal to a DV cassette. This option would support recording, playback and long-term storage, without the need for long-term storage.

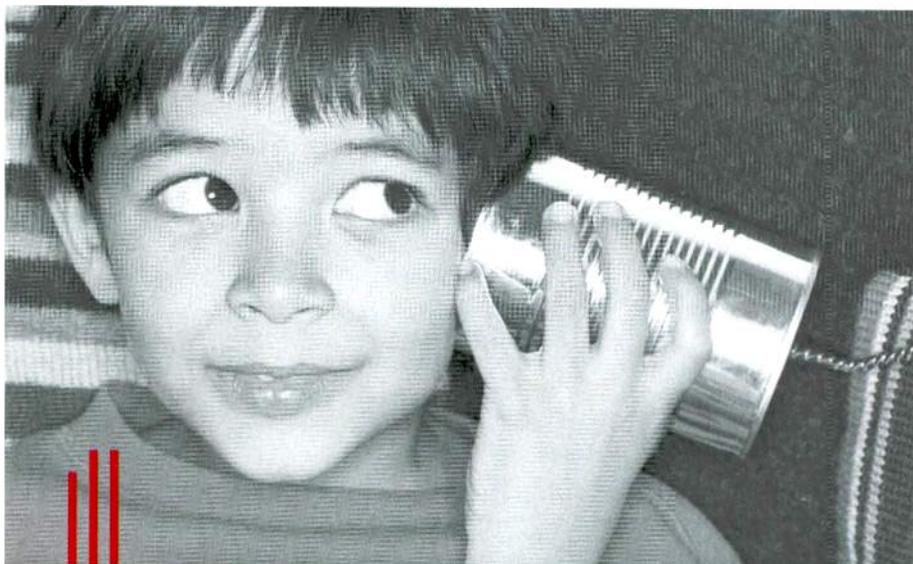
For those working with ProHD, the DR-HD100 comes reasonably close to providing the shooting convenience and playback performance of a HD-based camcorder.

BE

Steve Mullen is owner of Digital Video Consulting, which provides consulting and conducts seminars on digital video technology.

The DR-HD100 comes close to providing the shooting convenience and playback performance of an HD-based camcorder.

the DV I/O port. Now, use the control menu to select AV/C mode. Next, use the play menu to select play all. Use FCP to FireWire capture all clips by pressing the DR-HD100's back index button to move to the first clip. If the clip doesn't begin playing, press the play button; immediately click FCP's capture now button to capture all



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Ross Video's OverDrive

Integrated production control technology improves live production efficiency.

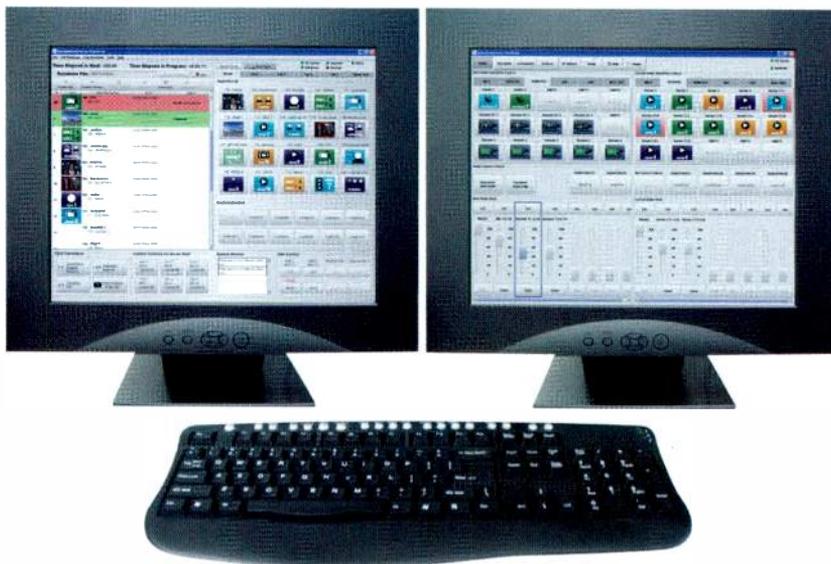
BY BRAD ROCHON

With the majority of the digital transmission build-out completed, broadcasters are now focusing on other areas to increase efficiencies, reduce costs and improve the quality of their production offerings.

In recent years, the implementation of digital server systems, CG MOS workflows and robotic cameras has facilitated production efficiency. However, facilities are searching for further enhancements that offer immediate improvements to operational efficiency and the bottom line. One new technology that accomplishes these goals is Ross Video's OverDrive production control system.

Centralized control

OverDrive features integrated, centralized production control for devices and effects in a production rundown. This allows for a single operator to manage program playout. With the addition of a MOS protocol interface to the newsroom system, the workflow



Ross Video's OverDrive provides an integrated MOS link between a newsroom editorial system and other production devices in a control room. It executes a more consistent, sophisticated on-air production without increasing staffing levels.

running on a Microsoft XP platform, OverDrive offers a stable, future-proof and reliable control platform.

Extensive industry consultation and feedback from customer sites

operator intervention. Cut-ins, talk shows, 24-hour highlight programs and back-to-back news productions can be managed seamlessly on one control system.

- *ROI.* Users can experience a rapid return on investment by optimizing crew size, reducing production errors and on-air mistakes, and adding new production capacity during mornings, late evenings and weekends.
- *Device selection.* Users can choose their preferred equipment brands to integrate with the system, whether with current legacy devices or new technology.

Facilities are searching for further enhancements that will immediately impact their operational efficiency and improve the bottom line.

uses the production control system for playout of newsroom-produced programming.

The system provides live production facilities with a rundown-based, event-driven workflow that matches the visual toolsets and operational workflow used in common newsroom systems. Using modern Java programming technologies for system clients

have identified the following control system key benefits:

- *Scalability.* Users can instantly transition between manual, semi- or fully-automated production environments in the same control room using the same devices.
- *Flexibility.* Users can easily manage scripted or unscripted events and last-second changes with minimal

Rundown playout

The primary application in this technology controls rundown playout. In OverDrive, for example, the RundownControl application manages all switcher effects, keys and external device control. Users can create

rundowns locally, on a remote client or in the newsroom system with an ActiveX desktop plug-in.

A rundown is made up of stories that contain one or more events. Each event is designed around a template that is created by entering specific or placeholder data into a number of fields. Data in a template could include switcher memory, CustomControl (programmable macro) ID, timing triggers, picon (picture icon for identification), device control (such as server clip, camera preset or audio channel level) and descriptive information.

A well-designed control system with a flexible architecture allows the system to be used in production-assist environments, fully automated one-operator control environments and any configuration in between. It also allows for the ability to scale staff (from one operator to a full traditional crew) between or during a production to accommodate a facility's specific needs.

In live news production, unscripted events and late-breaking stories are common. Transitioning seamlessly from scripted to unscripted operation while on-air is an essential requirement. A control system needs to provide powerful tools that allow these situations to be handled effortlessly and without error. For use in these situations, OverDrive features Quick-Recall and CustomControl toolsets.

Last-second changes in the newsroom system must be immediately reflected in the control system, and the status of the control system rundown needs to be displayed on the newsroom GUI for the benefit of the producer. A real-time MOS interface allows editorial or rundown sequence changes in the newsroom system to automatically update the control system, providing coincident rundowns at all times.

Other considerations

Additional elements to consider when purchasing control system technology include the redundancy of hardware and data, the selection

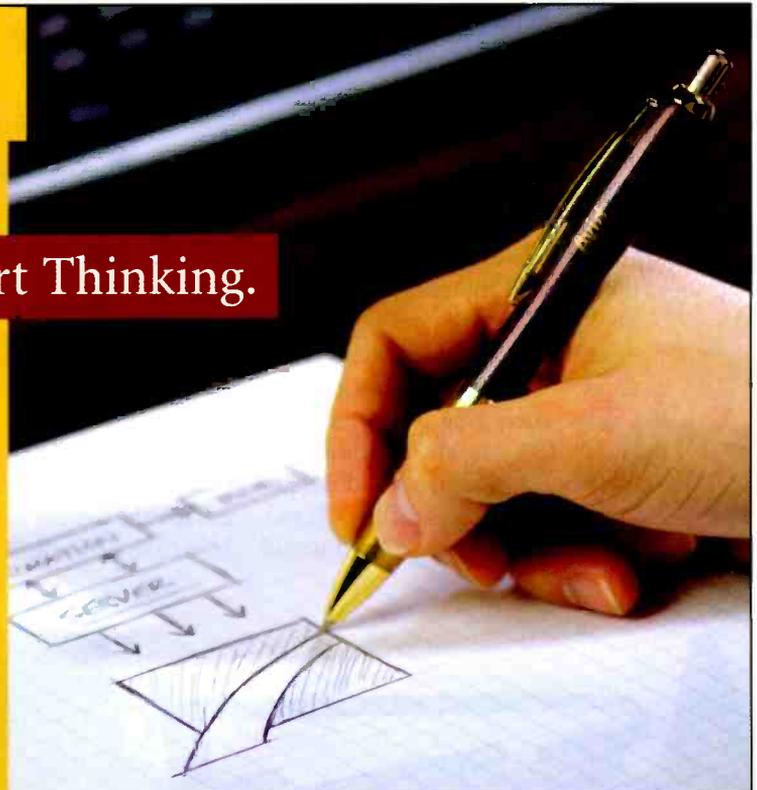
of device interfaces available and any optional components, such as satellite control panels and remote clients. Any licensing or maintenance fees must also be investigated. All of these items impact the system operational costs and the ultimate benefit the system can provide to your organization.

Although integrated control system

technology is relatively new, the growing number of facilities that have implemented it have experienced an immediate reduction in production operational costs, increased production capabilities and an improved quality of their production offerings. **BE**

Brad Rochon is product manager of OverDrive for Ross Video.

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The SAMMA system

The automated system from SAMMA Systems migrates magnetic media to digital files.

BY GILAD ROSNER

Magnetic media has been the most common way to record audio and video for the last several decades. The value of all this content is incalculable, yet its survival is in great danger. Magnetic tape cannot be physically preserved beyond a certain point; components of the tape break down, causing the degradation and eventual destruction of the recorded content.

The only way to preserve the content is *migration*, copying the recorded content to a new tape or to a digital file, while correcting for signal degradation. The amount of audio and video content in danger — hundreds of millions of hours globally — is too vast to be saved through traditional

methods. The scale of the problem is far too large for manual processes to keep up. Without taking action, stations and archiving facilities could

an unattended magnetic media migration system. The platform is a comprehensive system designed to migrate large quantities of tape media to digital

The amount of audio and video content in danger — hundreds of millions of hours globally — is too vast to be saved through traditional methods.

suffer irretrievable loss of the world's audiovisual heritage.

A unified solution

To combat this loss, SAMMA Systems created the System for the Automated Migration of Media Assets (SAMMA),

files. Through the use of expert systems, proprietary software and hardware, and the distillation of decades of magnetic tape preservation and restoration experience, the technology presents a unified solution to the problems of saving videotaped images.

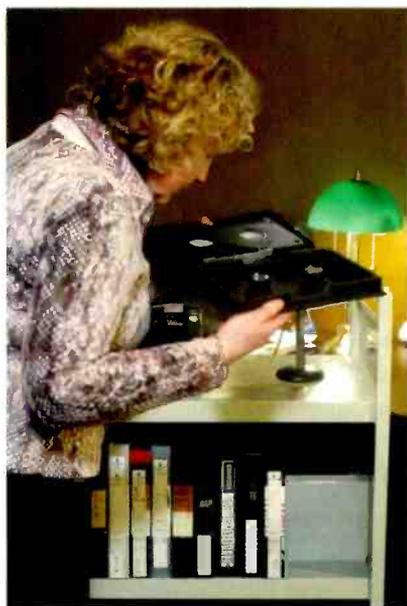
The workflow is simple. An operator loads the system with as many as 58 source tapes. The automation then migrates the material to digital files (and/or to sub master cassettes). Once completed, the operator unloads the source tapes and reloads the next batch of tapes to be copied. The copied digital files are then moved into a local storage system.

The system uses advanced video and audio analysis hardware and software to ensure total quality control throughout the process. The analysis engine provides time-base correction, dropout compensation and frame synchronization. It also creates a log of any errors and the corrections made, all referenced to timecode.

The system makes dynamic decisions about how to proceed based on the real-time analysis. For example, a declining RF envelope during migration may indicate a playback head clog. Should this happen, the system halts the process, loads a calibration tape and rechecks the RF level. If the



A single SAMMA can accurately migrate up to 140 hours of content per day.



To prepare your tapes for migration, you will need to designate someone to enter some basic information about each tape into a database, print a barcode that SAMMA will generate, and affix the label to the tape and its respective containers.



Once the tapes are prepped, an operator scans the barcodes of the tape batch to produce a loading queue. The operator then inserts the tapes into the SAMMA system based on queue.

less encoding of archival media. The encoder inputs and outputs SDI plus AES audio, and the resultant files are

wrapped in MXF.

The robotic tape handlers can contain from three to six to playback decks, depending on the format. A Beta tape version is built to accommodate as many as six decks in single robot. Such a system can migrate tapes to digital files only at the rate of 140 hours of content per day. At seven days per week of operation, this yields a potential of 50,960 hours of migrated content per year.

Effective migration

As broadcasters move from tape-based plants to server-based operations, one of the biggest tasks facing them is retaining access to their existing videotapes. SAMMA provides a high-quality, rapid and highly cost-effective migration of those assets to digital files.

BE

Gilad Rosner is a systems integrator with SAMMA Systems.

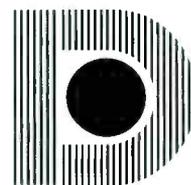
RF level is still low, the system will load a head cleaning cassette and then recheck the levels. If the original tape is determined to be at fault, a log is made, and the deck is put back into service.

Detailed metadata — such as physical condition (tape stretching and tension) and signal condition (luma and RF levels, motion, and silence) — is collected from each tape. Extensive reports on the condition of a collection of tapes are available both during and after the migration process. The SAMMA system is fully portable, allowing it to be brought to a station's site for transfers. This eliminates the uncertainty, risk and cost of shipping collections off-site.

Centralized intelligence within the system allows several tasks to be completed in a single pass. Multiple tape copies and digital files can be created in the time it used to take to make a single duplication. To take full advantage of the digital domain while sacrificing none of the quality, the system uses real-time MotionJPEG2000 encoding hardware to perform loss-

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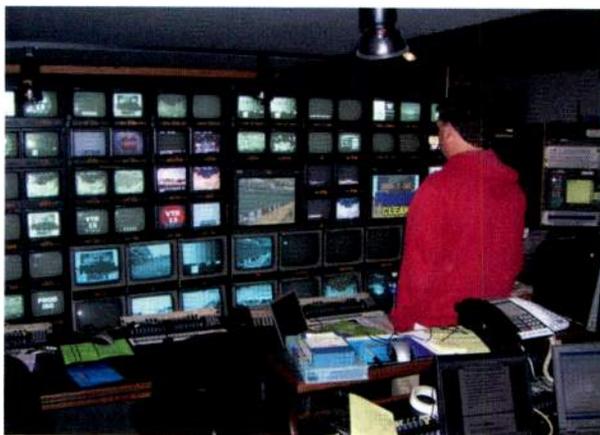
The graphics systems covered ESPN's X Games 12.

BY L.T. MARTIN

This summer's X Games 12 continued the tradition of living on the cutting edge of sports. After all, that's why this spectacular display of speed, skill and daring produced by ESPN is called the X Games. (The "X" stands for extreme.) But as exciting as is to see someone doing a double backflip

Almost 17 million viewers tuned into this summer's live X Games telecasts on ESPN. That's up 3 percent from the 16.4 million viewers who watched it last year. Portions of the X Games were also televised live on ESPN International to more than 78 countries and territories in the Pacific Rim, Middle East and Africa.

x 96 Grass Valley Venus SDI router, with 40 external intercom panels; an Adams Digital Intercom Matrix, with 25 external intercom panels; and a 28-channel MATV system. NMT also provided the production with complete monitoring of feeds from all three event venues, as well as incoming material from the Super Shooter



Ten Deko 3000 graphics systems were installed in mobile units and in the broadcast center at the STAPLES Center, shown here.



The Deko graphics system can accommodate multiple compositions, permitting simultaneous production of specific formats in HD or SD aspect ratios.

on a motorcycle or taking a header off a vertical pipe, the video production behind this four-day sports spectacular pushes the envelope of broadcasting possibilities.

From Aug. 3-6, ESPN and ABC provided 18 hours of live programming. X Games fans could also tune into 19 other delivery outlets, including wirelessly over ESPN Mobile, online at EXPN.com and in Spanish on the ESPN Deportes network. There was even a pay-per-view post-games special, "X Games Xtended," that exclusively presented a new medal event, the BMX Big Air competition. Fans could even monitor the event interactively for two hours each night on the DISH Network's DishHOME channel 100, where they could choose from six camera feeds in a mosaic format to select the angle they liked best.

High-intensity SD

The complexity of the live BMX freestyle, Moto X, skateboard, surfing and rally car racing competitions made this the second biggest televised sports event — right behind the Olympic Games. Most of the competition's events took place in the Los Angeles area, including at the STAPLES Center and the Home Depot Center, with surfing from Puerto Escondido, Mexico.

Paul DiPietro, senior director of remote operations, developed the technical plan to execute ESPN's production needs with the help of his team of 400 operators and technicians. All of the production infrastructure shoehorned into the Home Depot Center stadium broadcast operations hub was provided by National Mobile Television (NMT). This included a 96

25 remote truck provided by NEP.

Even though many of the cameras were shooting high definition for archiving and future repurposing, this year's X Games 12 broadcast was all standard definition. It was simply too large an undertaking to upgrade the more than 70 cameras, 50 tape decks and EVS servers, and 14 linear and nonlinear edit bays.

Go-for-the-gold graphics

Jeff Wilkov, creative producer, put a great deal of emphasis on the digital graphics that would spice up the visuals. These included keys and graphics for the pre-production edited pieces (called "pretures" in X Games slang), the broadcast shows and the graphics shown to the live audiences on jumbo stadium screens during the actual competitions.

All of the graphics inserted during the events had to be linked to ESPN's on-location Sports Media Timing and Scoring center for timeliness and accuracy. To keep this information constantly updated and fed to the

use the Avid Deko 3000 graphics system. Ten of the new graphics systems were installed in mobile units and in the broadcast center. And with the help of a 4TB server system custom-built by ESPN, the graphics were ac-

names of the players and statistics of their events changed under the fast-paced pressure of the Games.

ESPN also chose the system because each SD channel could display different clips or DekoObjex scenes. That enabled the operators to animate lower-third formats in one channel and full-screen templates in another, or display tickers, bugs, cel animations and clocks in separate channels. With its new version 4.0 software, the system is able to import QuickTime movies and export Deko-signature Motions to nonlinear editors.

The system can accommodate multiple compositions, permitting simultaneous production of specific formats in HD or SD aspect ratios. An advanced composition tool produces text that fits-to-fill a layer boundary and auto-branding frames that apply to every manual

ESPN chose the system because it could use templates for pre-produced graphics without being completely dependent on them.

graphics templates in the Avid Deko systems, the team relied on feedback from transducers built onto the race cars, motorcycles or bikes that get triggered at the finish line, along with input from judges entering their evaluations into handheld keypads.

As in past years, ESPN decided to

cessible in all the edit bays through an Ethernet network.

ESPN chose the system because it could use templates for pre-produced graphics without being completely dependent on them. That made it easier for the graphics operators to edit their content on-the-fly as the

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The graphics system allowed operators and editors to have an audio WAV file associated with each graphic on the Motion Timeline.

or automated text entry. At the X Games 12, the operators had access to the system's optional FastAction keyboard designed specifically to aid data entry under live production pressures.

A feature crucial to the look of the X Games production was that the graphics system allowed operators and editors to have an audio WAV file associated with each graphic on the Motion Timeline. This allowed the operators to fire off a sound effect as the graphic image moves onto the screen.

These motions automatically adjust to changing text independent of their content, and the graphics system supports the incorporation of sound effects linked to layer, row, word or character motions, regardless of factors such as the number of letters in a player's name. It also enables broadcasters to combine 3-D objects from Autodesk 3ds Max and Avid Deko graphics along with their associated real-time data integration.

A winning combination

The graphic elements for both the winter and summer X Games have been created since 2000 by v12, a design studio based out of Santa Monica, CA. The 400 elements of this year's assortment, called "Book of X," included both an animated package of full-screen animations and an insert package that would be keyed over live footage, along with scoring and statistical information.

The creative director at v12, David Sparrgrove, used Adobe Illustrator and Photoshop for design, After Effects for compositing, and Maxon's CINEMA 4D for 3-D animation. In addition to a redesigned logo, the graphics for this summer's events included a new animated character known internally as "Jenga Man." The tribute to Hasbro's stacking game played off of the intentionally blocky look of the rest of the game's graphic elements.

Sparrgrove prebuilt as many of the graphics before the show as possible. However, because a large portion of them reflect the ever-changing ramps and race courses of the games themselves, he had to be on site during the production to update their look as the officials revamped the playing fields. New versions would be uploaded nightly to the v12 render farm in Santa Monica over broadband Internet for the next day's performances.

One obstacle that had to be overcome, however, was that the Avid Deko 3000 did not have the ability to include 3-D motion graphics in real time. So, Sparrgrove created moving 3-D clips in v12's graphics system and sent them to the Deko systems as a DV stream. Then, a 2-D animation from the Deko with all of its live scoring data could be matched seamlessly into the final frame of the prerendered 3-D clip.

BE

L.T. Martin is a freelance writer and post-production consultant.

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**A letter from
the publishers**

The news business is fast-paced; it never slows down. Just when it seems the industry will get a break, the next storm, political scandal or local emergency pops up, and you are charged with covering it — better, faster and more in-depth than the next station.

But, sometimes you could use a little help to do that, and new technology is often the solution. Whether it's improving workflow, automating news tasks or producing content for multiple delivery platforms, implementing the proper equipment and systems is paramount to producing news faster, better and on more platforms.

Selecting the right equipment to make this happen, however, isn't always easy. That's where we can help.

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This supplement and symposium focuses on the latest newsroom technology. We've assembled key companies to provide you with the latest technical information. Whether you need a better newsroom workflow, an all-digital solution or a transition from SD into HD, the answers lie in the pages ahead.

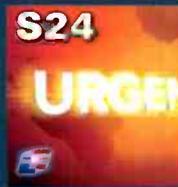
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Graphics	S24
Distribution	S30



File-based news workflows improve efficiency from acquisition to air



The transition from videotape to a digital file-centric workflow for news production continues to gain momentum. During the past year, many broadcasters have committed to one of the competing digital file-based ENG formats and upgraded their newsroom workflow with the transition to video file servers.

The accelerated pace for adopting a file-based workflow to replace, or in some cases augment, videotape-centered news production is easy to understand.

"Ultimately, higher production values and efficiencies are the two levers users get as a result of implementing file-based workflows," said David Schleifer, vice president of broadcast and workgroups for Avid Technology.

"The goal of a newsroom has always been to tell a story well, to tell it accurately, but above all, to tell it first," said Ed Casaccia, Thomson product development manager for Grass Valley server, storage and digital news production. "Beating the competition to air has always been the prize."

Claiming that prize requires a newsroom to create complex packages with several prerecorded and live contributions, and multilayer graphics. With the advent of new distribution avenues, such as the Web, cell phones and podcasting, newsrooms must tailor those packages for different audiences using multiple delivery platforms.

"Moving to a file-based workflow is criti-

cal to being able to do all of this on limited budgets," Casaccia said. "It eliminates repetitive jobs — ingesting tapes, carrying content around on sneaker net — allowing every member of the team to contribute directly to the success of the newsroom."

Building news production around a central server that makes raw content simultaneously available to reporters, producers and news directors offers an abundance of other advantages, said Fred Schultz, Farris senior marketing manager, news solutions for NEXIO server systems. These advantages include the ability to edit and play to air while continuing to ingest, play edited stories directly without rendering delays, and make all content simultaneously and immediately available to all users, he said.

Files also improve the overall appearance of news, said Rick Young, vice president of product management for Pathfire.

"The integrity of the content is significantly improved as a result of file-based content handling," he said. "There are no more generational losses."

Files in the field

Several competitive electronic news-gathering systems that record video as files for simple integration into a file-based workflow have emerged throughout the past few years. While they rely on different media to store raw footage, they share a fundamental goal of replacing videotape as the sole

A Grass Valley-based file-centric workflow helps to maximize news production efficiency at CNBC headquarters in Englewood Cliffs, NJ.



"The integrity of the content is significantly improved as a result of file-based content handling."

— Rick Young,
Pathfire

Edit

A format-independent SD and HD editing application, with built in transcoding for mixed media formats and aspect ratio conversion – Aurora Edit seamlessly handles any media for any project. With full integration to MOS and asset management tools, your news team can take advantage of descriptive metadata – quickly and easily linking finished stories to the rundown.

Playback

Through an intuitive user interface, Aurora Playback offers a fully synchronized news playback system getting the right story on the air at the right time. It also provides automatic playback of NRCS playlists or complete manual operation of user-created playlists, managing up to six-channels from a single server or mirrored systems.

Storage and archive

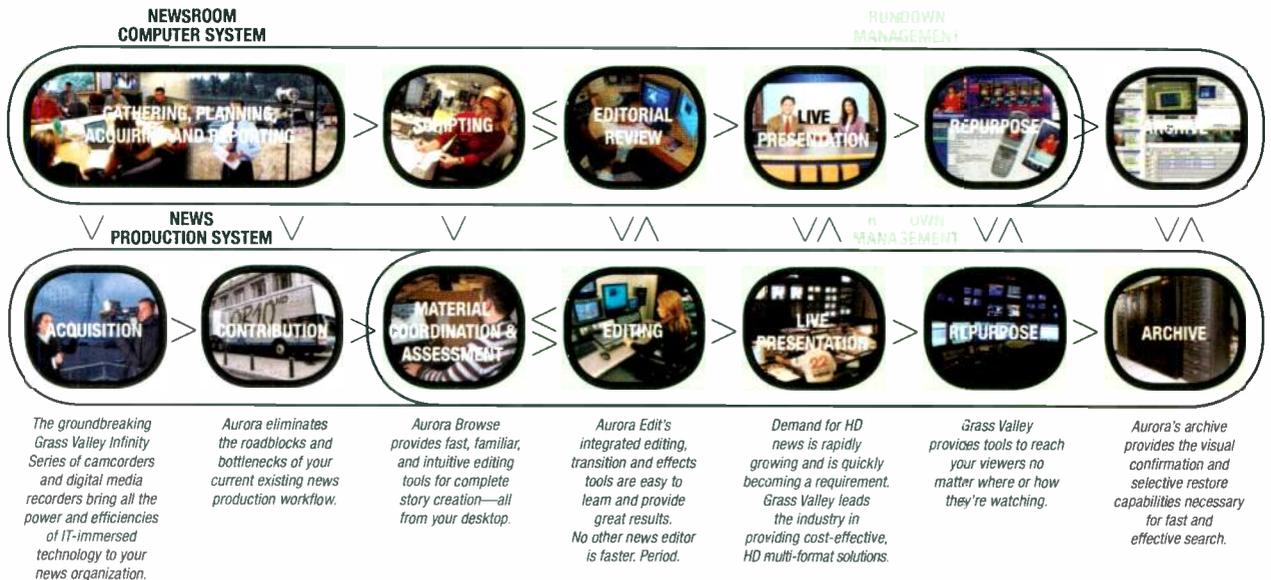
Central to a collaborative newsgathering operation is the rock-solid IT-based infrastructure behind it. Grass Valley provides IT-based servers and storage systems to enhance every aspect of your Digital News Production workflow.

No other technology provider comes close to delivering such a comprehensive, integrated, newsgathering solution. From acquisition to playout, you're assured of producing the highest quality—and fastest—news content available.

From newscasts to content creation

In addition to day-to-day operations, new distribution methods (such as the Web, mobile phones, PDAs, and iPods) are changing the way news is delivered. No longer is the focus only on producing local newscasts. It's also about becoming content creators for the new media.

Having optimal workflows and the products to support them is the key to harnessing the potential of new markets. For example, Grass Valley's forward-thinking products—such as Ignite HD™, an ideal choice for live production, 24-hour news, late-breaking news, and webcasting—give you maximum flexibility as you move to add distribution channels to your news operation.



The K2™ media server and media client system is

a shared-storage system offering more than 100 channels. Redundancy is available at every level with no single point of failure and it is designed for remote network operation with easy-to-use operational and administration interfaces - while supporting non-destructive expansion or reconfiguration. K2 is ideal for HD news workflows and integrates seamlessly with all Aurora products.



Ignite HD is designed to produce live newscasts with only one or two operators.

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File-based workflow efficiencies begin in the field at NECN-TV in Newton, MA, where videotape is giving way to optical media and Sony's XDCAM.



"Tapeless systems can only work if they eliminate the linear disadvantages of tape without throwing out the advantages."

— Ed Casaccia, Grass Valley

recording medium in the field.

This marks a fundamental shift for news-gathering; although, tape has some advantages, such as being a relatively inexpensive medium, Casaccia said. "The linear nature of tape is its biggest disadvantage. On acquisition, it limits the way you shoot."

A commonly encountered newsgathering situation — waiting for the arrival of a newsmaker or the start of a police operation — illustrates the point.

"Do you keep recording so you know you have the shot, but risk needing to change tape at a critical moment?" Casaccia asked. "Or, do you wait for events to start before hitting record and risk missing the start of the action?"

"Tapeless systems can only work if they eliminate the linear disadvantages of tape without throwing out the advantages," Casaccia said. "The Grass Valley solution is to use low-cost, IT industry-standard media that can be used directly in the Infinity series digital ENG camcorder and plugged straight into an editor. REV PRO disks currently hold 35GB, equivalent to two hours of SD or 40 minutes of HD, at a price roughly comparable to a DigiBeta tape."

The Infinity camcorder can also use professional-grade CompactFlash cards in situations where a news shooter must wait for an indefinite point when a story starts.

"Because there are no moving parts, users can leave the camera in loop record for hours without draining the battery," Casaccia said.

Sony's XDCAM and XDCAM HD ENG

camcorders tackle the headaches associated with gathering news on videotape. Based on an optical recording media, the camcorders feature a Professional Disc, which records DVCAM, MPEG IMX SD and HD (in the XDCAM HD version), as well as low-res proxies and metadata.

XDCAM and XDCAM HD provide "several advantages over linear tape-based acquisition, such as instant random access, simultaneous proxy and high-resolution recording, and high-speed ingest," said Wayne Zuchowski, marketing manager, XDCAM systems, Sony Electronics. They also provide unique workflow advantages, such as editing capabilities within the camera or deck, or via a laptop in the field, he said.

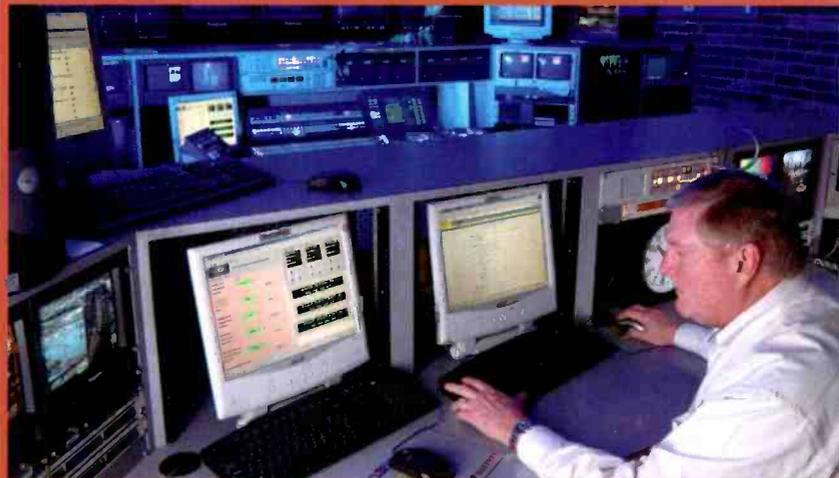
"The XDCAM format is extremely robust with a long shelf life and is well-suited for multiple applications in the broadcast workflow from acquisition to archive. It has proven its ability to handle extreme temperature and moisture conditions and as a noncontact medium, can handle higher G-forces than traditional tape devices," said Zuchowski.

In the newsroom

In the newsroom, file-based workflows revolve around the concept of centralized storage of news footage, graphic templates, audio clips and other media assets that can be accessed simultaneously across the newsroom's network. Depending on the system, rough cuts or even finished news stories, promos and teases can be completed on the desktop with more sophisticated editing



Journalists can repurpose news for other distribution avenues with Avid's Active ContentManager.



Henry Boze at WWBT-TV in Richmond, VA, uses the Crispin NewsCat to locate archived news clips.

reserved for craft editors in edit suites.

Shared access to content is central to this concept. "When Avid talks about file-based workflows, we're talking about workflows that have shared collaborative storage at the center," Schleifer said. "Some facilities could consider their operations to be file-based but still have a serial or linear workflow like you do with tape today. But, that's not what we're referring to. All of the benefits really come from centralized storage."

Metadata is an important component of file-based workflows. Information now written on videotape labels, such as the subject of a shoot and where and when material was shot, can accompany files in digital form, making it quick and easy for everyone in the newsroom to find desired footage on the server.

"By using file-based acquisition tools that allow for descriptive information, such as script and source information, you are guaranteeing a better workflow and ultimately a better on-air product once it hits the production location," Young said.

However, the full potential for metadata isn't yet realized, Schleifer said. "Right now, not much metadata moves from the field other than clipping, good shot markers, things like that," he said.

At the end of the news production process, metadata can provide the information needed to repurpose content for other distribution vehicles or build and categorize the news archives. For example, Crispin's NewsCat application automates all meta-

data associated with a news story after it airs, said Bob Valinski, director of business development for Crispin.

"This includes gathering story name, story text, CG text, date and creator, so that video file can be easily located and repurposed," Valinski said. "Operators can easily annotate the video file with keywords. A 'Notes' section acts as an 'electronic sticky note' to allow journalists to place comments in the metadata for future viewing."

Automating on-air production

A file-based news workflow is also the key to automating the on-air news production environment. Because digital files — not tape — are being played back, last-minute changes can be accommodated and deadlines moved back.

"A well-executed ActiveX integration is essential between the news automation and newsroom computer systems," said Scott Blair, Sundance Digital product manager, news automation.

According to Blair, a news producer can create media asset placeholders with ActiveX tools embedded in the rundown hours prior to a newscast.

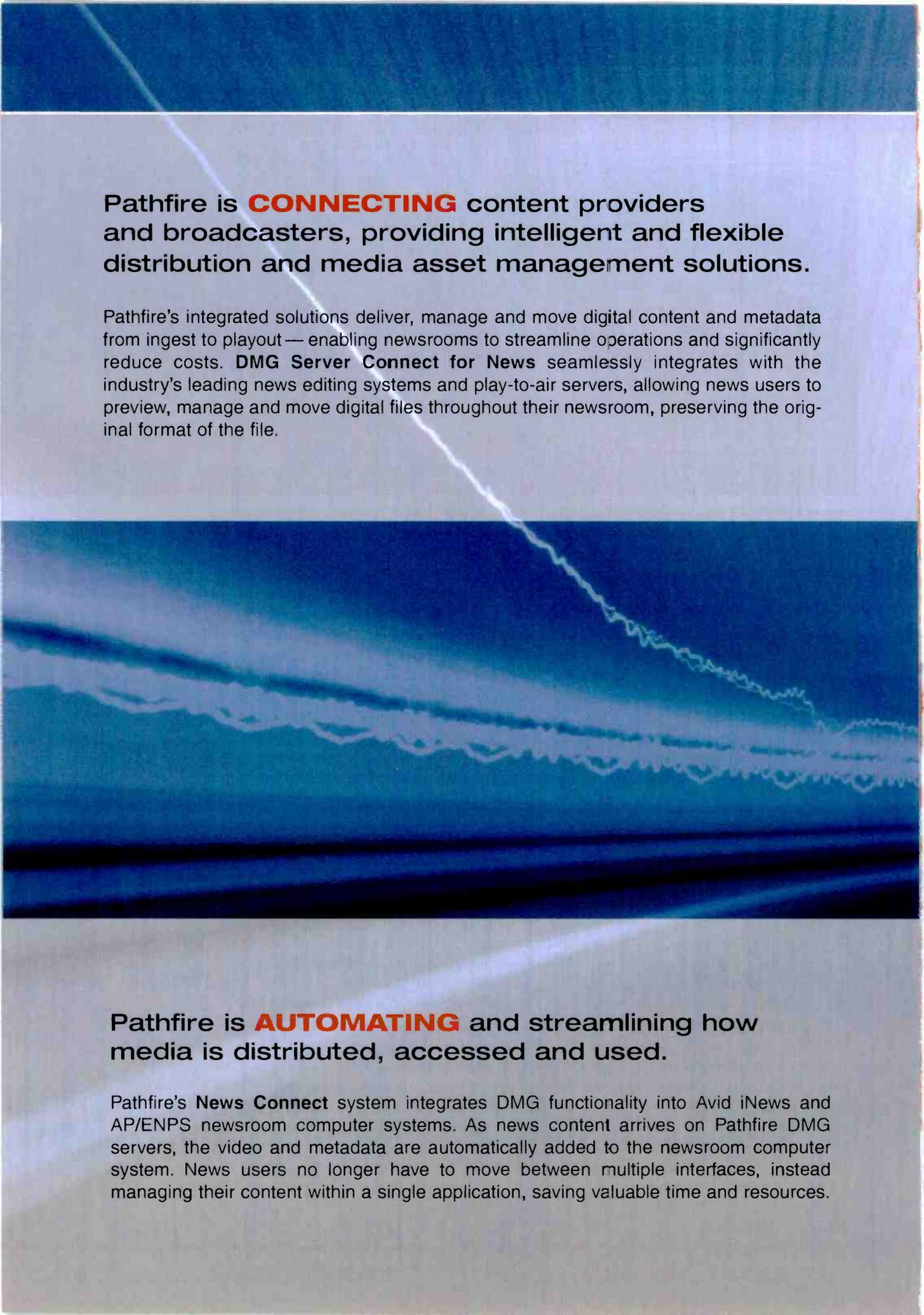
"The editor or graphic artist can then publish completed media to the story slug or placeholder ID whenever it is ready. Newsroom automation systems such as NewsLink will then report 'ready' status to the producer and director within a few seconds after completion," he said.

"Existing clips, or files, can just as



"When Avid talks about file-based workflows, we're talking about workflows that have shared collaborative storage at the center."

— David Schleifer,
Avid Technology



Pathfire is **CONNECTING** content providers and broadcasters, providing intelligent and flexible distribution and media asset management solutions.

Pathfire's integrated solutions deliver, manage and move digital content and metadata from ingest to playout — enabling newsrooms to streamline operations and significantly reduce costs. **DMG Server Connect for News** seamlessly integrates with the industry's leading news editing systems and play-to-air servers, allowing news users to preview, manage and move digital files throughout their newsroom, preserving the original format of the file.

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Pathfire's **News Connect** system integrates DMG functionality into Avid iNews and AP/ENPS newsroom computer systems. As news content arrives on Pathfire DMG servers, the video and metadata are automatically added to the newsroom computer system. News users no longer have to move between multiple interfaces, instead managing their content within a single application, saving valuable time and resources.

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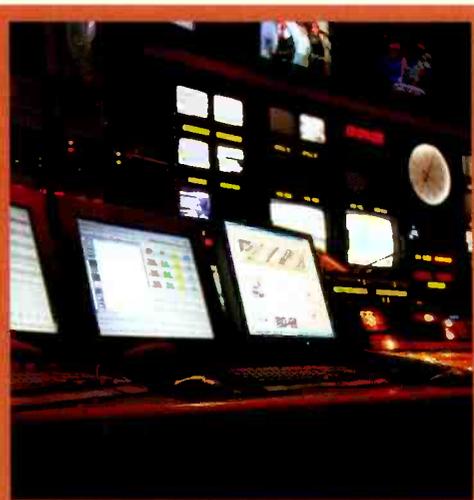
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KIRO-TV in Seattle uses Sundance Digital NewsLink's color-coded user interface to direct newscasts.



A-Channel, the CHUM Television station in Barrie, Ontario, delivers more content to viewers with Ross Video's OverDrive.



"[GigE's] extra bandwidth provides a cost and performance sweet spot."

— Fred Schultz, Harris

easily be repurposed with updated script information by dragging and dropping the clip name into the script from the video inventory section," he added.

The benefits of a file-based news workflow and automation can also open up new revenue streams.

"From an automation standpoint, a file-based workflow enables a station to be more competitive and flexible in how it transmits its news video," Valinski said. "For example, once the newsroom is completely file-based, it's a fairly simple process to repurpose material to create a 24-hour news channel. Minimal staffing is required to maintain a 24-hour news channel under automation control."

Remember the future

The progress of file-based workflows into TV newsrooms isn't happening in a vacuum. With the February 2009 analog shutoff right around the corner and a growing number of stations converting to HD, the backbone around which these file-based newsroom systems are built may require a major overhaul. Many newsroom networks were built to handle 25Mb/s SD video. Won't HD for news require greater network bandwidth?

Not necessarily. XDCAM HD supports an SD workflow for stations with a 25Mb/s infrastructure, Zuchowski said.

"The XDCAM HD system has selectable recording rates of 18-, 25- and 35Mb/s, which allows many stations to use their existing networks and infrastructure to transition from SD to HD seamlessly," he said.

Avid's DNxHD is another approach. "Avid DNxchange is a great example of this where we've made the effort to ensure that not just HD, but finishing quality HD, can move over SDI or over the current SD infrastructure," said Schleifer. Avid optimized DNxHD for Ethernet, so stations with GigE can have multistream HD workflows.

The wide availability of GigE is minimizing the need for custom HD infrastructures, Schultz said. "Its extra bandwidth provides a cost and performance sweet spot by marrying the flexibility of IP content management with the security and reliability of enterprise-quality content storage and playout."

HD news production will place other demands on newsroom infrastructure, such as greater storage capacity and faster transcoding.

"While transcoding of SD content for different servers or applications has mostly been a real-time or better process, the large amounts of data associated with HD will dramatically increase the time required for transcoding," Young said. "Unfortunately, compression formats that lend themselves well to editing are not the best for transport and vice versa. This is likely to mean that the need for transcoding will continue."

Casaccia said, "Central storage capacities, too, will need to grow to incorporate the larger file sizes of HD material. However, a sensibly designed SAN will allow you to add capacity at any time without taking the storage offline."

END

Stations transitioning to HD newscasts are attracting new viewers



Slowly, local broadcasters have started offering HD newscasts, and the move to HD is growing. Given where viewers are headed, the decision to launch HD newscasts is understandable. According to a recent study from Kagan Research, by the end of this year, about 30 percent of TV households in the United States will own an HDTV set. By 2010, nearly 180 million HDTV sets will have been sold in the United States, accounting for more than 81 percent of TV households.

The benefit of being first

Taking the HD plunge can be expensive for local news operations. "But the benefits are clear," said Ed Casaccia, Thomson product development manager for Grass Valley server, storage and digital news production.

"Competitive news content is one of the most significant drivers in both ratings and advertising revenue for broadcasters," he said. "The appearance of news content in HD compared with SD is markedly better, offering viewers more detail and a sense of more immediacy to what's being covered. Some news outlets have reported that their newscasts have consistently ranked No. 1 in their respective market since they began HD newscasts," he said.

"In a highly competitive market, the first mover to HD could benefit by attracting new viewers," said Brad Rochon, Ross Vid-

eo OverDrive product manager. "Moving to HD now provides some degree of future-proofing the facility," he said.

"Right now, people are basically staking out real estate. That's the main focus. Get that share of mind with that percentage of the audience that's trying to find HD content," said David Schleifer, Avid Technology vice president of broadcast and workgroups.

One step at a time

On the downside, producing an HD newscast can come with a hefty price tag. "Equipment, new set designs and training are significant costs associated with the move to HD that must be factored into the equation," Rochon said.

"Costs can range from \$250,000 to several million dollars, depending upon the station size and system complexity," Casaccia said.

Switching to an HD newscast now is likely to come with another significant downside. "The disadvantage of doing it now is that the technology is still maturing," Schleifer said. "A lot of the systems that get installed now are going to require change over time to ensure they are really delivering workflow efficiencies."

Mindful of the expenses, many of the stations rolling out HD news operations make the transition one step at a time. "Stations first must convert their infrastructure to SDI digital, which helps facilitate the

As stations transition to HD, maintaining the efficiencies of their SD file-based workflow will be important.



"The appearance of news content in HD compared with SD is markedly better."

— Ed Casaccia,
Grass Valley



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The superior 3D renderer, **VizEngine™** is the output source for **VizWeather**



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A complete 3D as well as HD/SD real-time weather solution for the creation of highly sophisticated weather presentations, with real-time integration to international and local weather data providers. With countless visualization possibilities for the creation of 3D fly-overs, 3D weather icons, manipulate satellite or radar imagery, and much more. The graphics and animations are driven by the weather data, and can be controlled, switched, and manipulated in seconds. The solution was designed for and by meteorologists and weather presenters. Viz | Weather now also supports Curious World Maps. Plug and play weather data. Easily accessible and available on-line globally. Triggers the weather graphics. With Viz | Weather you can show your viewers real-time weather either as point based symbol or as high-resolution 3D animations. Viz | Weather includes an interface with local real-time weather data of less than 1km resolution, providing accurate local forecast for use in transportation control, large outdoor sports events, etc...

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Ardendo Product range:

Ardendo offers a range of software products for IT-based production and archiving of digital media.

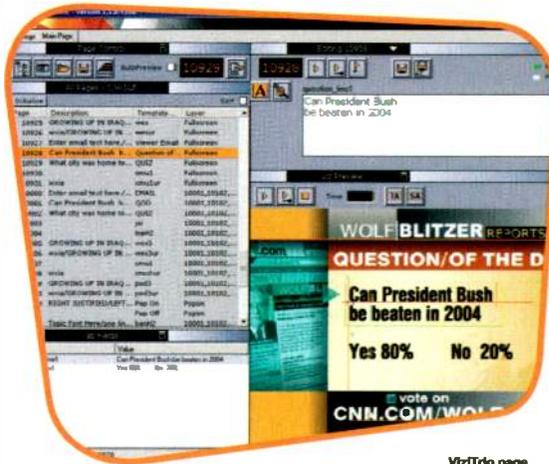
- ARDCAP** Professional Ingest Solution
- ARDENC** Browse and Thumbnail generation
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In addition, Ardendo also offers project implementation services: Resources for project management, solution architecture, system customisation, test and training.



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Viz|Trio is a cost-effective, yet powerful, real-time 2D/3D character generator. In addition to the basic CG features it offers a feature-rich 3D design system for creation of true 3D graphics and animations. Viz|Trio offers a wide range of attractive features such as the Look-Ahead Transition Logic™, multiple clients controlling one output channel and integration to Non-Linear Editing systems.



Viz|Trio Output
Image Courtesy of CNN

Viz|Trio page
Image Courtesy of CNN

HD/SD Output

Viz|Trio can deliver both High and Standard definition formats. Being built upon the Viz|Engine real-time output machine Viz|Trio as a software automatically supports SD and HD. The core technology in Viz|Engine is entirely resolution independent, hence adaptation to new output standards is only a hardware issue.

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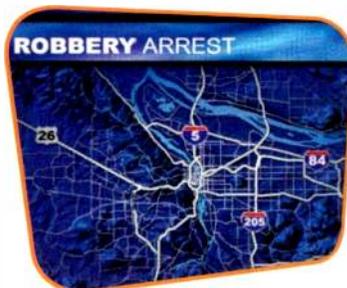
Curious Software introduces its new 'Design, Produce, Present' workflow built around the award winning Viz|Curious World Maps, and a new Viz|Artist and Viz|Engine integration.

Design- The workflow starts with the creation of templates in a new authoring environment incorporated into Viz|Curious World Maps.

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Present- Using Viz|Trio, Viz|Content Pilot or Viz|Weather, it is made simple. No need to copy heavy animation files to a DDR, simply save the template as a numeric page into the rundown (Trio, Pilot or Mos playlist) and "take to air" upon the directors cue.



"XDCAM HD is The New Betacam"

"The image that the PDW-F350 puts out is absolutely stunning," says director/cameraman Jody Eldred. "XDCAM® HD is the new Betacam®."

Eldred and Mark Falstad, both Emmy Award winners, took PDW-F350 camcorders to the ends of the earth. Eldred went to Israel to shoot 1080/24P. Falstad went to Alaska to shoot the legendary Iditarod® sled dog race in both news-style 60i and documentary-style 24P. Featured on Sony's XDCAM HD Disc Set, the results speak for themselves.

Falstad says, "We shot pictures that I never dreamed possible. For instance, in the middle of the night with only a hazy moon and no chance of making a picture, I simply turned on the Slow Shutter at 64 frame accumulation and we got the classic shot of a glowy tent in the mountains. And absolutely no noise because I wasn't boosting gain. It was stunning!"

"To do time lapse, I put the camera on my tripod, easily set up the frame count on the LCD display and hit the trigger. It was that fast. Overcranking at 60 frames per second, you can see slow motion of the dogs' paws kicking up snow and the ears and tongues flying. And you can play it back immediately in the camera. The PDW-F350 gives me a toolset that I never imagined having, especially at a price of \$25,800 [MSRP]."

"It's way too good."

-Jody Eldred





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*"XDCAM HD makes me
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-Mark Falstad



Jody Eldred came to a similar conclusion. "I'm very impressed with the skin tone, the way the reds work, the good detail in the darks and the highlights. I have ~160,000 invested in my F900 HDCAM™ package. But the F350 really deserves to wear its CineAlta™ badge. In fact, it's way too good for a camera at this price."

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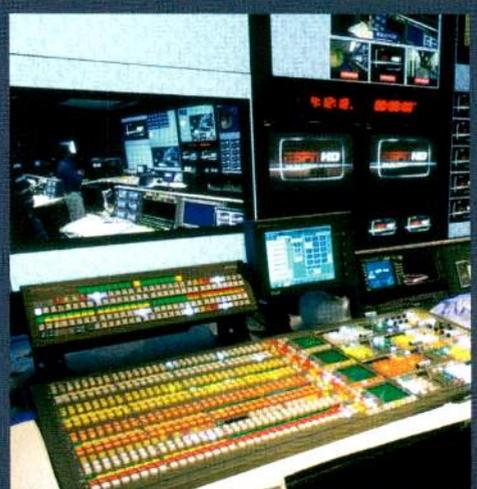
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Ross Video's OverDrive provides an integrated MOS link between a newsroom's production devices.



The first stage of converting to HD news typically includes a production switcher, such as Grass Valley's Kalypso HD.



"Stations are making a natural progression to true HD production."

— Rick Young, Pathfire

handling of news content as digital files," Casaccia said. "This would include installing production equipment capable of handling HD signals, such as a Kalypso HD video production switcher, Trinix routing switcher and HD modular gear." Other areas to start an HD conversion include cameras, graphics and servers, Rochon said.

"Station infrastructure and studios seem to go first, followed by specials or longer-form pieces that can be done with one or two cameras in the field and edited without time pressure," Schleifer said. "It's also where HD can help tell the story better. Last on the list is the daily newsgathering with a lot of cameras in the field and these bigger processes and workflows that need to be in place as well."

HD is about more than better picture quality for most stations. "Facilities adopting HD news are more proactive in searching out new technologies that will improve workflow and production efficiencies in addition to the improvement of on-air quality that HD can bring," said Schleifer.

Delivering on those workflow improvements in HD can be a challenge. "The biggest technical challenge is when you want that multi-user collaborative workflow in HD — the same kind of workflows that are delivering efficiencies in SD for us to our customers," Schleifer said. "They want them in HD, and we've got issues in bandwidth and camera compatibility and server compatibility right now. There are challenges out there. It's not easy being first,

but it is certainly something you can do today. You just have to examine the value of being first," he said.

Before fully upgrading to HD, many stations prepare for the transition in the SD realm. "Stations are making a natural progression to true HD production," said Rick Young, Pathfire vice president of product management. "This oftentimes involves a movement from SD 4:3 to SD 16:9 to HD 16:9. This is both cost-effective and provides the home viewer with a progressively better product."

Mixed SD and HD news

Stations airing HD newscasts today will exist in a mixed format world for the foreseeable future. Even if all of their remote and studio shots originate in HD, file footage from SD archives will be required. News production in a multiformat world presents a unique set of challenges.

"We know that, particularly in multiformat environments and workflows, the biggest challenge is in maintaining very high production values and excellent technical standards. Flexibility is key," Casaccia said.

"In addition to our acquisition and NLE solutions, Grass Valley has invested a lot of resources in developing high-quality multiformat equipment that can process both SD and HD signals from the same frame," he said. "This includes SD/HD routers, switchers, servers and even cameras. The GeckoFlex and Kameleon product families of signal conversion gear are critical to



Intelsat's teleport in Ellenwood, GA, provides uplink, downlink and turnaround services to broadcast stations.



Sæoul Broadcasting System's 6000sq-ft facility in Los Angeles relies on a Harris NEXIO server and a NEXIO news system.

handling all material in a common format. Sometimes an SD graphic or video clip will have to be upconverted to HD and vice versa for a station's SD channel. Grass Valley has taken all of this into account across its products and systems."

There's a little known fact about up- and downconversion that stations should understand, Schleifer said. "The process does introduce added time into the workflow because you are asking the system to change the media. Quite frankly, a lot of other solutions don't highlight this, leaving customers to realize later on that there will be some big transcoding and conversion steps to tackle," he said. "One of the bigger issues to be concerned with is really the on-air look and feel and how you deal with aspect ratio conversions, because you are including 4:3 elements with the 16:9 version."

Stations should avoid maintaining the same material in SD and HD, said Fred Schultz, Harris senior marketing manager of news solutions for NEXIO server systems. "Deciding how to avoid the costs and risks of dual inventories is key to clean and profitable HD news," he said.

"When necessary, daily operations can be conducted from pools of parallel content using asset management tools. The better alternative, like our NEXIO XS server system, stores each asset in its native form, then during playout provides automatic sizing and shaping for HD, SD and third-screen applications," Schultz said.

"By choosing equipment that supports intelligent resource management, moving from SD to HD in a facility should be seamless," Rochon said. Outside the station, dual format recording can simplify the process of supporting SD and HD playout, said Wayne Zuchowski, marketing manager for XDCAM systems, Sony Electronics. "XDCAM HD products have the ability to record in either SD (DV 25Mb/s) or HD (MPEG-2 18Mb/s, 25Mb/s and 35Mb/s)," he said. "Facilities can choose to begin capturing HD content now, or capture in SD today and be ready for HD tomorrow. XDCAM HD decks also have upconverters and downconverters to fit into both SD and HD infrastructures regardless of how users decide to capture for total flexibility."

The news production infrastructures required to produce newscasts for an SD and HD audience present other challenges as well. "HD will bring increasing pressure on technology vendors for improvements in the consolidation, identification, archiving and querying of assets," Schultz said. "The separate files that are generated each time a camera rolls must be easily and meaningfully consolidated, i.e. by story or location, to prevent clutter and enable handling as a single object." Additionally, manual entry of customized metadata for each shot must be easier and, along with auto-generated metadata, must be universally maintained across product lines, he said.



"Deciding how to avoid the costs and risks of dual inventories is key to clean and profitable HD news."

— Fred Schultz,
Harris

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Interplay Low-Res Encode creates low-resolution versions of incoming footage simultaneously with the high-resolution capture. Automatic encoding of the same asset in multiple resolutions saves time, frees editing systems to do production work, and ensures that **every user is working with the most efficient, best-quality material**.

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"HD trucks are not in as great of an abundance as SD trucks are."

— Ron Rosenthal,
Intelsat

One of the more serious issues facing successful implementation of HD file-based infrastructures involves codecs, according to Schleifer. "The issue we run into is that it's really difficult to maintain the same codec and workflow in HD. So, a lot of vendors need to transcode somewhere in the process to make field-acquired media compatible with playout servers. There is no codec today that's the same in the camera, in the editing system, in the ingest server and in the playout server," Schleifer said.

"There's no real way to build that solution yet. Although the first substantiation of it would be to use Ikegami cameras to acquire in Avid DNxHD, use Avid systems to ingest, edit and play it out to air, which is appropriate for some workflows but not for all," he said.

HD in the field

The final step in HD conversion is ENG and SNG contribution. While some of the early pioneers of HD newscasts use live HD contribution footage from a news chopper, most ENG and SNG fleets lag far behind.

Scarce HD news production and satellite transmission resources at local stations have required a turnkey service, said Ron Rosenthal, regional vice president broadcast solutions North America for Intelsat. "Over the last 18 months, we've observed a tremendous amount of growth from news organizations who are looking to further their ability to acquire and distribute HD content," he said.

"One of the successes we've had is a partnership with PSSI, Media Arts and Mira Productions. Mira Productions and Media Arts are responsible for the production, Intelsat provides the space segment and PSSI is providing the HD transmission trucks," he said. "The service is attractive because the HD trucks are not in as great of an abundance as the SD trucks are," he added.

Additionally, this year the company unveiled new HD transmission support for its QuickSPOT flyaway uplink as another alternative.

Certainly, the expense involved in changing out SNG and ENG infrastruc-

ture for HD is a factor. Another important reason for the slow rollout is the unfolding relocation of BAS license holders, including TV stations authorized for point-to-point microwave transmission to narrower digital channels in a new portion of the 2GHz band. While that FCC-mandated process plays out — perhaps even beyond its September 2007 completion deadline — the industry will likely be too focused on the conversion to commence broad use of HD live shots.

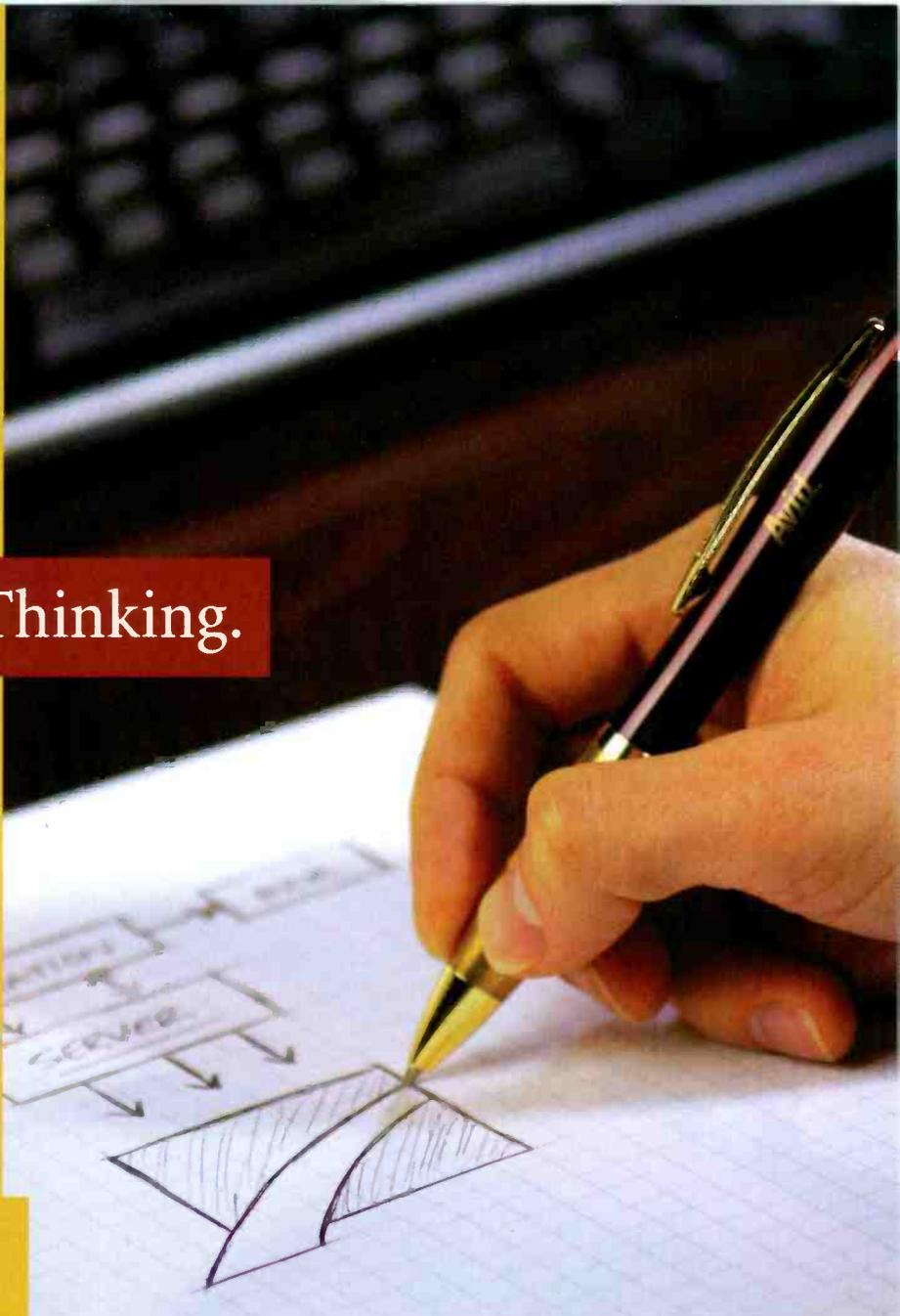
"Live SNG is still very much a requirement in newscasts, and thus reliable encoders utilizing advanced codecs, like MPEG-4 AVC, are very much a requirement," Young said. "Advanced compression is key to both real-time and file-based acquisition. We spend a good deal of our R&D time working on advanced codecs like MPEG-4 AVC and VC-1."

When live news contribution commences, bandwidth and codecs will take center stage. "Bandwidth is and will continue to be an issue for stations," Casaccia said. "So, embracing advanced compression schemes like MPEG-4 AVC and JPEG2000 will be critical going forward."

Conventional digital file transfers over public Internet networks via Wi-Fi, EvDO, WiMAX and broadband satellite link with file-based workflows in the field are other options. While not capable of supporting live HD contribution, the approach is a viable alternative for filing edited packages from the field.

"Interestingly, the easiest way for broadcast journalists to file a late-breaking news story may be as close as the local coffee shop," Casaccia said. "Thomson has announced Wi-Fi transmission capabilities for its Grass Valley Aurora and EDIUS laptop NLEs and other third-party products as well."

As stations purchase the technology and acquire the expertise to present HD news to their viewers, they are staking out their future. On an industry-wide basis, progress is slow but steady. The number of stations offering HD newscasts is small, but it continues to grow. For those pioneers, HD is helping them win new viewers today and become a thriving player on the media landscape in the long run. **END**



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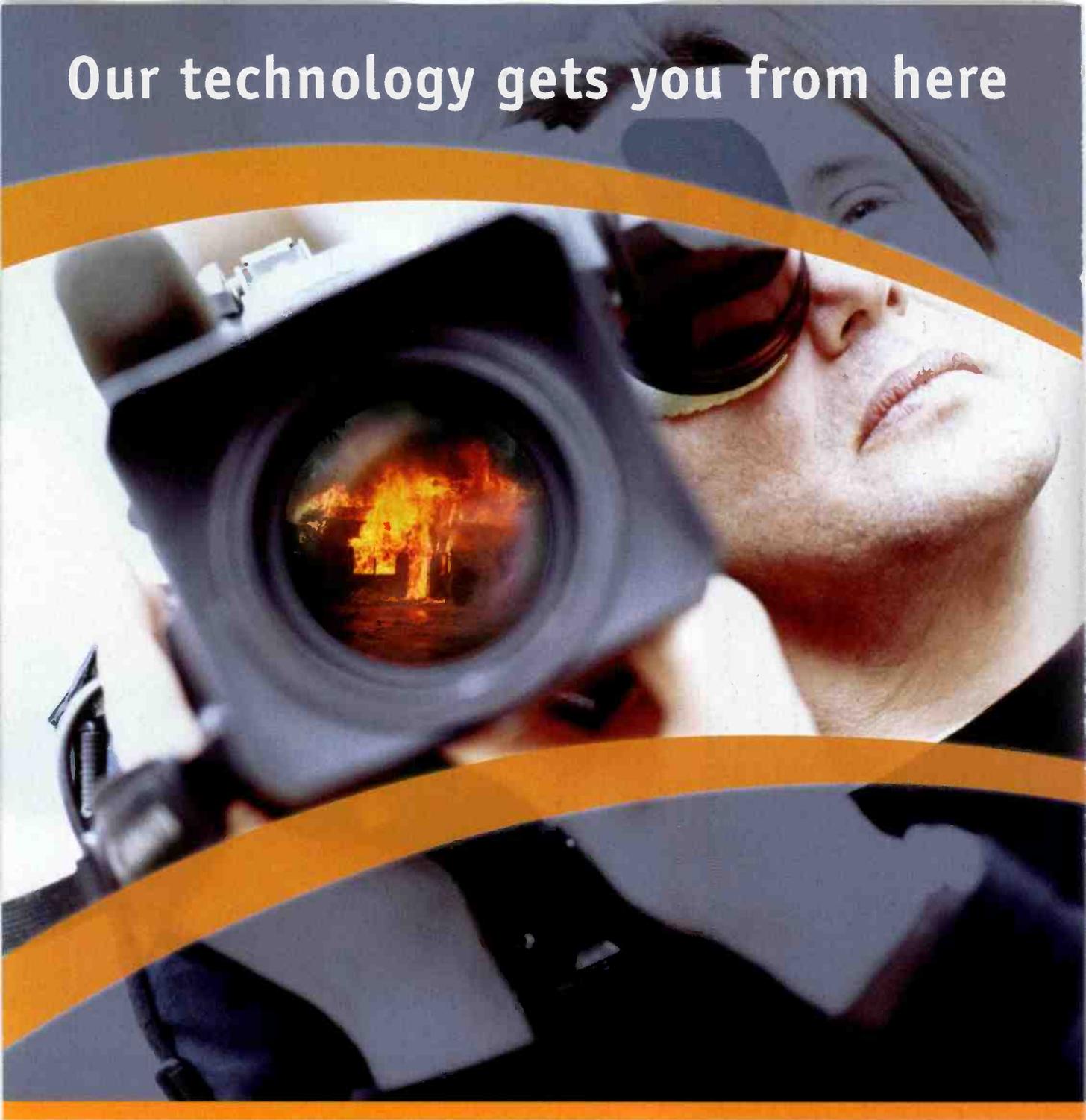
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Today's graphics must respond to the changing shape of news



News graphics, such as the one above created with Viz|Artist animation design software by Todo Noticias, a 24-hour news channel in Argentina, can help to build a TV news operation's identity and brand.



"That single graphic can be automatically repurposed for each application."
— Fred Schultz, Harris

The competitive landscape facing TV newsrooms is rapidly changing. Stations continue to compete for local news viewers, but now they face the added challenge of delivering news on the Web and to handheld devices, such as cell phones. In addition, TV news stations must now compete with nonbroadcast news organizations, such as newspapers and blogs, for the public's attention.

Stations that have spent decades branding themselves with an identifiable look and graphic presence must now deliver a complementary product via new media alternatives to fend off competition and protect their TV franchise. As if that weren't enough of a challenge, those same stations are simultaneously rolling out an HD presence — or will be soon.

Thus, from the tiniest cell phone LCD screen to the largest plasma HDTV, the shape of television news is changing. Newsrooms must continue serving the majority of their viewers who watch conventional 4:3 TVs as they also create new news products and repurpose existing stories for 16:9 HDTVs, the Internet, cell phones and video iPods.

Central to leveraging the market presence on these platforms are news graphics — the visual signatures stations have spent substantial time and money creating for their on-air look. However, given the economic realities of local TV news, it's unlikely

that stations can afford to duplicate that effort. Fortunately, new tools offer the ability to minimize the labor needed to build alternative news graphics.

"What we're envisioning is a template that can feed the traditional broadcast chain — whether it's SD or HD — and simultaneously feed the small devices, like PDAs and cell phones," said Isaac Hershey, president of Vizrt. Vizrt is developing a new product called Viz|Multi Platform Suite, which it previewed at IBC2005 in Amsterdam last month. Viz|Multi Platform Suite is "a lightweight version of our graphics engine that runs on cell phones and PDAs," he said. The product will reside on viewers' cell phones and create a graphic when a news item is accessed.

The new graphics engine will be template-based, so journalists, producers and graphic artists can produce the graphics without disrupting their file-based workflow. The templates will know the parameters and resolution of the target phone.

Serving multiple distribution platforms requires graphics to be created in common file formats in the highest resolution and stored in a central system, according to Fred Schultz, Harris senior marketing manager of news solutions for NEXIC server systems. "Then, that single graphic can be automatically repurposed for each application," he said. The Harris Inscribe graphics systems work in both live and offline environments,

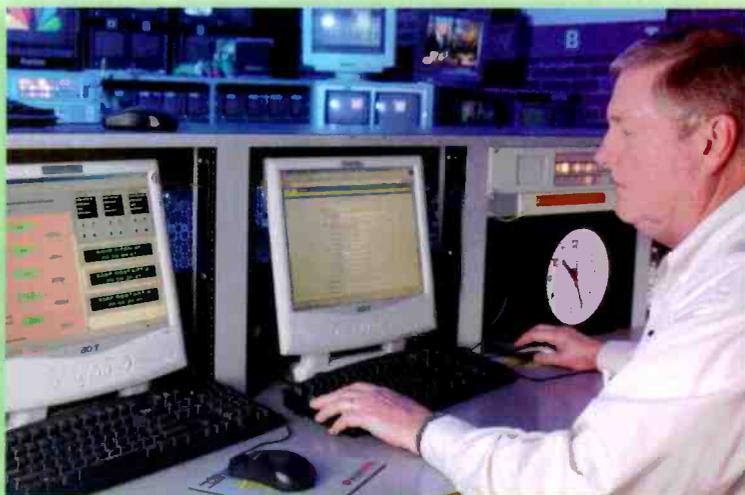
NewsCat



An integrated news cataloguing and archiving solution.

Manage the Growing Amount of News Content

As facilities move to a tapeless workflow with nonlinear editors and video servers, it's important to have a system in place to store news stories without the time consuming process of dubbing to videotape. Crispin's NewsCat digitally archives stories after airing and provides a method to easily locate material at a later date. Archived video clips are linked to a database containing all script information from the newsroom computer system. The database functionality includes an extensive search function; producers and editors can search for a story using traditional parameters such as date, slug, script information or keywords.



Optimized Workflow

NewsCat enables broadcasters to optimize their facility-wide workflow through an interface resembling an Internet search engine. Multiple users can simultaneously search and retrieve archived video from anywhere on the Intranet.

Video Storage Designed for a Newsroom's Workflow

Most television news departments require that the most recent (3 - 12 months) news video be available almost instantly (nearline storage) and that the remaining news library be accessible within minutes (shelf storage). Crispin's NewsCat has the flexibility to scale the size of the nearline storage to meet the needs of both large and small newsrooms.

Create Stock Footage Libraries

News departments always have the need to locate generic file footage to use in a story. The unique annotate feature in NewsCat allows a news department to add key words and descriptions to archived video enabling producers to quickly locate file video.

No Software!

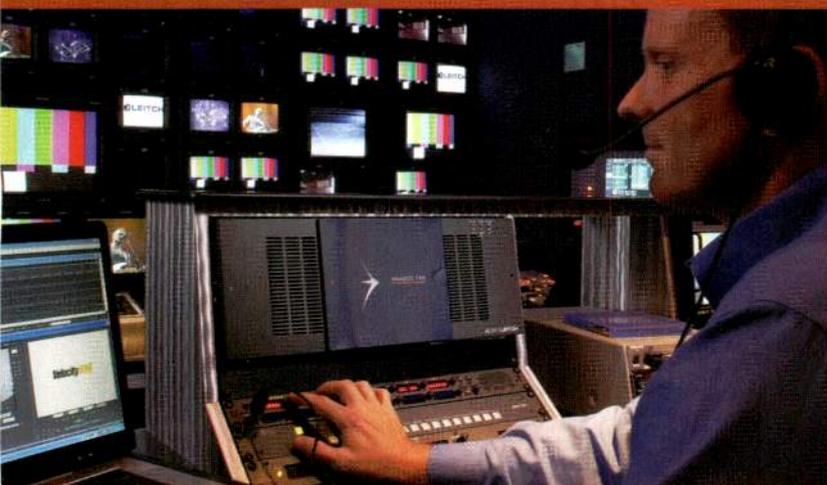
All user interfaces are seen using a standard browser such as Internet Explorer. Any networked PC in the news department has access to NewsCat searches...no dedicated terminals of software needed for users!

Some key points to consider:

- Archive your video as easily as saving your script
- Interface with ENPS, iNEWS or QNews
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An operator at Touring Video in Burbank, CA, uses a Harris VelocityXNG NLE paired with the NEXIO shared storage system.



The Viz|Multi Platform Suite will scale news graphics for a particular cell phone's screen size and orientation.

and offer high-quality video output and increased productivity workflow.

Stations have realized that maintaining productivity gains through the adoption of file-based workflows will be a key issue for any news graphics system serving multiple output avenues. "We are always looking for efficiency in the workflow, which is why we've introduced and worked on features like Multi Compose in our Deko product," said David Schleifer, vice president of broadcast and workgroups for Avid Technology.

"Multi Compose lets you work on the graphics with the idea that you are delivering for SD, HD and other places as well," he said. "You can take the same graphics and have different rules for the different output formats."



"We are always looking for efficiency in the workflow."

— David Schleifer, Avid Technology

Challenges and opportunities

Delivering news graphics to cell phones reveals opportunities unavailable with traditional broadcast. For example, using Viz|Multi Platform Suite to prepare news graphics for cell phones will provide stations with information about a targeted audience.

"We will know when the graphic was viewed and how often it was viewed," said Hersly. "There also will be interactivity, so that if a cell phone user presses a given item — whether it is buying a product or asking for information on a news graphic or a news story — a recipient will have the ability to request it," he explained.

Creating news graphics for the cell phone will require attention to the physical size of the screen. After all, a five-pixel-high logo would be nearly impossible to read. Additionally, there's no uniform orientation or even aspect ratio among cell phone screens, so the location of graphics is a concern as well.

"When dealing with output formats like cell phones, there are no standards," Schleifer said. "At the moment, you have to simply understand that you are dealing with a small screen, and just leave it at that."

Perhaps even more important than having a news presence on cell phones is staking out a claim on the Web. This enables a station to be a valued source for breaking news and local information.

A station's Web graphics can offer visitors detail that wouldn't otherwise be possible with TV graphics. For example, a map indicating a traffic tie-up on a morning newscast is likely to be limited in size and on-screen time. On the Web, visitors can view a more detailed map for an unlimited amount of time.

As with news graphics for the cell phone, creating news graphics for the Web doesn't have to impede the newsroom workflow, according to Hersly. "Presenting news graphics on the Internet will be transparent unless they want to add more information," he said. "The question is: Do they want to add additional templates? Consider the Web version. CBS News has announced it is streaming Katie Couric — obviously a composite that has the video and the graphics together."



Using Avid Instinct, a journalist writes a script and selects accompanying video footage and graphics.

According to Hersly, “With our new approach, you’ll have the opportunity of playing the graphics over the video or to the side on the Web screen. But that will be quite simple to do. Once you set it up, you don’t really care what device it is going to.”

HD graphics

The Internet and the small screen are only part of the story. At the other extreme are graphics for HD newscasts.

SD newscasts will continue to be necessary for the foreseeable future. Even after analog transmission is shut off in February 2009, millions of TV households are likely to continue using their NTSC televisions, either connected to a cable set-top box or a terrestrial digital-to-analog converter box. At the same time, stations will increasingly roll out HD newscasts complete with news graphics.

To serve up news graphics for both audiences, stations could create each separately, which would allow them to take full advantage of screen real estate. Alternatively, they could create an SD version of the graphics and upconvert for the HD audience, or build HD news graphics and downconvert for the SD audience. Both conversion options limit where news graphics can be placed.

What is the handful of local stations with HD newscasts doing today? “That’s a mixed bag,” Hersly said. “I’d say 85 percent are using one HD graphics [source] and convert-

ing that using center cut and downconverting to the traditional SD channel.”

“Having said that, those using the devices for branding or snipes are doing HD for the HD stream and SD for the SD stream. That’s where we see a differentiation,” he said. “But in news or live production, we see it coming out of one, and all the clients are doing it that way for sports and news.”

However, HD’s wider aspect ratio opens up the possibility to design and position graphics in new, original ways if separate SD and HD channels are created. “There certainly is more real estate with HD, and I think people’s imaginations will dictate how they utilize it,” Hersly said.

“To use the real estate efficiently, it would be wise to use two different graphics channels — an HD graphics channel and an SD graphics channel,” he said. “Then you could physically ignore the curtains — and, for example, physically move everything to the left and get the curtains side by side for more real estate, or simply have a different layout. There’s no reason the same content can’t be laid out differently on SD and HD and then add additional information on the HD channel,” he added.

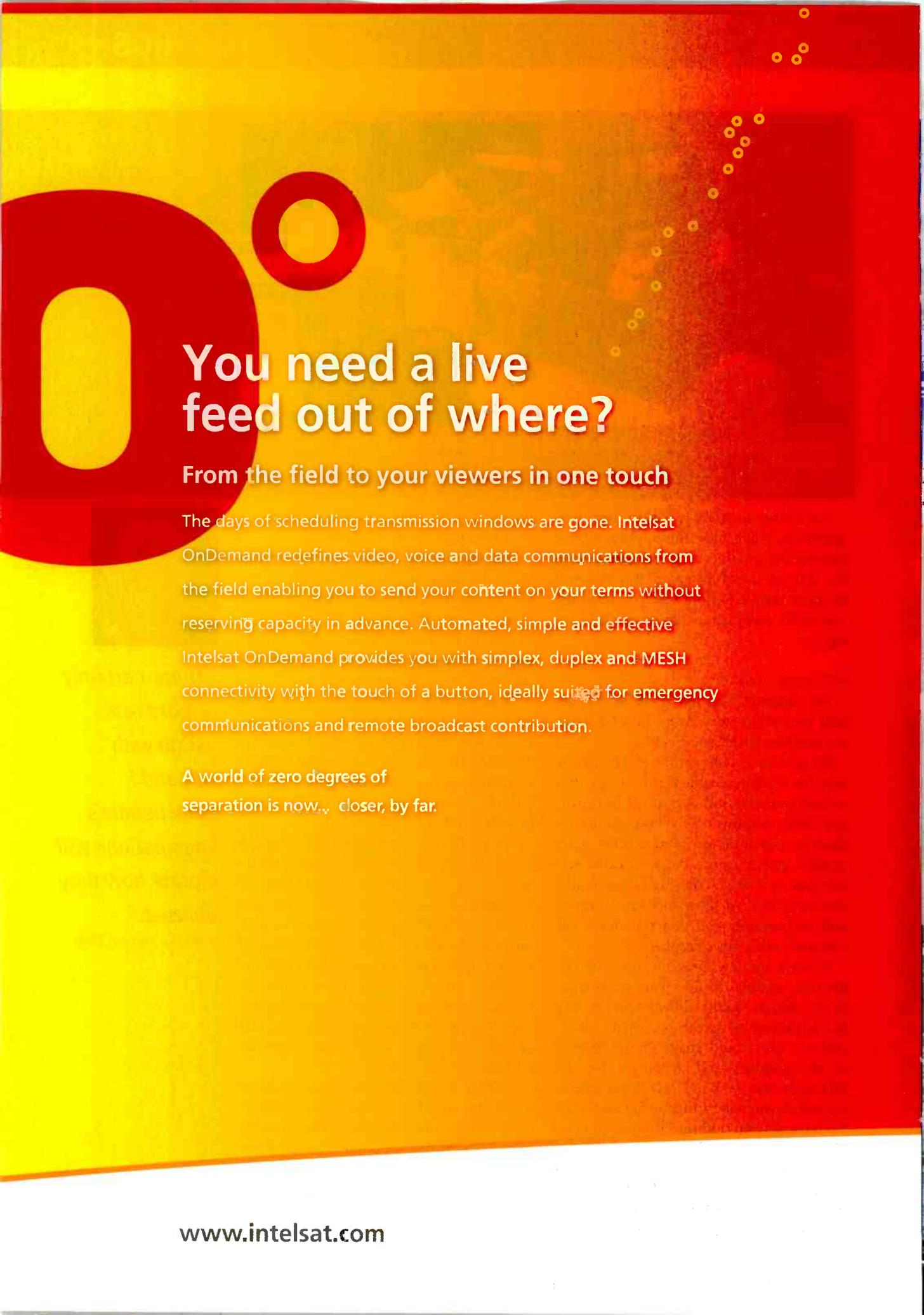
Schleifer is optimistic about how stations will use the added screen real estate to present news graphics once they get past the growing pains. “Once people get out from under those challenges, then all of those creative folks in broadcast, who are constantly re-evaluating what their customers want and how to deliver it, will get involved,” he said.

END



“There certainly is more real estate with HD, and I think people’s imaginations will dictate how they utilize it.”

— Isaac Hersly, Vizrt



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New distribution outlets demand efficient newsroom workflows



When it comes to emerging distribution alternatives for news, such as cell phones, video iPods and the Web, there's a upside and a downside.

On the upside side, local news isn't losing any of its value to the consumer. Polls consistently show audiences regard local newscasts as valuable sources of information about their communities.

The downside is that without paying close attention to the tools and workflow needed to feed these alternate distribution paths, the budgets of local newsrooms that choose to pursue them are likely to explode.

"Broadcasters are going to have to address these new delivery markets, and if they are going to do it without a massive increase in costs, then technology is going to have to play a part," said Ed Casaccia, Thomson product development manager, Grass Valley server, storage and digital news production.

"The key for local newsrooms is to know their market well and invest in the infrastructure to deliver this compelling content when and how local viewers want to watch it," said Brad Rochon, OverDrive product manager for Ross Video.

"The real challenge broadcasters face is in reaching their audience and moving their audience between their products in an appropriate way," added David

Schlöfer, vice president of broadcast and workgroups for Avid Technology. "The real trick is for the newsroom to start to think differently, think about managing all of these output vehicles and managing all of the additional production costs and tasks, and ultimately manage the viewership across multiple screens. That's not the kind of mindset a lot of newsrooms have taken on."

Making it happen

All screens aren't alike. What works for news presentation on television is different from what will succeed on cell phones. Minimizing parallel workflows to provide news for each distribution avenue will depend on the ability of news production tools to let reporters, producers and editors repurpose content without piling on a heavy editorial burden.

"Despite what some manufacturers will tell you, there is no one-touch solution to convert broadcast news into Web content, mobile phone clips or podcasts," Casaccia said. "First, a news story is never just the prerecorded package. A single item in a news program will include the introduction from the anchor, some prerecorded content and perhaps a live discussion with either the reporter on the spot or with an expert in the studio. So, the newscast has to be disassembled and broken up into individual stories.

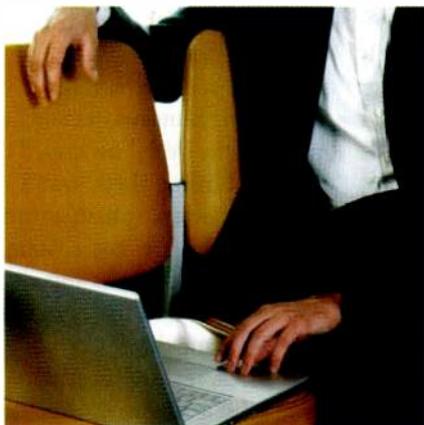
At WFTV-TV in Orlando, FL, an operator manages a news rundown with Avid iNEWS.



"The key for local newsrooms is to know their market well."

— Brad Rochon, Ross Video

Reaching more viewers in more places.



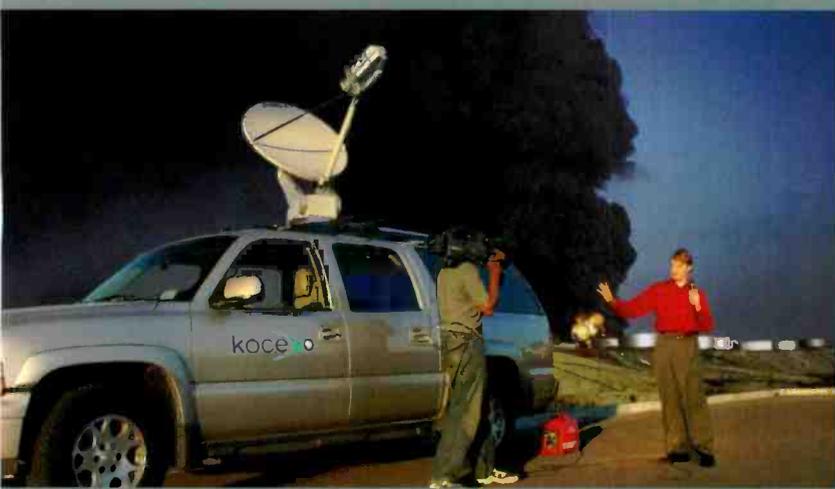
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New contribution options have emerged, such as Intelsat's QuickSPOT and turnkey production and transmission services.



Incoming files of news footage, as shown on the Pathfire screen, are easily repurposed for alternate distribution avenues.

"Second, you have to decide if you are going to use the broadcast version and simply flip the format or do more repurposing for the new delivery platform."

"Unlike repurposing for the Web, the steps involved in getting the content to mobile devices can be daunting. Different service providers deliver video in different formats. Unless you only expect to deliver to just one cell phone provider's customers, you will have to deal with multiple platforms and multiple transcodes," said Rick Young, Pathfire vice president of product management.

"Fortunately, there are intermediate service providers who can offer that service. But, it will still be necessary to reach agreement with the carriers as well, so there is a very real concern about the time and effort required of a local broadcaster to bring all this together," he said.

Successfully creating, repurposing and delivering news to the disparate devices can't be an afterthought.

"The key is knowing up front that the end user may receive your product in many formats," Rochon said. "There are many technologies, such as dual format graphics devices, integrated production control, file-based server systems and real-time compression software, for phone delivery that facilities can implement today."

Newsrooms that want to distribute content cross platform must do so without detracting from their core mission: preparing content for television.

The potential for disruption is huge, according to Schleifer.

"In the early days, CNN had put together a several hundred-person newsroom to manage the Web," he said. "They went out and established their brand on the Web. I think that was a valuable thing for them to do, but they are not sustaining that anymore, because it was too disruptive. They had to go in and figure out how to resolve and fine-tune that."

Casaccia sees it differently.

"It's not at all disruptive," he said. "It takes what news broadcasters already do and love doing — gathering stories and telling them clearly and accurately — and does more of it. That assumes that the right technology is in place."

More news product

Many of the same newsroom workflow efficiencies that stations must exploit to feed content to alternate distribution channels also make it possible to produce a greater amount of news with the same editorial staff. For example, some stations sell editorial services to other stations in the market or launch their own additional newscasts. At least one station, WRAL-TV in Raleigh-Durham, NC, has launched a 24-hour local news channel on a multicast DTV channel.

"In a file-based, fully integrated newsroom operation, it is as easy to do multiple news broadcasts, updated as you go through the day, as it is to do one," Casaccia said. "Live interviews in an earlier broadcast can be



"It takes what news broadcasters already do and love doing ... and does more of it."

— Ed Casaccia, Grass Valley



Making the Transition to HD Pay for Itself

HD is finally becoming mainstream, and broadcasters are in full swing budgeting and planning their move into the HD world. But, despite significant advancements in HD technology and dropping costs for HD supported products, how can the premium over SD technology be justified? How can a broadcaster move from first generation SD, or perhaps even analog straight to HD and make the move pay for itself?

In a 2005 RTNDA/Ball State University survey only 44.5% of television facilities reported a profit, down from 58.4% in 2004. With only 44.2% of TV news budgets increasing for 2005, many facilities face significant financial challenges in joining the move to HD.

In such a competitive environment as broadcast television, how can a facility return to profitability without cutting local programming and move to HD at the same time? Many forward-looking broadcasters are turning to the OverDrive Integrated Production Control



Typical OverDrive Installation

System from Ross. OverDrive, winner of the 2005 SBE award for Innovative Technology, is the market leader in production control technology and it is used daily by production facilities to improve efficiencies, streamline workflows and reduce production costs while producing HD programming.

Live Production Control Systems have often been confused with production automation systems, however there is one significant difference; modern systems like OverDrive are designed to easily and instantly change complex live production elements at any time, even seconds before taking the shot to air. In addition, a MOS protocol interface allows these changes to be directed from the newsroom system while maintaining synchronization of the on-air control system rundown at all times.

Live production control systems offer another key advantage. They allow for operator intervention, or control, at a level that suits each facility's unique requirements, ranging from traditional manual productions, to semi-automated or 'production-assist', to full system control of all devices and shot elements. In OverDrive, full scalability is available at

any time, allowing for maximum production and staffing flexibility.

In production control environments, the management and control of on-air devices such as the switcher, video servers, mixer, robotic cameras, and CG is centralized in one GUI and operated by a TD/Director position. Well-designed systems allow the facility to choose these devices from a wide selection of customer-preferred vendors to best suit their individual budgetary and technical requirements.

Integrated production control systems offer many advantages, including the following key operational and financial benefits:

- 1. Operational and workflow efficiencies:** Higher consistency and repeatability in productions resulting in lower costs and fewer on-air mistakes
- 2. Additional production capabilities:** A cost-effective solution to increasing production capabilities such as cut-ins, a new morning show or coverage during the weekend
- 3. Cleanly manage unscripted events:** A powerful tool for managing late-breaking, unscripted and 'on-the-fly' events cleanly without compromising the 'look' of the production
- 4. Leverage new technology:** Powerful integration of video server, switcher/DVE and graphics technology

One of the key decision points when considering new technology is ROI, or the return on investment. A well-equipped OverDrive HD system will typically create a positive return in 18 to 36 months, driven by savings in crew resources and increases in production efficiency.

Clearly, Production Control technology is a valuable tool that should be considered as broadcasters look for ways to make the transition to HD pay for itself.

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Ross Video Limited
8 John Street
Iroquois, Ontario K0E 1K0
Canada
+1 613-652-4886
www.rossvideo.com
solutions@rossvideo.com



Origination of news footage as files, as with Grass Valley's Infinity camcorder, can improve production efficiency.



CHUM Television's A-Channel in Barrie, Ontario, uses Ross Video's OverDrive for complete and fast-paced news productions.

played into later programs as if live. Stories can be updated through the day, keeping them fresh. This is a way of creating a lot of extra broadcasting hours for relatively little additional operational cost and no additional investment."

Rochon put it simply: "Experience with integrated production control systems has shown that facilities are able to produce more programming with fewer staff per production while maintaining and often improving quality."



"Not only have the devices and viewing habits changed, but technology has changed the nature of the competition as well."

— Rick Young, Pathfire

Changing the equation

New distribution avenues aren't exclusive to local newsrooms. In fact, newspapers are in a better position to exploit the Web as a news source because of their traditionally larger teams. Add the unrestricted availability of news from out-of-market stations, TV and cable news networks, and Web bloggers, and it's easy to see that the competitive field on which local newsrooms play is getting a lot tougher.

As Young said, "Not only have the devices and the viewing habits changed, but technology has changed the nature of the competition as well. Just as the Internet has allowed television stations to augment their video coverage with in-depth 'print' stories, traditional print news sources are now using more and more video on their Web sites. Local broadcasters are no longer the only source for local news video."

"This creates an even stronger requirement for versioning of material — shorter

for mobile devices, longer and more in-depth for Web site viewing. It also creates a need for technology that enables stations to get more video content onto these other platforms quickly," he said.

"Newsgathering technologies that use IP-based transport, particularly with the increase in wireless access, can enable more reporters with camera operators or backpack journalists to submit stories and streaming content from the field without the need for microwave or satellite capabilities."

However, increased competition for the attention of news consumers is no reason to panic.

"Most of the time, people have limited time to watch news television — whether on-air or online. They turn instinctively to the people they trust. It is all about building your brand through quality newsgathering and delivery. If you have a strong news offering on television, then people who are looking for news online will go to your brand first," Casaccia said.

For media companies with both TV stations and newspapers, the synergy of combining newsgathering resources to develop product for the Web may be attractive.

Schleifer concluded, "The idea of consolidating those efforts is certainly one that's under a high degree of scrutiny and discussion at companies that have assets that cross those boundaries. I think we will see some of that become reality because it just makes so much sense."

END



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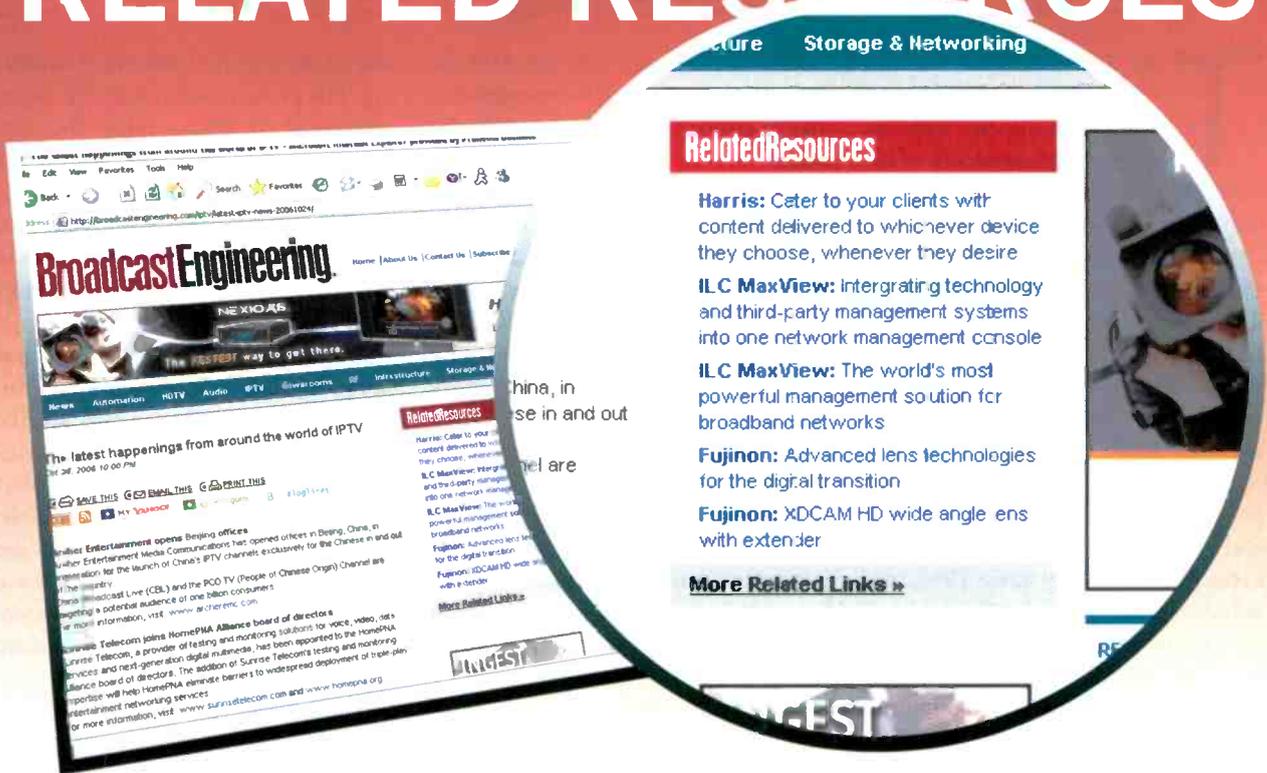
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Broadcast Engineering

Sony's XDCAM HD

BHP Sport selected the Professional Disc system for its coverage of the Land Rover G4 Challenge.

BY SIMON FITZGERALD

The 2006 Land Rover G4 Challenge is the biggest communications exercise in the car company's history. Meticulously planned for more than three years, the month-long challenge consists of 18 competitors navigating their way through more than 2400mi in Bolivia, Brazil, Laos and Thailand. The event builds on the success of 2003's G4, itself an indirect successor to the Camel Trophy, which ended in 2000.

BHP Sport specializes in corporate productions for motor sports clients. Our company has been involved in every Camel Trophy since 1990, and we covered the previous G4 for Land Rover. Sony also has been a long-standing partner in our business, at least since 1990, when I was shooting in Beta SP.

For this year's challenge, we produced six 30-minute internationally sold series. We also produced several pre- and post-event promos; four-hour competitor-specific versions for each of the 18 competing nations; and five 10-minute satellite-fed weekly video news releases. This enabled broadcasters to stitch together their own news reports or feed into magazine programs.

Going tapeless

To cover the challenge, we selected the Sony XDCAM HD system. We used three PDW-F350s and two PDW-F330s with five PDW-F70 playback decks.

We'd already decided we were going down the HD route because of the clear business and creative advantages. But it was only after talking with Sony and understanding the way the technology was headed that discs suddenly came onto our radar. Land

Rover was also keen to use HD for archive and corporate presentations and to entice broadcasters to take the series.

Nevertheless, apart from a December test with a demo unit, we didn't get our hands on the equipment until April, two days before flying out to shoot the first stage in Bangkok, Thailand. Our camera-ops, Nick Guy and Daryl Kibblewhite, spent a day setting up the units for consistency of look and tested a range of HD lenses. We were trying to enhance the look we'd achieved with Digibeta in 2003. When working in these environments, it's important to adjust the color temperature so the tones slightly exaggerate the warmth and richness or the crisp, cold daylight of what you're shooting.

The second day's shoot in a stunning forest location in Laos proved

one of the production's most satisfying. The pictures were fantastic. More important, it was a relief that the system worked in 113°F heat. Then the competition traveled in vehicle convoys over rugged terrain and into extreme climates of humidity and high-altitudes, where temperatures dropped below -4°F at night.

The heat and billowing dust clouds were also major concerns for us with what — at that point — was untried camcorder equipment. Of course, instinctively camera-ops will protect their equipment as much as possible, but you do still need to trust that the equipment isn't going to develop a physical fault on a shoot. The camera system did its job well despite the dust, high humidity and temperatures.

There were occasions when we took the environmental conditions to



The XDCAM HD system provided crisp, clear pictures despite dealing with sand, dust, wet conditions and extreme temperatures.



The Sony XDCAM HD supports a nonlinear workflow, which allowed BHP Sport to turn around a considerable amount of content in a short time frame.

extremes at BHP, too. My crew has just about forgiven me for forcing them to endure hotel rooms and vehicles without air-conditioning to maintain a constant camera temperature. If you land in a country and open the flight case, the humidity is usually extraordinary. The last thing you want to have to do with any camera is start playing around with temperature controls. We acclimatize the cameras once and keep them that way.

From a shooting schedule point of view, we would select one location from the six daily competition venues as most suitable for television coverage. With a GPS and map, we marked coordinates for camera positions, split the five camera crews among them and recording travel times between venues. We knew before we set off exactly how we were going to cover the story.

Benefits

When it comes to playback in the field, I've gone from heretic to believer. I used to worry that someone would hit the record button or that moving backward and forward would

scuff the tape. With discs, you can go into record mode automatically without any risk of recording over existing footage.

While some might see disc-based camcorders as suitable only for ENG applications, we've been impressed with the quality and speed at which images have been captured. The XDCAM HD images are of exceptional clarity. And, with all the extra fiddling required with tape, there's no way we'd be able to get as much work shot, finished and delivered. The system's chief benefits include easy access to thumbnail and footage information, as well as high-quality production.

Post-production is established at the end point for each stage. This meant the crews were often in a city hundreds of miles from the action. For a multicamera shoot, we'd normally have an OB and a line of monitors, and I'd be calling the shots. Instead, rushes were couriered to post-production each evening with information about the day's shoot, relayed by sat-phone.

We knew at the outset we were go-

ing to benefit from the option of accessing clips instantly from the disc. We could open up and play thumbnails in-camera, discuss specific stories with each other and begin to see how the shots matched-up.

Random access to the footage allowed us to tell the post team where to build the stories and enabled the editors to open up recordings and immediately understand what to do. This proved a huge advantage over tape. Reviewing footage in thumbnail form makes the entire editing process in Apple Final Cut Pro much more streamlined and instantly rewarding.

There were also a couple of unexpected fringe benefits of going tapeless that revealed themselves during our constant jigsaw-packing of 112 flight cases into three Land Rovers together with crew, driver, and camping and personal gear. In 2003, we had a trunk full of tapes. This year, the discs proved a vital space saver and gave us room for two additional camera bodies. Using discs also reduced our freight costs by a considerable margin. **BE**

Simon Fitzgerald is co-owner of BHP Sport.

Production switchers

Today's complex switchers feature the functionality of entire control rooms.

BY JOHN LUFF

One has to wonder why production switchers are not more appropriately named. While they still mix signals, switchers now perform vastly more complex and expansive functions.

When the first modern switcher company started in Grass Valley, CA, a synchronous switch or a dissolve was sometimes considered an accomplishment. Many of us remember timing sources to a switcher before every production to avoid dissolves sliding in from left field. Wipes beyond horizontal, vertical, diagonal and circular were a challenge and were optional features that one could add at the time of purchase.

Today, a switcher's dizzying array of features can turn a good technical director into a great one. Picture and key repositioning are standard on most switchers. Digital video effects are often integrated into a seamless operator control panel. Even standards conversion allows some HD switchers to include SD and HD inputs from another standard.

Mixing signals (vision signals or pictures) is the root purpose of a switcher. But today's modern systems feature machine control, still stores, clip recorders and DVEs. In a sense, switchers have become the hub of video production. These holistic systems combine the functionality of multiple devices.

The paradox of complexity

Today's switchers have taken on much of the functionality of entire control rooms of the past. However, this complexity presents a paradox.

Much more is expected of a technical director today. Without panel memory or EMEM, a lot of what



Brian Prom, director at KEYC-TV in Mankato, MN, uses a Snell & Wilcox Kahuna multiformat SD/HD production switcher in the station's control room.

is done live on-air today simply requires the work of more than one person. Today's huge control panels feature hundreds of buttons and soft keys that change seemingly at will, which limits an engineer's ability to absorb the complete production environment.

Many large events, such as the Academy Awards, cannot be produced without at least two technical

directors who can demonstrate how to use switchers' new capabilities must train users. When buying a switcher, it's important to buy the best training package available — and not for just one person.

Dual processing power

A critical element emerging in the switcher market is the ability to remain useful during crossover mar-

In a sense, switchers have become the hub of video production. These holistic systems combine the functionality of multiple devices.

directors controlling the switchers. And additional personnel are required to run the many channels of playback that fit into flying boxes and on-set displays.

This complexity requires a new approach to training. Experienced tech-

ket years. HDTV has finally taken off, eight years after the FCC asked the top 10 markets to initiate digital broadcasting. Unfortunately, much of what we see today, and virtually all legacy production content and file footage, is still produced in 4:3 SD.

One solution is a production environment with aspect ratio converters and standards converters in sufficient quantity to support external conversion of non-HD content. I once worked on a large control room project, and the conversion hard-

capability allowed you to mix both formats.

Effects and layers

There is an interesting contrast between analog switchers and modern digital implementations. Production

chines. If a moving swoosh is used to reveal a replay, the source must be told to run in sync with the DVE or wipe that is bringing it onto the screen. Similarly, the audio effect must be triggered, and a sequence must be cued on a CG. This capability can be exceed-



The Miami Dolphins stadium control room uses a Ross Synergy 3 MD-X switcher when broadcasting events such as Miami Dolphins football, Florida Marlins baseball and the FedEx Orange Bowl. The switcher supports all popular SD and HD formats and offers control over VTRs, video servers, audio servers, audio mixers, robotic cameras, routing systems, and more.

ware was more expensive and complex than anything else in the design. There were more than 40 pieces of equipment.

As an alternative, manufacturers have fortunately recognized the opportunity for a niche and made switchers that can process more than one standard at a time. This allows legacy content to be seamlessly integrated without complex routing and conversion planning.

As time goes on, I suspect this capability will be more common. The first switcher that offered seamless integration keyed the nonmatching format in each mix effects. This was somewhat limiting, but it was a start. If you had SD ENG content to stick into an HD news program, this

switchers used to cascade mix effects, 1 into 2, 2 into 3, etc. Today, all effects are processed on an equal footing, and internal computations match the signals in time, so putting 2 before 1 is not a problem.

What about layers? Early digital implementations from Grass Valley and Abekas offered true layering, where each layer was processed with effects and keys, and subsequent layers could reveal or hide content in lower layers. Today, some switchers can easily conceive and control layers, which is perhaps more intuitive for many productions.

Sophisticated control

We take it for granted that today's complex switchers can control ma-

ingly complex. It might not be possible without sophisticated control systems.

When all control was done on RS-422, this was difficult. But now that many devices can receive commands over TCP/IP connections, device control is easier.

As Ethernet control becomes more ubiquitous, we can expect even closer ties between switchers and other source devices. This no doubt conflicts with other control strategies, such as newsroom computer systems and production automation, but I suspect it is a fact of life. **BE**

John Luff is a broadcast technology consultant.



Send questions and comments to:
john_luff@prism2b.com

WatchPoint Workflow System

Scalable, automated system streamlines the creation, management and distribution of media assets based on an extensible, open architecture; offers an array of installation options, adapting to and streamlining current processes while leveraging existing hardware and software investments; supports linear and on-demand media, as well as interactive content and applications.

678-812-6300; www.tandbergtv.com

TANDBERG Television

Touch It Plus

Wohler



Simple and effective way to monitor multichannel video in space-critical environments; replaces up to 12 confidence monitors within a 3RU space; acts as a mini A/V router; features dual high-res 7in LCD panels, one offering touch-screen monitoring for 12 1.8in thumbnail images; at a touch, any of the thumbnails can be selected to appear on the second LCD panel at the full 7in size; includes 12 stereo analog audio inputs and output routing of selected video.

510-870-0810; www.wohler.com



Emerge MPX1000

Avocent

HDMI v1.3 test solution

Tektronix

Wireless HD media extender provides connectivity for moving HD content from one source to multiple destinations incorporating HDMI technology; high-res computer graphics up to 1280 x 768 resolution, HD video including 720p and 1080i, stereo audio and control data are wirelessly transmitted to as many as eight wireless or wired receivers; extension product extends video and audio over standard 10/100 Ethernet wiring up to 3000ft.

256-430-4000; www.avocent.com

Integrated sink, source and cable test solution provides 1080P, deep color formats and new test requirements up to 3.4Gb/s; includes DPO70804 real-time oscilloscope with a new version of TDSHT3 HDMI compliance test software, new AWG7000 arbitrary waveform generator, TDS8200B sampling oscilloscope for time domain reflectometry, DTG5334 data timing generator and new HDMI test fixtures.

503-627-4753; www.tek.com



Previzion

Cinital

High-definition virtual studio system offers advanced camera motion tracking and scene integration technology for rapid previsualization or visual effects creation; incorporates components of visual effects pipeline, including camera tracking, video I/O, keying, 3-D rendering, compositing and color correction, to match live-action foregrounds and computer-generated backgrounds; records and imports data into many leading 3-D applications.

877-246-4825; www.cinital.com

2006 Catalog

TV One



Updated catalog features 30 new items and comparison charts for specific categories; includes new CORIO2 C2 RoHS-compliant products, five new pieces to C2-1000 Series and 10 new pieces to C2-2000 Series that all have DVI and analog inputs and outputs; also features the OneTask 1T-C2 scan converters and downconverters, the PX-710 (a time base corrector and frame synchronizer with genlock) and the PX-720 (a standards converter for PAL, SECAM and NTSC standards).

859-282-7303; www.tvone.com

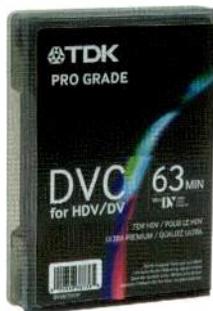
CatSnake Cat 5E UTP cables Belden

Cat 5E UTP cables are AES/EBU-compliant; feature the company's bonded pair design, which bonds the insulated conductors together along the full cable length, making them ideal for Ethernet patches, indoor broadcast applications in high-traffic areas and OB truck applications; feature heavy jacket and upjacketed versions for medium to heavy duty environments; pass the UL 1581 -40° C bend test.

765-983-5744; www.beldencdt.com

Pro Grade DVC

TDK



Tape for HDV and DV camcorders features a two-layer tape structure with Dual Layer Metal Evaporation (DLME) and Hard Carbon Protective Layer (HCPL) technologies; offers universal compatibility with HDV and DV camcorders and a 63-minute recording time.

516-535-2659; www.tdk.com

XB201DBM

Gepco

Extra-flexible, high-bandwidth microphone cable is the latest addition to the X-Band cable line; features a double braid shield for added noise rejection; conductors are made from finely stranded, oxygen-free copper to maximize conductivity and protect against corrosion.

847-795-9555; www.gepco.com



EQX

Evertz

Routing and distribution system adopts extensive redundancy for all critical system elements; delivers broadcast-quality 576 x 576 routing capability in 26RU; expands to 1156 x 1156 through passive splitting for larger applications; offers format-agnostic data path; supports from 3Mb/s to 3Gb/s; handles SD-SDI, HD-SDI, DVB-ASI, SMPTE310 and other high bit rate signal types; offers expansion capabilities in groups of 18 inputs or outputs; features all front-accessible and hot-swappable components.

905-335-3700; www.evertz.com

iCR Snell & Wilcox

Automated content mastering and repurposing workstation enables users to create high-quality digital masters of their content and repurpose for distribution on multiple, revenue generating platforms; integrates image conditioning, content mastering, quality control and content repurposing functionality; features concurrent processing capabilities that eliminate the need for separate encoding and transcoding, and performs these functions as part of a single workflow; includes automated QC that enables operators to quickly focus on problematic areas.

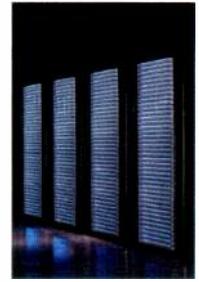
818-556-2616; www.snellwilcox.com

MediaGrid

PICK HIT
Broadcast Engineering INC 2006

Enterprise-level active storage for large digital media files; combines grid storage and computing through the use of multiple intelligent, interconnected and independent storage servers; composed of Content-Directors and ContentServers; interconnection via redundant GigE; is highly scalable, reliable and manageable.

866-861-5690; www.omneon.com



Omneon

Vegas+DVD Sony

Production suite combines Vegas 7, DVD Architect 4 and Dolby Digital AC-3 encoding software for professional video, audio, DVD and broadcast production; allows users to edit and process DV, HDV, SD/HD-SDI and all XDCAM formats in real time, fine-tune audio, as well as author surround sound, dual-layer DVDs; features Sony DVD 5.1 support and enhanced video monitoring for Vegas 7; features scripting support, keyframeable transformations, crop and effects, graphical subtitles, 4:3 and 16:9 preview settings, and dual-layer authoring and burning support for DVD Architect 4.

608-204-7680; www.sony.com

DP600



PICK HIT
Broadcast Engineering INC 2006

Program optimizer allows terrestrial, cable and satellite broadcasters to automatically normalize the loudness of all of their file-based programming and commercials without affecting the original dynamic range; programs can be normalized by either adjusting metadata values or scaling the audio itself to a target loudness level; offers the option of faster-than-real-time, file-based encoding and decoding of Dolby Digital, Dolby Digital Plus and Dolby E content, as well as efficient transcoding between the coding formats.

415-558-0200; www.dolby.com

Dolby

Teleglide

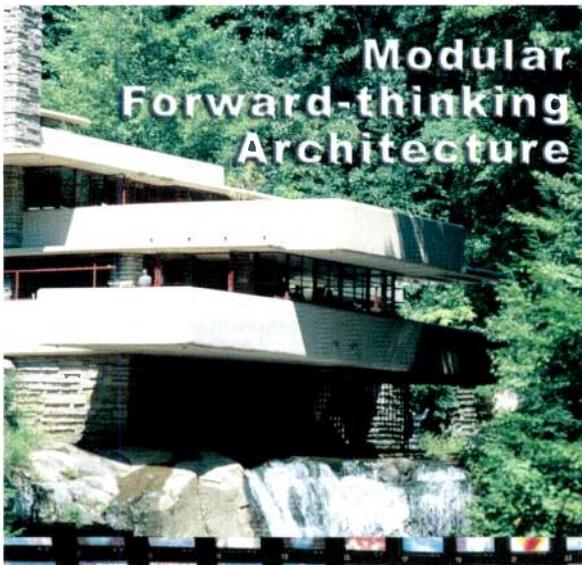


PICK HIT
Broadcast Engineering INC 2006

Camera trolley system consists of a single or dual trolley for optimal load stabilization; the track is a dual rail system with connecting brackets; is fully servo controlled with location feedback for preset positioning and motion control.

**201-848-9818
www.telemetricinc.com**

Telemetrics



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Introducing Xe from VCI Automation

VCI's recent acquisition of DTG has given birth to a new product division-VCI Automation. The unique, ground-breaking designs offered through this merger provide modern television broadcasters with an innovative automation platform called Xe. VCI Automation, with its expanded product portfolio, global presence and commitment to reliability, gives your operation a solid, forward-thinking architecture to build your future.

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AES/EBU direct cabling assemblies

Available in 10ft and 15ft versions and with a wide variety of XLR connector combinations, including all male, all female, mixed genders or TRS connectors; include Tails/Tails, DB25 analog or digital Fanouts and DB25 Trunks, supporting either analog or digital wiring standards; designed to be rugged and flexible.

908-686-7400; www.wireworks.com

Wireworks

iTX

Transmission system replaces all of the functions of a broadcast master control and layout chain in a single software application; acts as a video server, master control, graphics and logo inserter with automation, ingest, editing and content management; reduces the investment required to launch and operate new channels; intended for both SD and HD.

303-237-4868; www.omnibus.tv



Channel Box



Chyron

HD/SD switchable, turnkey branding system features 3-D design and controllable playout for branding applications, including tickers, crawls, snypes, promos and end credits; a comprehensive set of real-time video, graphics, effects and audio capabilities can either be integrated with traffic and automation systems or used as a standalone control device; features include a customizable event control GUI, API and control interfaces and an HD/SD switchable platform.

631-845-2000; www.chyron.com



ELIPZ



Battery employs high-capacity Li-Ion cells and delivers all-day operating times for a typical 10W handheld camera; offers under-the-camera mounting design that allows one face of the battery to quickly attach to the camera through a mount similar to quick-change tripod adapters; features universal 1/4-20 mounting thread for monopod and tripod interface; delivers up to nine hours of run time to many popular handheld camera models.

203-929-1100; www.antonbauer.com

Anton/Bauer

OFI-20B, OTM-20A&C

Fiber-optic test equipment product line; handheld OFI-20B optical fiber identifier detects the optical signals being transmitted through the fibers to identify optical undamaged fibers; OTM-20A&C optical test meters integrates a laser source and tool for optical network test and maintenance; integrates with existing OPTO+ fiber-optic products.

513-459-3400; www.harris.com

Harris

E-FIB

Extension to Eclipse range of products offers users a non-blocking high-speed audio connection between isolated locations; dual concentric fiber ring provides full redundancy while maintaining audio links, even if the main fiber pair is fully disconnected; runs at full audio bandwidth, allowing intercom matrices to share audio resources as if they were local.

510-496-6600; www.clearcom.com

Clear-Com

Marco

Standalone desktop editing software package runs on normal desktop or laptop PCs; provides video input and output from camcorders via FireWire; can export media files for use by store-and-forward applications; includes Quantel editing capabilities such as dissolves, wipes, custom transitions, one shot effects (white balance, lift, gain and gamma, size and blur/mosaic tracking) and an available templating option for adding text and graphics.

323-993-5957; www.quantel.com

Quantel

Artisan Logitek Electronic Systems

Router-based digital audio console uses a series of drop-in modules that permit users to purchase console configurations to meet their needs; multiple frame sizes allow console configurations, ranging from newsroom work areas to on-air locations; features 5.1-compatible operation, direct access to two master mix busses and four sub mix busses from each fader module, and on-board five-function dynamics processor and four-band equalizer.

713-664-4470
www.logitekaudio.com

ProStream 2000

Digital splicer allows seamless real-time splicing of SD and HD MPEG-4 AVC (H.264) video streams; offers multichannel splicing capabilities within IRU; integrates with Entone's StreamLiner digital program insertion solution and other Harmonic IP-based digital video solutions.

408-542-2500
www.harmonicinc.com

Harmonic

KP-612E and KP-412E TELEX/RTS

Twelve-position key panels available with push-button or lever key fit in a standard 19RU; feature two encoders, one for head-set, microphone, auxiliary input and matrix in volume adjustment, and the other a knob for menu selection; include standard numerical keypad with four extra keys (mic mute, user assignable, page up and page down); KP-612E features a six-character display, while KP-412E features a four-character display.

952-884-4051; www.telex.com

Cinegy Air

Completely software-based automation and playout server; relies on open IT architecture; supports all standard video files from DV to 1080i HD MPEG-2 long GOP 4:2:2; control via TCP/IP interconnect; scalable to hundreds of channels; supports closed caption and Dolby E pass-through.

202-742-2736; www.cinegy.com

Cinegy



generationQ templating

Templating facility allows users to set sophisticated house styles and maximize productivity by quickly and easily entering information into the templates; templates can be designed and built around live video content; allows for frequent refreshing for the latest program information and last-minute changes.

323-993-5957; www.quantel.com

Quantel



Xstation Miranda



HD/SD playout server features integral channel branding and playlist control; offers playout with graphics rendering for dynamic control over long-form clips, commercial spots, tickers and crawls; its graphics engine allows a virtually unlimited number of animated

elements to be individually keyed at each layer.

514-333-1772; www.miranda.com

MTM400 Tektronix

MPEG transport stream monitor features new IP/GigE option that allows network engineers to view multiple or single program transport streams over GigE networks, identify signal degradation issues and correct problems; enables real-time monitoring of the broadcast video quality at any network access point over an IP network with integrated IP metrics and comprehensive MPEG tests, allowing users to quickly relate the source of MPEG errors to the IP traffic.

503-627-4753; www.tektronix.com

FlyDrive Advent Communications

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+44 1494 774400; www.adventcomms.com

D9054, D9034 Scientific Atlanta

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770-236-5000; www.scientificatlanta.com

QOD Gateway Imagine Communications

System enables bandwidth improvements, enhanced video quality and customized service offerings such as targeted ads and personalized audio; can be used in both a stored VOD and real-time (switched) environment; incorporates a third-generation method of statistical multiplexing for SD and HD VOD content, which adds negligible incremental consumer response delay (one-tenth of a second) for trick modes in VOD and channel change times in switched digital video and IPTV.

760-230-0110; www.imagine-com.com

WMR Artec Technologies

WM9/VC1 stream encoding and transmitting in one, two or four channel versions that can generate several simultaneous streams as well as multibit streams for each channel; equipped encoder remote control enables remote configuration and operation of individual encoders or an entire encoder farm via standard browsers; allows up to four stereo or eight mono signals per video stream to be encoded and transmitted with lip synchronization, in addition to SDI and HD-SDI with embedded audio; supports DV (IEEE 1394); is upgradeable to 10Mb/s.

+49 5441 59950; www.artec.de

NexGuard Thomson

Enhancements to anti-piracy product line expand production and post-production content security; offers an administration tool that provides users with complete control of their internal content security system; features Mac OS X functionality and third-party licenses that secure work performed by consultants, subcontractors and other personnel working outside a main facility; includes NexGuard Packager, NexGuard Granter, NexGuard Viewer and NexGuard Token Manager, all feature encryption, watermarking and key management technologies.

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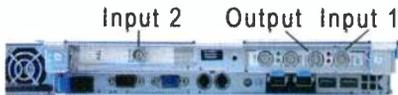
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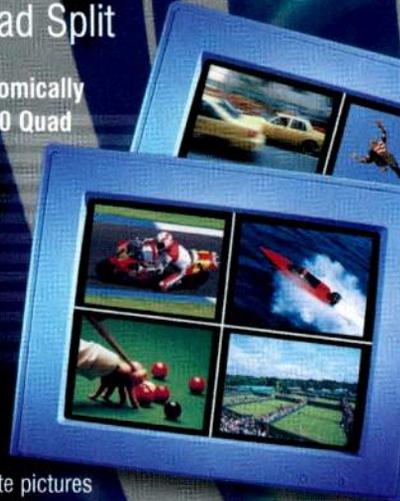
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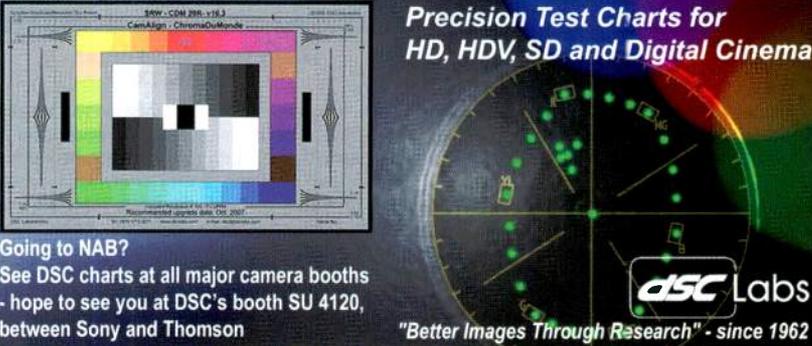


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Help Wanted

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Fast growing, leading station in the resurgent city of New Orleans needs an energetic, decisive technical leader to serve as Chief Engineer.

WDSU-TV, a Hearst-Argyle station and NBC affiliate, seeks an enthusiastic professional who can build the vision of our technical future and also use hands-on skills to teach and motivate. We are looking for a person with a positive, news-oriented team attitude who wants to work closely with other departments to innovate and win.

Our Chief manages a large department and is responsible for all technical areas of the station: Most important is digital functionality and development, accompanied by equipment maintenance, studio production, master control, transmitter and physical plant. Excellent digital and IT skills are imperative, with knowledge of LANs and WANs and computer networking in general, along with a solid grasp of broadcast engineering operations. Demonstrated success in budgeting, capital planning and human relations are also necessary.

You will support an already strong station with a Harris automation system with Pinnacle server for program and commercial playout. You will lead the transition to a tapeless environment in news gathering and to full HD and digital broadcasting.

Our candidate will have at least five years experience in television engineering in a leadership role. If you are the Chief Engineer at a successful smaller station, or you are the Assistant Chief in a large-market station and are ready to run your own department, we want to hear from you. College degree and SBE certification preferred. Please send cover letter and resume to: Mason Granger, President & G.M., WDSU-TV, 846 Howard Ave., New Orleans, LA 70113. NO PHONE CALLS, PLEASE. We are an Equal Opportunity Employer.

**ASSISTANT GENERAL MANAGER FOR TECHNOLOGY
(CHIEF TECHNOLOGY OFFICER)
NET RADIO-TELEVISION-DIGITAL MEDIA**

NET seeks a Chief Technology Officer who will provide the strategic vision for enhancing NET's digital media production and distribution platforms and infrastructure. NET is Nebraska's state-wide public broadcaster and is a nationally recognized leader in educational technology and public media. The successful candidate will be a member of NET's senior management team and will have a prominent role in setting the organization's technological priorities and in implementing processes that will help improve NET's public media mission.

The Chief Technology Officer will be responsible for overseeing NET's current technology team and NET's multiple media platforms. NET is a large and complex organization, with state-of-the-art technologies and needs someone who is a good communicator is energetic, positive, outgoing, and has demonstrated success integrating technology into a larger organization. In addition, the successful candidate must be a strong manager of staff. NET has a great team, and desires to help them grow.

Requirements: Bachelor's degree in related technical field, BSEE preferred. Ten years television broadcast experience required, five years of which must be in technical management and supervision. Equivalency considered. Radio broadcast experience and familiarity with satellite transmission systems, network operations, and digital transmission technologies desired.

Review of applications will begin November 15, open until filled. Competitive salary and excellent benefits. Apply at www.wrk4neb.org. Visit our website www.netNebraska.org for additional information.

Help Wanted

Communications Engineering, Inc.

Communications Engineering, Inc. (CEI) is seeking qualified applicants for opportunities which offer unlimited growth potential. As a recognized leader in the integration of broadcast systems, CEI offers a range of career opportunities to qualified individuals with various levels of education, expertise and experience. Opportunities at CEI include:

Installation Manager

This position will be working in a multi-project, multi-team environment and will be responsible for labor and installation material budgets, time line development and project installation management.

Senior Systems Design Engineer and Systems Design Engineer

If you have a background in the analysis, design and management of media communications systems as well as knowledge of equipment, current trends and technical developments in the industry, contact CEI. The positions are responsible for the design and functional checkout of advanced audio, video and software systems.

Senior Systems Installation Technicians and Installation Technicians

Duties include pre-wiring and preparing racked systems and furniture consoles for broadcast technical facilities. Must have experience in cable fabrication and termination, mechanical assembly, rack and cabinet wiring and harnessing. Must have ability to understand and use wire lists, schematics and technical documentation.

For more information on these positions, visit our Web site at www.commeng.com.

Please send your resume and communications to:

Fax: (703) 550-5180 Attn: Shay Martello; shay.martello@commeng.com; mail inquiries to: Shay Martello, Communications Engineering, Inc., 8500 Cinder Bed Road Suite 100, Newington, Virginia 22122.



CHIEF ENGINEER

LeSEA Broadcasting Corporation's KWHE TV-14 in Honolulu, Hawaii is seeking a full time assistant Chief Engineer to maintain inter island microwave links, KU/C band uplink truck, studio and UHF DTV transmitters. Must have 7 years + experience as a systems engineer or higher and have a FCC or SBE license. Full benefits including Medical, Dental, Vision, and matching 403b are available. Qualified candidates please send resume along with cover letter in confidence to the Chief Engineer at mkemmerling@leseas.com or fax to 808-526-0326.

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Help Wanted

ON SITE PROJECT MANAGER AND INSTALLATION COORDINATOR

Solotech an International Sound, Video and Lighting Contractor is seeking candidates for the position of On Site Project Manager and Installation Coordinator. They will be reporting directly to the Senior Project Manager. The successful candidate will serve as the principal contact person between Solotech's Project Department and on site contractors. The candidate will actively participate in project tendering, planning and scheduling. They will be responsible to coordinate all technical plans and documentation related to the project, including architectural, structural, HVAC and electrical plans. They will be Solotech on site representative.

Qualifications :

The ideal candidate possesses the following:

- 5 years experience in Sound, Video and Lighting Contracting
- Ability to supervise and motivate local contractors
- Ability to work under pressure
- Fluency in English, spoken and written a must
- Fluency in French, spoken and written an asset
- Thorough knowledge of computer software, Microsoft Office, Project, Excel, Autocad 2D
- Availability to work in USA and Asia.

Interested parties should email Sylvie Lafontaine at slafontaine@solotech.ca with their Curriculum Vitea and salary requirements. We will contact you if your candidature is retained.

Help Wanted

IT MANAGER - WFAA-TV DALLAS, TX

Belo owned WFAA-TV, ABC 6th market network affiliate is seeking a seasoned IT Manager to maintain and manage broadcast computer systems. Experience with design and maintenance of complex Internet and WAN communication systems. Must have knowledge of router, switch, and firewall configurations. Manage upgrade designs of server based digital video, audio systems, graphics and editing system. Assure compliance with local and corporate IT policies and procedures while meeting the obligations of assigned priorities. Assure proper installation and registration of hardware and software with respective manufacturers and publishers.

The candidate must have 10 years of computer and network maintenance experience or comparable work experience. Baseline education requirements include a BS degree in Computer Science or Information Technology and MSCE certification. An SBE certification as a network technologist is optional but preferred. A minimum 5 years in IT management experience is required. A minimum of two years of experience supporting broadcast hardware and facility formats, and interfacing with Audio / Video equipment is preferred. The ideal candidate MUST be highly reliable, have excellent communications skills, confident demeanor, and excellent rapport when interacting with all levels of staff and outside vendors.

For consideration submit a resume, salary history, and references to: WFAA-TV, Attention Human Resources, 606 Young St., Dallas, TX 75202; humanresources@wfaa.com; Fax 214-977-6393

MOBILE UNIT ENGINEERS / DRIVERS

TRIO VIDEO, the Midwest's leading mobile television production company, is seeking qualified applicants for **Mobile Unit Engineers** to operate and maintain its standard and high definition mobile unit fleet from its base of operations in Chicago. Responsibilities include coordinating, troubleshooting and maintaining on-site mobile unit operations and equipment. All experience levels considered with: engineering degree, technical training, multiple years of hands-on broadcast experience or any combination.

Drivers for long-haul and local tractor/trailer transport from its base of operations in Chicago. Current CDL Class A license required with minimum of 3 years tractor/trailer experience.

Qualified candidates should send their resume to: Trio Video, 2132 West Hubbard, Chicago, IL 60612; resumes@triovideo.com; fax 312-421-0361

DIRECTOR, TECHNICAL ENGINEERING

ReelzChannel seeks Director, Technical Engineering in Los Angeles. Television engineering supervisor, responsible for the day to day maintenance and support of production, post production and studio systems. 5+ years experience and BA or equivalent experience. M-F, 9-6, on call 24/7.

Experience in the following areas:

- Studio cameras (robotic camera systems experience is a plus)
- Apple Final Cut Pro Editing system (other NLE experience will be considered)
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Send resume to Careers@reelzchannel.com

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Help Wanted

BROADCAST ENGINEER
Univision- San Francisco

JOB SUMMARY:

This position is responsible for day-to-day functionality of all broadcast related equipment. The equipment includes, but is not limited to: master control, newsgathering, general office equipment. The position has supervisory responsibility for microwave links to/from the station, and transmitter sites.

ESSENTIAL JOB FUNCTIONS:

- Equipment maintenance/repair.
- Equipment malfunction - troubleshoot, diagnose/repair and/or replace broadcast equipment.
- Provides operational support to News, Creative Services, other depts. as needed.
- Preventative maintenance on all equipment (PM).
- Assists Chief Engineer/Assistant Chief Engineer with new equipment integration.

MINIMUM REQUIREMENTS:

Two-year degree or certificate in Electronics, Engineering or equivalent electronics training. Min. two years experience in TV/radio equipment maintenance/repair (SBE or FCC certified a plus). Skilled in electronic troubleshooting. Tech exp. in: communications systems, tech. documentation (knowledge of CAD helpful), computer operation/networking skills, general knowledge of audio/video flow in a given plant. Background in all of the Microsoft office software helpful as well as basic networking and DOS/Unix instructions. Ability to work closely with staff members in problem solving capacity. Bilingual Spanish/English desired but not required. Valid Driver's License with good driving record is required. Ability to work flexible schedule including nights, weekends, holidays. Position is represented by NABET, CWA Local 51. Ability to lift up to (50) lbs. Ability to stand, walk bend, reach and sit for up to (8) hours.

Please send resume, cover letter and salary requirements to contact info. below. Please indicate the position that you are applying for.

Email: kdtvjobs@univision.net
Regular mail: 50 Fremont St., 41st Floor
San Francisco, CA. 94105
Fax: (415) 538-8053
EOE

MANAGER OF PRODUCTION ENGINEERING

Glendale, AZ arena looking for qualified Manager of Production Engineering. Need 3-5 years of video/audio and lighting experience. Also looking for Sound & Light Technician. Needs 1-3 years of arena audio and light experience. Both positions are Full Time salary, with benefits. Please email resume and cover letter to matt.coy@phoenixcoyotes.com

DIRECTOR OF TECHNICAL SERVICES

Manage Technical Services Dept for the distribution of video masters of English language TV programs & films to Central and South American broadcasters. Req. MA in Film & Television. 2 yrs exp or 2 yrs as Video Engineer. Fluent in Spanish. Job site: Los Angeles. Send resume to Independent International Television, Inc., Ms. Lopez, 800 Douglas Rd. North Tower, Ste. #440, Coral Gables FL 33134.

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Pathfire	S8-S9		pathfire.com
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Rohde & Schwarz	63	888-837-8772	test-rsa.com/tvtrans/be2
Ross Video Limited	S33	613-652-4886	rossvideo.com
Sony Electronics Inc.	23		sony.com/proaudio
Sony Electronics Inc.	S14-S15		sony.com/xdcam
Streambox	139	206-956-0544	streambox.com
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Balancing free speech

Released from the FCC's Fairness Doctrine, broadcasters are not bound to present balanced news.

BY PAUL MCGOLDRICK

Years ago, broadcasting was an expensive and rather exclusive business.

Early on, the FCC recognized that the power of the airwaves matched that of the print media, so it took extreme measures to ensure that broadcasters offered balanced political views to their listeners. For example, if one candidate for office was given time on the air, then the FCC mandated that the opponent be given equal time.

The Mayflower and Fairness doctrines

The FCC first began controlling editorial content on the airwaves in 1940, when it enacted a federal law named the Mayflower Doctrine. The purpose

The removal of the Fairness Doctrine opened the way for one-sided cable channels.

of this doctrine was to prevent broadcasters from editorializing content. The commission did not want broadcast owners brainwashing mainstream America with their opinions.

In 1949, not under any kind of law, the FCC began enforcing a rule of its own called the Fairness Doctrine. Under this self-imposed, almost parental-like, governance, the 2881 radio stations and the paltry 98 TV stations of the time were required to give equal airtime to everything. In effect, it was like having a town hall meeting on any development affecting local people. The FCC's reasoning behind the Fairness Doctrine was that broadcasters held their licenses

as public trustees.

While the Fairness Doctrine was in practice, the FCC rarely got involved in any disputes between the public and broadcasters. And the Mayflower Doctrine was ignored by most broadcasters.

Power to the public

The Fairness Doctrine was successful in terms of helping the public. In 1976, the station owners at WHAR, a radio station in West Virginia, refused to cover any of the Congressional debates about strip mining because they deemed the topic too controversial. Listeners used the Fairness Doctrine to their advantage, and in the end, the listeners won; WHAR covered the debates.

The doctrine was a powerful tool for the general public. And it made the airwaves a fairer place at a time when the industry was evolving.

Overtured

But the Fairness Doctrine didn't last forever. In 1982, WTVH-TV in Syracuse, NY, aired advertisements that promoted the Nine Mile Island nuclear power station as a wise investment for the state. The Syracuse Peace Council, a local association, demanded equal time to the advertising. (The council said that what was being advertised as a "wise investment" of about \$400 million would actually end up costing taxpayers more than \$5 billion.) The FCC intervened and insisted the station give the group equal airtime.

WTVH refused to give the council equal airtime because it said the Fairness Doctrine was not an actual federal law. The Washington, D.C., Court of Appeals ruled in favor of WTVH, citing that the FCC's Fairness Doc-

trine contravened the First Amendment of free speech. This ruling was a turnaround from a Supreme Court judgment in 1969, which stated that the doctrine was both constitutional and essential to democracy.

A new kind of news

The Ronald Reagan administration did not favor legislation or rules that impeded business growth. So in August 1987, the FCC discontinued use of Fairness Doctrine.

The removal of the Fairness Doctrine opened the way for one-sided cable channels, where pundits who think they are reporters can make claims without presenting the other positions.

During both the Reagan and George H. Bush administrations, the House and Congress passed bills to enact the Fairness Doctrine as a federal law. It was vetoed by the White House on both occasions, which says a lot for bias and little for democracy.

BE

Paul McGoldrick is an industry consultant on the West Coast.

? Send questions and comments to: paul_mcgoldrick@prismb2b.com

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NEO® SuiteView Solo™

A compact, high-resolution multi-source display processor supporting up to 12 inputs in 1RU. NEO® SuiteView Solo™ provides a very affordable, high-resolution monitoring solution for full-featured applications requiring fewer inputs.



HDTV

CCS

SNMP

SuiteView™

A simple yet versatile multi-source display processor offering from 4 to 16 inputs in 1RU. Supporting a wide range of video outputs simultaneously, SuiteView™ provides an extremely cost-effective monitoring solution for use with video-based displays.



- Compact and cost-effective with up to 12 inputs in 1RU
- 8-input version provides ultimate affordability
- Auto-sensing video inputs for HD, SD and composite, plus graphics/streaming video inputs
- High-resolution, configurable outputs support up to UXGA (1600x1200) for use with plasma, LCD, computer monitors and projection displays
- Optional local or remote control panel available
- Layout Designer is an easy-to-use interface that allows for the creation of custom or standard layouts for multiple images

Smaller, High-quality Monitoring Applications

- Mobile trucks
- QA stations, edit suites, tape rooms
- Master control and production control rooms
- Corporate board rooms, schools
- Video conferencing
- Trade shows and kiosks

- Compact and versatile with up to 16 inputs in 1RU
- Auto-sensing video inputs for SDI and composite video signals
- Multiple video outputs provided simultaneously, including SDI (x2), component and composite video
- Well-suited for use with SDI, composite or component video monitors, smaller plasma displays, or for routing across video networks
- Local control panel provided standard
- Optional, user-friendly Layout Editor provides configuration and control capabilities

Simple Monitoring Applications

- Mobile trucks
- Master/production control rooms
- QA stations, edit suites, tape rooms
- Monitoring remote sites
- Cost-effective "as run" confirmation
 - Record multiple feeds simultaneously
 - Interstitial/security/traffic monitoring

SuiteView™ Multisource Display Processors

The SuiteView™ processors are capable of rendering multiple video and computer graphics signals in real time to either high-resolution plasma, LCD, computer monitors and projection displays or video-based displays. See page 46 for ordering information.

NEO® SuiteView™

An advanced, modular multi-source display processor scalable up to 44 inputs. Integrated with our award-winning CCS Navigator™ application, NEO® SuiteView™ provides fully customizable, system-wide monitoring solutions for mission-critical 24/7 operation.

- Highly scalable and modular with up to 44 inputs in 3RU (smaller configurations available in 1RU)
- Auto-sensing inputs support a wide range of signal formats from HD, SD and composite on BNC to graphic/streaming video VGA/DVI graphics inputs
- High-resolution, configurable outputs (main and redundant) support up to UXGA (1600x1200) for use with plasma, LCD, computer monitors and projection displays
- Layout Designer is an easy-to-use interface that allows for the creation of custom or standard layouts for multiple images
- Mix-and-match other NEO® processing modules within the same frame
- NEO® frames support multiple NEO® SuiteView™ systems to drive multiple unique displays
- Front-loading, hot-swappable PSU, fans and modules for mission-critical applications
- Peace of mind with optional redundant PSU and controller
- Redundant outputs provide a backup in the event of a display failure

Mission-critical Monitoring Applications

- Multichannel master control rooms
- Production control rooms
- Network control centers
- Satellite transmission sites
- Traffic monitoring
- Security monitoring



Designed to provide unattended, consistent quality control, the Harris Q-SEE™ customizable monitoring technology provides cost-effective signal monitoring with advanced alarm thresholds (signal levels and time duration), thumbnails and optional MPEG-4 streaming. Q-SEE™ infrastructure enables operators to remotely view systems over industry-standard IP networks, allowing remote system monitoring from anywhere, at anytime. The ability to “see” what’s going on can significantly improve an operator’s ability to react.



Operators can view up to 32 thumbnails and up to 4 MPEG-4 streams per CCS Navigator™ page

Q-SEE™ provides operators with all of the capabilities they require — at a significant cost advantage over the competition. To provide a superior level of signal quality control, Q-SEE™ products can tie directly into the Harris CCS Navigator™ monitoring and control application (or third-party applications), allowing the user to establish video, audio and VBI data alarm thresholds for consolidated signal management.

QSEE6800+HST Module for Local and Remote Network Monitoring

Q-SEE™ technology has been incorporated into a cost-effective, advanced network monitoring module. The QSEE6800+HST can be installed into any existing broadcast

facility and immediately enhance the user’s monitoring abilities. The QSEE6800+HST module permits user-customizable alarm criteria, scalable thumbnail viewing and optional MPEG-4 monitoring streaming. The module generates its confidence monitoring MPEG-4 stream (audio and video) from any one of the eight inputs. Both the thumbnails and the confidence monitoring MPEG-4 stream provide audio level bars to immediately identify audio presence. Each thumbnail can provide either line-based video waveform or video vector information. CCS Navigator™ can simultaneously display the MPEG-4 stream and thumbnails.

See page 13 for more information.

6800+™ with Q-SEE™ Technology

Our newest, next-generation 6800+™ frame and modules support Q-SEE™ technology. Newer 6800+™ modules include alarm thresholds and thumbnail capabilities. The user-customizable alarm set is specific to the functionality of each module. The new 6800+™ frame optionally supports a dedicated Ethernet resource card to provide the broadcast of available thumbnails and user-customized alarms for IP-based monitoring with CCS Navigator.™ The Ethernet resource card also provides optional, industry-standard SNMP interfaces to allow 6800+™ products to tie into remote monitoring applications.

Flexibility in Test and Measurement Applications

Q-SEE™ provides flexibility in test and measurement applications such as the Videotek® VTM Series™. In these instruments, Q-SEE™ enables total customization of the display, allowing the user to choose which of the available signals is being monitored and where the information is being displayed.

The NUCLEUS™ network control panel is designed to meet the many needs of today's broadcast operations. Providing complete customization, NUCLEUS™ enables users to tailor the control interface to their specific applications. NUCLEUS™ allows the user to navigate to a specific device quickly with the minimum number of keystrokes.



Harris has always led the way in the industry with practical, real-time control panels, and NUCLEUS™ is no exception. More knobs for parameter adjustments. More buttons to quickly invoke parameter value changes. A better display to improve overall operation, and a higher degree of user customization. NUCLEUS™ allows the user to quickly store and recall device presets and to reset a device to a user-defined "unity" setup.

NUCLEUS™ is available in a desk mount form factor. This is ideal for live production environments. This panel offers the same capabilities as the rack mount panel.

Offering much more than simply processing control, NUCLEUS™ has been designed to support Harris routers and test and measurement tools. Customers will be able to control additional products as the drivers become available through software upgrades.

Configuration services: Time is a precious commodity. To help maximize the effectiveness of your CCS Navigator™ or NUCLEUS™ setup, skilled technical service personnel are available to assist in the planning, design and implementation of your monitoring and control requirements within these platforms.



Network monitoring and control can be accomplished by means of both hardware panels and software applications. Both NUCLEUS™ and CCS Navigator™ provide customized user interfaces that enable users to quickly identify problems and take corrective action.

CCS Navigator™ is an innovative, Windows®-based software application that enables users to easily monitor both Harris and third-party devices within any facility. Operators experience immediate familiarity with the CCS Navigator™ onscreen GUIs, as they are representations of the user's facility and workflow. Minimal operational training is required, as CCS Navigator™ supports a simple, point-and-click operation.

Actual system block diagrams can be imported into CCS Navigator™ to accurately reflect the impact of any alarms within a signal path. Actual JPEG images of rack elevations can be imported to accurately identify the location of any problem. Both Harris CCS-enabled devices and third-party, SNMP-enabled devices can be linked into these system images — providing a powerful monitoring and control system that allows users to mastermind their operations.

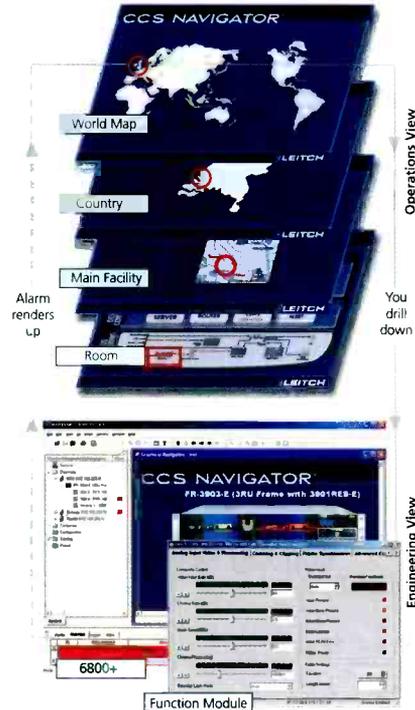
An alarm from any CCS-enabled device within the facility is broadcast over UDP to all clients on the network — multiple workstations are visually alerted simultaneously. An SNMP trap (alarm) from any third-party device within the network is sent to every addressed client on the network. Any operator can manually take charge and address the situation. CCS Navigator™ also supports automatic responses to specific, critical alarms. User-defined

actions can be triggered by specific criteria for situations when the response must be immediate and accurate.

CCS Navigator™ provides a set of design wizards that permit users to quickly set up router controls, processing product (6800+™, NEO®) frame views and IconMaster™ auxiliary control GUIs. These wizards are significant time savers during the setup of the GUIs.

Thumbnails and Streaming Video

The newest Harris processing products are able to generate thumbnails from the video signal that passes through them — greatly enhancing the operator experience. Operators are now able to see the state of the signal that is generating the alarm. They can confirm content prior to actually switching a feed live to air. Suddenly, signals from remote



facilities across the country can be seen at a central monitoring facility — just as if they were in the next room. Mistakes are minimized, confidence is gained.

Key Features

- Centralized or distributed monitoring of Harris and third-party equipment
- Real-time local or remote control with individually configurable control parameters
- Scalable from simple control of one or two devices to the control of large distributed systems with many devices
- Secure access to network resources by user groups and individual settings
- Creation and placement of action/status hotspots over user-supplied images
- Wizards enable quick creation of control panel surfaces to control/monitor routers and IconMaster™
- Buttons, images, text and CCS-enabled products symbol gallery
- Browsing (backward & forward) across Navigator pages
- Single button to launch simple or multiple presets
- Single click to launch Web-based applications



The Command Control System, CCS™, encompasses a powerful system of software applications, control panels, protocols and gateways that enable monitoring and control of both Harris and third-party products within a network.

Broadcast infrastructures are becoming increasingly complex to design and integrate. With complex infrastructures comes an even greater need for simple, straightforward monitoring and control. Operators need to know—at a glance—where a problem exists, and must be able to take corrective action confidently.

The fundamentals of good system design remain constant: industry-standard IP infrastructures; a system architecture that is scalable from small, compact islands of equipment to large distributed networks; and protocols that are open and documented for straightforward integration into any network client. The CCS™ environment delivers all this and more.

Industry-standard IP infrastructures: Broadcast engineers cannot afford to invest in non-standard communications infrastructures. Price points for IP networks continue to drop. Troubleshooting tools quickly locate bottlenecks. More employees possess IP skills. It just makes good business sense.

Scalable system architectures: Network traffic is bursty—increasing during peak production times and falling at night. Whether a broadcast facility's system is small with only a few frames, or large with hundreds of frames from various manufacturers, the infrastructure must be scalable to accommodate the network traffic. CCS™ infrastructures are able to scale with no special customizations to standard network infrastructures required, and offer both UDP and TCP/IP communications to ensure the most efficient use of precious networking bandwidth.

Open and documented protocols: Today's broadcaster needs to know what traffic is being carried on his communications networks. Proprietary protocols are a thing of the past! The open and documented CCS™ Protocol brings practical, real-time control across IP networks. And because CCS™ Protocol provides a single broadcast of all product alarms to all clients within the network, overall network traffic is minimized.

Harris core processing products, Videotek® legalizers and Platinum™ routers support CCS™ Protocol. Implementation plans are underway across our other core product lines—IconMaster™ master control systems, IconLogo™ branding, IconStation™ branding systems, and Videotek® test equipment. A single protocol will allow users to gain access to the majority of the Harris product portfolio.



SNMP support complements the implementation of CCS™ Protocol. All Harris processing products (6800+™, NEO® and X75™) now, optionally, support SNMP. In cases where third-party systems are already in place for system-wide monitoring, SNMP is the common interface to virtually all devices.

Documented device interface descriptions can be accessed via www.broadcast.harris.com/leitch. Whenever possible, both the CCS™ Protocol definition and the SNMP MIBs are posted.



Any product identified with the CCS™ check mark will bring you all the value of the award-winning Command Control System™

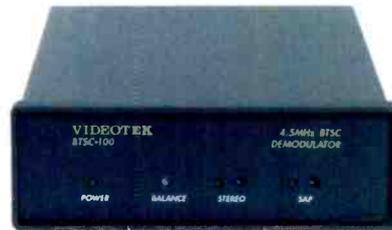


DM-100 - Utility Analog Demodulator

The **DM-100** is the perfect demodulator for utility applications in cable TV, industrial TV headends, trucks, presentation rooms, and more. The DM-100 accepts either Antenna or Cable TV RF inputs, and outputs both video and balanced BTSC stereo audio. Compact size — three units in 1RU space.

OPTIONS:

- DM-100X:** DM-100 without external power supply
- PS-120:** Multiple Unit power supply
- PS-48:** -48 VDC power supply
- DAT-1:** Rackmount frame
- DM-100J:** Channels plans for Standard M, Japan



BTSC-100 - Aural BTSC Demodulator

The **BTSC-100** is an aural TV demodulator that decodes a 4.5 MHz or aural composite input into balanced left and right BTSC stereo audio and Secondary Audio Program (SAP) outputs. The BTSC-100 is designed for use in applications where the existing audio is only available in 4.5 MHz or aural composite formats, and where fully demodulated stereo and SAP audio is required.

OPTIONS:

- DAT-1:** Rackmount frame

DEMODULATORS

DDM-800 - Multi-channel 8VSB/QAM Frequency Agile Demodulator



The **DDM-800** is a compact, one rack-unit, Frequency Agile Digital Demodulator capable of demodulating 8VSB, 64 QAM and 256 QAM modulated signals and converting them to DVB-ASI output format. The DDM-800 can house up to four separate demodulators in one package. The demodulated MPEG-2 output streams can then be locally decoded, analyzed, multiplexed or passed to a cable facility via QAM modulators or to a data distribution network. The DDM-800 front panel interface enables quick setup through direct entry keypad and navigation keys. The status display for each demodulator shows SNR and Bit Error Rate (BER). External communications supports configuration through an intuitive Web Browser GUI via the 10/100 Base-T Ethernet connection, SNMP and Serial communications. The DDM-800 has the flexibility to add three optional demodulators (DDM-Opt-801) to its base unit, providing a space efficient and economical solution for Cable, Satellite and Broadcast facilities.

OPTIONS - DDM-Opt-801: 8VSB Demodulator with single ASI output. (Three additional allowed per base unit)

Features

- High Demodulator Density: Four ATSC Receivers in compact 1RU package
- Supports 8VSB and QAM modulated transmissions
- Factory or Field installed modules (Single Demodulator is standard)
- Ethernet communications, Web Browser, and SNMP support with Alarm Time Stamp
- Real-time clock with battery backup, instant memory save feature for all settings
- Front panel LCD display
- Power and Summary Alarm LED indicators
- Universal, Multi-drop Serial port
- Programmable GPI Alarm outputs
- Standards available: ATSC, 64 QAM, 256 QAM

DM-192, DM-154, DM-145, DM-141A - Frequency Agile Analog Demodulators



The **DM-192** is a 192-channel agile demodulator that provides features and performance found on demodulators over twice its price! It shares all of the features of the **DM-154** plus front panel selectable synchronous or envelope detection and three types of full-time audio outputs. The DM-192 is ideal for high quality reception and testing. The DM-154 demodulator can be used for FCC compliance testing. Controls include forced mono mode, a Zero Carrier Pulse (chopper), 4.5 MHz aural carrier output, external IF loop and remote control via an RS-232 port. The **DM-145** has the capability of providing full time stereo audio and SAP outputs. The most affordable model in our family, the **DM-141A** receives "off-air" or CATV signals, processes these signals and provides two buffered composite baseband video outputs. Additionally the DM-141A provides balanced stereo audio outputs and front panel speaker.

Features

- Multi-band tuning (VHF/UHF/Cable)
- HRC/IRC tuning capability
- Random access, search or up/down channel selection
- Front panel Cable/Antenna selection
- Synchronous detection
- Envelope and synchronous detection on DM-192
- Up to 4 MHz bandwidth for FCC testing
- Audio output configurations for every requirement
- Front panel LED channel display
- Front panel memory retained for one week in event of power loss
- Standards available: NTSC, PAL-M and NTSC-J

DEMODULATORS



Harris Videotek® Demodulators - 8VSB, 64 QAM, 256 QAM and NTSC

For nearly three decades, the Harris Videotek® brand name has become synonymous with high performance TV demodulators at the lowest cost to the industry. With a range of models to support applications from basic monitoring through full FCC proof-of-performance testing, Videotek has become one of the largest suppliers of frequency agile demodulators in North America. All analog models provide video and BTSC stereo signal demodulation for off-air broadcast, CATV and closed circuit monitoring applications. 8VSB demodulators use advanced digital technology to provide transport stream outputs. High definition, standard definition, and analog MPEG-2 decoding features are available in select products.

Digital Demodulators	ASI Output	SMPTE 310 Output	LVDS Output	ASI Input	SMPTE 310 Input	LVDS Input	HD SDI Output	SD-SDI Output	NTSC Output	HD CAV Output	Remote Control	Audio Output	Size
DDM-800	4*	NO	NO	NO	NO	NO	NO	NO	NO	NO	Web Browser SNMP, Serial, GPI	NO	1RU
DDM-540	1	YES	YES	YES	YES	YES	YES	YES	YES	YES	Serial	1-AES 2-Analog	2RU
DDM-520	1	YES	YES	YES	YES	YES	NO	YES	YES	YES	Serial	1-AES 2-Analog	2RU
Analog Demodulators	Cable Channel #	Remote	Video Outputs	Video SNR	Audio Output	QUAD Output	4.5 MHz/Comp	IF Loop	Zero Carr Pulse	Detection	Diff Gain	Diff Phase	Size
DM-192	2 - 125	RS-232/422	2	> 50dB	Stereo/SAP/ PRO	YES	YES	YES	YES	Synchronous/ Envelope	< 4%	< 4.0°	1RU
DM-154	2 - 99	RS-232	2	> 50dB	Stereo/SAP	YES	YES	YES	YES	Synchronous	< 4%	< 4.0°	1RU
DM-145	2 - 99	NO	2	> 49dB	Stereo/SAP	NO	NO	NO	NC	Synchronous	< 5%	< 5.0°	1RU
DM-141A	2 - 99	NO	2	> 49dB	Stereo	NO	NO	NO	NC	Synchronous	< 5%	< 5.0°	1RU
DM-100	2 - 99	NO	1	n/a	Stereo	NO	NO	NO	NO	Synchronous	n/a	n/a	1RU x 1/3 Rack Width
BTSC-100	n/a	n/a	n/a	n/a	Stereo/SAP	n/a	YES (IN)	n/a	n/a	n/a	n/a	n/a	1RU x 1/3 Rack Width

* Options allow up to four, one is standard # All video demodulators tune VHF and UHF channels 2 through 69

DDM-520/DDM-540 - 8VSB Frequency Agile Demodulator/Decoder



The **DDM-520** and **DDM-540** are frequency agile 8VSB demodulators with MPEG-2 HDTV/SDTV decoders. The MPEG-2 transport stream generated by the DDM-520 and DDM-540 is compliant with the SMPTE 310M, DVB-ASI and DVB-SPI requirements. The MPEG-2 HDTV decoder decompresses the demodulated MPEG-2 program streams, accepting either HDTV

(main profile at high level) or SDTV (main profile at main level) formats, and generates a multitude of signals including RGB and YPbPr analog Component Video, NTSC analog composite video, SVGA and Serial Digital signals for monitoring the video program selected. A separate connector provides for the selected AES or Dolby® Digital (AC-3™) encoded audio bit stream output. In addition, the decoder will produce an analog stereo audio output for the selected channel for monitoring purposes. The DDM-520 and DDM-540 are packaged in a standard 2RU rack mountable chassis. The DDM-540 provides for additional monitoring of signals with an HD/SDI output that conforms to SMPTE 292M and 299M.

Features

- 12 Button Numerical Keypad for direct data entry of channel
- Signal to Noise Ratio and Bit Error Rate information available
- HD/SDI output (DDM-540)
- Closed Caption decoded and displayed on the output video
- Transport stream display selection for PSIP table information
- Auto programming of available 8VSB channels
- SMPTE 310M, DVB-ASI, DVB-SPI transport stream inputs and outputs
- Constellation diagram display selection
- CAV, SVGA, SDI, NTSC outputs
- Dolby® Digital (AC-3™) and Stereo Audio outputs
- Standards available: ATSC

LCD MONITORS

FSM-15R - 15" LCD Display with Drawer



The **FSM-15R** is the perfect solution to a conventional monitor taking up valuable rack space. A 15" TFT active matrix LCD supporting up to 1024x768 resolution mounted in a one-unit high (1.75") drawer with industrial heavy-duty hinges. Easy action drawer withdrawal and return for ability to raise for display. Unit pushes back into the rack to minimize space during viewing.

Features

- One (1.75") rack unit high
- 15" active matrix TFT LCD display
- 1024x768 resolution, supporting 16.7 million colors
- Extra wide viewing angle
- High brightness and contrast ratios
- Plugs directly into standard VGA output
- Video and power cables provided
- Display powers off when in closed position
- 18" slides for stable rack mounting
- Recessed front panel handle fits behind rack doors

FSM-17RK - 17" Rackmount Flat-Screen LCD Monitor



The **FSM-17RK** Flat-Screen or **FSM-17WS-RK** Flat Wide Screen LCD Monitor is the perfect match for any VTM Series™ or other multimedia devices such as editors and data servers.

The FSM-17RK is a 17" TFT active matrix LCD panel supporting up to 1280x1024 resolution with 16.7 million display colors is housed in a 9RU ultra-thin 3" deep space saving rackmount. The FSM-17RK is VGA / SVGA / XGA compatible with a flicker and static free extra wide viewing angle that is low on power consumption and high in display solutions.

The FSM-17WS-RK is a 17.1" 16 x 9 wide screen monitor and installs in a compact 7RU. The monitor supports DVI, XGA and VGA connections.



FSM-17RK Features

- 17" TFT/LCD Flatpanel
- 1280x1024 resolution, supporting 16.7 million colors
- Plugs directly into VGA output
- Extra wide viewing angle
- Space saving, 3.0" depth

FSM-17WS-RK Features

- 17.1" WXGA TFT/LCD
- 1280 x 768 Resolution
- DVI and VGA Connections
- Space Saving 7RU Design
- Space saving, 3.0" depth

Flat Screen LCD Monitors

	Screen Size	Screen Type	Horizontal Scan	Vertical Scan	Optimum Resolution	Input	Mounting
FSM-17RK	17" Diagonal	TFT	39-79 kHz	50-77 Hz	1280 x 1024 60 Hz	RGB Analog	9RU Rackmount
FSM-15R	15" Diagonal	TFT	15-63 kHz	50-77 Hz	1024 x 768 60 Hz	RGB Analog	1RU Drawer
FSM-17WS-RK	17.1" Diagonal	TFT	15-63 kHz	47-63 Hz	1280 x 768, WXGA	DVI RGB Analog	7RU Rackmount

APM-210 - Stereo Audio Program Monitor



The **APM-210** is designed to provide superior audio fidelity from a sleek 1RU package. Designed for ease of integration with Harris' Videotek® state-of-the-art test and measurement instruments (VTM Series™, TVM-950, TVM-900, TVM-850, TVM-840, and ASM-100) via a looping input connection and provided

37-pin audio adapter cable, the APM-210 is an ideal multi-purpose monitor. The APM-210 audio's high quality and low distortion is attained using a 2-way speaker system, with a low and high frequency driver per channel, plus wide volume control range with balance adjustment. Front panel, direct input mode switching allows the selection of stereo and L + R monitoring for up to 10 different channels. Two, 10-segment, color LED bargraph meters are provided with selectable peak or average response ballistics and reference level. Five reference level selections allow a wide range of audio input levels. A front panel headphone jack mutes the speaker output for isolated listening requirements. Shielding permits use adjacent to waveform or picture monitors without magnetic interference making the APM-210 ideally suited for use in remote vans, editing suite, VTR monitor bridges or for any system that requires high quality professional aural monitoring of stereo audio signals.

APM-200 - Stereo Audio Program Monitor



Engineered for aural monitoring of stereo audio, the compact **APM-200** requires only one rack unit space. High-quality, low-distortion volume levels are output through two 5 inch speakers. Input mode switching allows the selection of L - R, L + R, stereo, reversed

stereo, L only or R only monitoring. Ten segment, two color LED bargraph meters are provided with switchable peak or average response ballistics. Shielding permits use adjacent to waveform or picture monitors without magnetic interference. The APM-200 is ideally suited for use in remote vans, editing suite, VTR monitor bridges or for any system that requires professional monitoring of stereo audio signals.

APM-800 - Stereo Audio Program Monitor



Engineered for dual aural monitoring of up to eight inputs, the **APM-800** has two color bargraph meters, internal speakers, headphone jack and external speaker amplifiers. High quality, low distortion volume levels are output through two 3" speakers. The APM-800 has switchable peak or average meter response, stereo or

monaural operation, and eight selectable inputs. Magnetic shielding permits use adjacent to waveform or picture monitors without interference. The APM-800 is ideally suited for use in remote vans, editing suites, VTR monitor bridges or for any system that requires monitoring of multiple audio signals.

AUDIO MONITORING



Monitor Optional

The **ASM-100** is an advanced audio monitoring instrument providing all the features required to maintain high quality audio in today's arena of multi-format, multi-channel scenarios. The unit draws many of its features from the value packed VTM series of multi-format on-screen monitors. Providing a high resolution 1024 x 768 XGA output for use on any standard computer monitor, the ASM-100 will accept and display up to 8 channels of analog or AES/EBU audio (base unit). Options are available for de-embedding SD and HD SDI inputs, Dolby® Digital and Dolby® E inputs with 8 channel analog decode, and a remote control panel. A unique advanced test tone option provides a means to verify surround sound channel placement and proper phase alignment.

Eight channels of audio can be displayed simultaneously along with lissajous patterns for proper amplitude and phase monitoring. Scales can be customized by adding text to each meter and a full range of meter ballistics are available. A 72-hour trending chart can be viewed directly below the meters to track historical amplitude and phase movement. The peak values are averaged over time and displayed to assist in determining overall audio sound level.

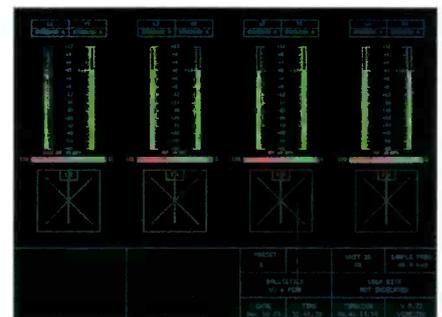
The unique Videotek® CinePhase™ display designed for intuitive viewing of surround sound levels is coupled with a new multi-channel phase display which presents all critical interchannel relations at a quick glance. A loudness ballistic selection coupled with Metadata readout provides valuable information for developing or monitoring modern multi-channel audio. Built-in on-screen alarms will continuously monitor for out of tolerance conditions and can report those conditions to the SpyderWeb® software for logging. Communication ports are available in serial RS-232/422 and Ethernet 10/100 Base-T.

Features

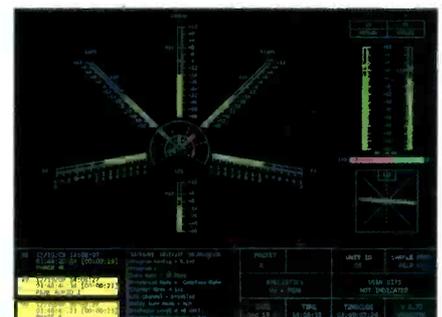
- Audio inputs include 8 analog, 8 AES/EBU, 2 embedded sources HD or SD
- Real time chart recording of data samples
- Eight channel plotting of phase and level with average value display
- Analog, AES/EBU, Dolby® Digital (AC-3™), Dolby® E from external or embedded sources
- CinePhase™ multi-channel Level and Phase display
- XGA Frame capture

Options

- Dolby® Digital (AC-3™), and Dolby® E metering and decoding
- Embedded source from SD
- Embedded source from SD and HD
- Embedded Tone output (CineTone™)

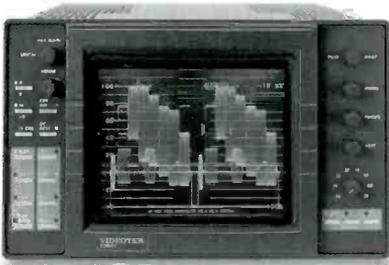


Multiple Lissajous Screen



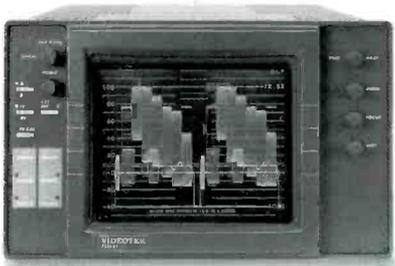
CinePhase™ Display includes multi-channel Phase Display

TSM-61 - Waveform Monitor with Line Select



Case Optional

TSM-51 - Waveform Monitor



Case Optional

The **TSM-51** and **TSM-61** are an excellent value in waveform monitors. Market-proven traditional features are combined with ergonomically designed controls for a variety of measurement functions. Selection of filter response and time base sweep are easily accomplished via tactile membrane control switches. Rapid A/B comparisons may be made by directly switching between the A and B inputs. The TSM-61 includes Line Select for lines 14 to 21, 1H and 1H mag sweep and a Differential Gain filter.

VSM-61 - Vectorscope



Case Optional

The **VSM-61** is designed for convenience and ease of operation in observing the vector display of video signals. Proven, reliable circuit design permits accurate measurement of differential gain and differential phase. Requiring only three rack units (5.25 inches) and one half-rack width, the VSM-61 vectorscope may be mounted in the optional DRC-1 double rackmount case along with Videotek's TSM-51 or TSM-61 waveform monitor for complete signal monitoring.

	SD-SDI Inputs	Analog Composite Inputs	CAV Inputs	Looping Inputs	WFM	Line Select	Vector	Eye Pattern	Alarms	Audio	Remote Control	Video Monitor Output	Size
TVM-821D	2	NO	NO	YES	YES	NO	YES	NO	YES	Stereo Lissajous	NO	NO	3RU 1/2 Rack
TVM-675	NO	3	1*	YES	YES	NO	YES	NO	NO	Stereo Lissajous	NO	YES	3RU 1/2 Rack
TSM-61	NO	2	NO	YES	YES	YES**	NO	NO	NO	NO	NO	YES	3RU 1/2 Rack
TSM-51	NO	2	NO	YES	YES	NO	NO	NO	NO	NO	NO	NO	3RU 1/2 Rack
VSM-61	NO	2	NO	YES	NO	NO	YES	NO	NO	NO	NO	NO	3RU 1/2 Rack

* 3 Inputs shared as one CAV ** Vertical interval

TVM-821D and TVM-821D/DC - Serial Digital Waveform Monitor/Vectorscope



Case Optional

The **TVM-821D** serial digital waveform monitor/vectorscope brings the most commonly needed functions within quick, easy and affordable reach. Button per function design provides simple operation. With two serial digital inputs A/B Parade and Overlay modes provide for level comparison and easy system timing. Waveforms can be displayed as RGB or Y,Pb,Pr. LEDs provide a display of input EQ for verification of signal integrity as well as alarms for EDH, Gamut, EAV and SAV data problems. X-Y display of stereo analog audio for gain and phase measurement. Four memories give fast recall of setups. Memories can be recalled from GPI inputs and there is a GPI output for alarm indication. Designed for portable applications, the **TVM-821D/DC** offers all of the same features and specifications while operating from a 12 volt DC source.

TVM-675 - Analog Component/Composite Combination Waveform Monitor/Vectorscope and Audio Monitor



Case Optional

The **TVM-675** is a full-featured half-rack-width combination waveform monitor/vectorscope and stereo audio monitor engineered to observe either composite or component analog signals. The audio may be displayed alone or in any combination with waveform and/or vector. One, two or three composite video signals may be observed individually or in any combination of three inputs. Waveforms can be displayed in either parade modes or overlaid for comparison of timing and amplitude characteristics. R-Y mode for improved resolution of differential phase measurements of composite signals. All three composite inputs may be displayed simultaneously with Flat, Low Pass and Chroma filters. Vector displays can also be overlaid for simultaneous observation and comparison of the phase and amplitude of up to three composite signals. Four user defined setups can be stored in memory.

A³— Advanced Audio Analysis options for the TVM-950, TVM-900, TVM-850 and TVM-840

TVM-A³-OPT 2

View up to eight (8) audio channels as Bar graphs or in the unique CineSound® display. Includes eight (8) Analog inputs, four (4) AES/EBU shared input/output pairs, and 16 channel of Embedded audio. Use the TVM-A³-4004 to add four (4) more AES/EBU inputs. Analog monitoring outputs for up to eight (8) channels simultaneously.

TVM-A³-4004

Audio expansion module. Adds four (4) additional AES/EBU input pairs to the TVM-A³-OPT 2.

TVM-A³-OPT 3 View up to eight (8) audio channels as Bar graphs or in the unique CineSound® display. Includes eight (8) Analog inputs, eight (8) AES/EBU input pairs, four (4) shared AES/EBU output pairs, and 16 channels of Embedded audio. Analog monitoring outputs for up to eight (8) channels simultaneously. Includes channel mapping, loudness metering, customizable meter scales, and peak level reporting.

TVM-A³-OPT 5

View up to eight (8) audio channels as Bar graphs or in the unique CineSound® display. Includes eight (8) Analog inputs, eight (8) AES/EBU input pairs, four (4) shared AES/EBU output pairs, and 16 channels of Embedded audio. Analog monitoring outputs for up to eight (8) channels simultaneously. Includes channel mapping, loudness metering, customizable meter scales, and peak level reporting. Adds decoding of Dolby® Digital, Dolby® Digital Surround EX, Dolby® E, and Dolby® Pro-Logic I signals for metering and provides a fully decoded analog output. Includes Dolby® metadata display.

Mounting Options

SSC-2 Single Standard Case for TVM-950, TVM-900, TVM-850 and TVM-840

PTC-2 Portable Case with Handle for TVM-950, TVM-900, TVM-850 and TVM-840

DRC-2 Double Rackmount Case for TVM-950, TVM-900, TVM-850 and TVM-840

BLK-1 Blank Panel for DRC-2

(One Required)

Units are supplied with a US standard IEC power cord. Alternate international power cords for Australia, Europe and the UK are available for no charge when specified at time of order.

TVM MULTI-FORMAT SIGNAL ANALYZERS WITH INTEGRAL LCD

RCU-1000 Remote Control Panel for the VTM Series™, TVM-950, TVM-900, TVM-850 and TVM-840



The RCU-1000 remote control panel replicates all of the front panel controls of the VTM Series™, TVM-950, TVM-900, TVM-850 and TVM-840 instruments. It can control up to ten (10) units in any mix of models up to 1,000 feet away.

Dimensions:

Height: 1.75" Width: 19.0" Depth: 2.75"

	Standard Inputs	Option Inputs	Looping Inputs	WFM	VEC	Eye Pattern	Alarms	Audio	Remote Control	Monitor Output	Size
TVM-950-E	2 HD/SD with Eye	2	Active	Yes	Yes	Yes	Yes	Option	Yes	XGA	3RU, _ rack
TVM-950	2 HD/SD	2	Passive	Yes	Yes	Option	Yes	Option	Yes	XGA	3RU, _ rack
TVM-950-SD	2 SD	2	Passive	Yes	Yes	Option	Yes	Option	Yes	XGA	3RU, _ rack
TVM-950-A	2 Composite	2	Passive	Yes	Yes	Option	Yes	Option	Yes	XGA	3RU, _ rack
TVM-950-E	2 HD/SD with Eye	2	Active	Yes	Yes	Yes	Yes	Option	Yes	XGA	3RU, _ rack
TVM-900	2 HD/SD	2	Passive	Yes	Yes	Option	Yes	Option	Yes	XGA	3RU, _ rack
TVM-900-SD	2 SD	2	Passive	Yes	Yes	Option	Yes	Option	Yes	XGA	3RU, _ rack
TVM-900-A	2 Composite	2	Passive	Yes	Yes	Option	Yes	Option	Yes	XGA	3RU, _ rack
TVM-850-E	2 SD with Eye	2	Active	Yes	Yes	Yes	Yes	Option	Yes	XGA	3RU, _ rack
TVM-850	2 SD	2	Passive	Yes	Yes	Option	Yes	Option	Yes	XGA	3RU, _ rack
TVM-850-A	2 Composite	2	Passive	Yes	Yes	Option	Yes	Option	Yes	XGA	3RU, _ rack
TVM-840-E	2 SD with Eye	2	Active	Yes	Yes	Yes	Yes	Option	Yes	XGA	3RU, _ rack
TVM-840	2 SD	2	Passive	Yes	Yes	Option	Yes	Option	Yes	XGA	3RU, _ rack
TVM-840-A	2 Composite	2	Passive	Yes	Yes	Option	Yes	Option	Yes	XGA	3RU, _ rack

Video Input Options

TVM-OPT EYE-2, Dual HD/SD-SDI Input Module with Eye pattern plus Jitter display for the TVM-950 and TVM-900. Replaces the standard HD/SD-SDI Input module with two (2) HD/SD-SDI active looping inputs with auto-detection of input formats (1080i, 1080p, and 720p at all popular frame rates including standard definition 525/625) and HD and SD Eye pattern with Jitter display. Monitoring output of selected input. Must be installed as inputs A and B.

TVM-OPT EYE-1, Dual SD-SDI Input Module with Eye pattern plus Jitter display for the TVM-850 and TVM-840. Replaces the standard SD-SDI Input module with two SD-SDI active looping inputs with auto-detection of input formats (525/625) and SD Eye pattern with Jitter display. Monitoring output of selected input.

TVM-OPT HD/SD, Dual HD/SD-SDI Input Module for the TVM-950 and TVM-900. Adds two (2) HD/SD-SDI passive looping inputs with auto-detection of SMPTE 292M and SMPTE 259M-C input formats (1080i, 1080p, and 720p at all popular frame rates including standard definition 525/625). Monitoring output of selected input.

TVM-OPT SD, Dual SD-SDI Input Module for the TVM-950, TVM-900, TVM-850 and TVM-840. Adds two (2) SD-SDI passive looping inputs with auto detection of SMPTE 259M-C input formats (525/625). Monitoring output of selected input.

TVM-OPT ACV-2, Dual Composite Analog Input Module for the TVM-950, TVM-900, TVM-850 and TVM-840. Adds two (2) Composite Analog passive looping inputs with auto-detection of NTSC and PAL.

TVM-OPT AAP, Advanced Analysis Package adds Data Analyzer functions in quadrant or full-screen views to the TVM-900 and TVM-840.

TVM-OPT ASI, Dual DVB-ASI/SMPTE 310 Input Module for the TVM-950, TVM-900, TVM-850 and TVM-840. Adds two (2) transport stream inputs with MPEG data analysis according to ETSI TR-101-290 guidelines for first, second and third priority. Confirmation of PSIP/SI content. Display total bandwidth and bandwidth of each program.



Case Optional

Harris' Videotek® **TVM-900** multi-format HD/SD-SDI video and audio signal analyzer with integral XGA TFT color LCD display is the most cost-effective, versatile, modular, and intuitive test instrument available in a half-rack scope package.

Features

- Dual, auto detecting HD/SD-SDI Inputs
- Standards: SMPTE-292M, SMPTE-259M-C
- Customizable display functions and screen location
- Patented Gamut display
- Video Relative Timing Display
- Peak Value Report
- Picture Thumbnail
- 608/708 Closed Caption detect/alarm/display
- Comprehensive Alarm set
- 16 direct-access user presets
- Integral XGA TFT color LCD display
- Illuminated controls and indicators
- Ultra-quiet cooling system
- DVI - I output
- USB port for control and data transfer
- 10/100BaseT Ethernet, SNMP agent, Web Server
- SpyderWeb II Remote Control and Logging Software
- GPI and Router control

Options

- Additional Dual HD/SD-SDI Input Module
- Dual HD/SD-SDI Input Module with Eye Pattern
- Dual ASI Input Module
- Dual SD-SDI Input Module
- Dual Analog Composite Input Module (NTSC, PAL)
- Advanced Analysis Package
 - Pixel locator/Data Word Analyzer
- A³, Advanced Audio Analysis Modules:
 - Meter and monitor up to eight channels of Analog, AES/EBU and Embedded
 - Dolby® Digital, Dolby® Surround EX™ Dolby® E, Pro-Logic I formats
 - Dolby® decoded outputs
 - "Loudness" metering and alarm
 - Multiple audio Lissajous display
- Remote Control Panel, RCU-1000



Case Optional

Harris' Videotek® **TVM-850** and **TVM-840** multi-format SD-SDI video and audio signal analyzers with integral XGA TFT color LCD display are based on the most advanced, versatile, modular, and intuitive test instrument platform available in a half-rack scope package. TVM-850 users can display and evaluate up to four input sources simultaneously, while the TVM-840 displays and evaluates one source. The **TVM-850-E** includes SD Eye Pattern with Jitter display.

Features

- Dual, auto detecting SD-SDI Inputs
- Standards: SMPTE-259M-C
- Display four different inputs, simultaneously (TVM-850)
- Customizable display functions, screen location, multiple displays
- Video Relative Timing display
- Patented Gamut display
- Pixel locator/Data Word Analyzer (TVM-850)
- Picture Thumbnail
- A/B Parade and Overlay
- 608 Closed Caption detect/alarm/display
- Comprehensive Alarm set, Peak Level Report
- 16 direct-access user presets
- Integral XGA TFT color LCD display
- Illuminated controls and indicators
- Ultra-quiet cooling system
- DVI - I output
- USB port for control and data transfer
- 10/100BaseT Ethernet, SNMP agent, Web Server
- SpyderWeb II Remote Control and Logging software
- GPI and Router control

Options

- Dual SD-SDI Input Module with Eye Pattern
- Additional Dual SD-SDI Input Module
- Dual Analog Composite Input Module (NTSC, PAL)
- Dual ASI Input Module
- A³, Advanced Audio Analysis Modules:
 - Meter and monitor up to eight channels of Analog, AES/EBU and Embedded
 - Dolby® Digital, Dolby® Surround EX™ Dolby® E, Pro-Logic I formats
 - Dolby® decoded outputs
 - "Loudness" metering and alarm
 - Multiple audio Lissajous display
- Remote Control Panel, RCU-1000

TVM MULTI-FORMAT SIGNAL ANALYZERS WITH INTEGRAL LCD



Case Optional

Harris' Videotek® **TVM-950** is the flagship of our multi-format HD/SD-SDI video and audio signal analyzers with integral XGA TFT color LCD display. These instruments are the most advanced, versatile, modular and intuitive available in a half-rack scope package. Input options are available for HD/SD-SDI, SD-SDI, ASI and Analog Composite video. The **TVM-950-E** includes HD/SD Eye Pattern with jitter display. The TVM-950 can display and evaluate up to four input sources simultaneously.

100% digital signal processing enables a precision presentation of Waveform, Vector, Gamut, Audio, Picture, Timing, and Data Analyzer screens, each of which can be viewed in any quadrant or full screen. Along with multiple picture thumbnail, and powerful MULTI mode, complete display flexibility is a reality.

The TVM-950 has impressive features: illuminated controls, modular platform for easy upgrade, HD/SD-SDI auto-detect, passive looping inputs which accept 1080i, 1080p, 720p formats at popular frame rates including SD- 525/625, dual link, real-time alarms (with time stamp, adjustable limits and peak value report), frame capture/transfer, EIA 608 & 708 closed caption, Teletext, XDS, Alarm Status, and Metadata displays.

The TVM-950 can be quickly and easily configured, with direct access to display functions, selectable screen location and context-sensitive pop-up menus, plus the industry's most intuitive navigation system. Complete presentation changes can be instantly applied with any of the 16 front panel preset selections.

Options include dual HD/SD Eye Pattern with Jitter display, dual HD/SD-SDI and dual Analog Composite inputs; Advanced Audio Analysis with CineSound® Surround display and comprehensive Dolby® decoding.

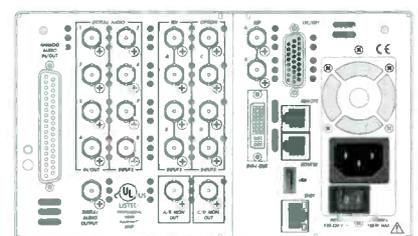
The TVM-950HD integrates seamlessly into any Broadcast, Post-production, Telecine, Satellite, or Cable facility. It's the ultimate choice for quality control, troubleshooting, and compliance check applications.

Features

- Dual, auto detecting HD/SD-SDI Inputs
- Standards: SMPTE-292M, SMPTE-259M-C
- Multiple Reference Inputs
- Display four different inputs, simultaneously
- Customizable display functions, screen location, multiple displays
- Video Relative Timing display
- Patented Gamut display
- Pixel locator/Data Word Analyzer
- Multiple Picture Thumbnail
- A/B Parade and Overlay
- 608/708 Closed Caption detect/alarm/display
- Comprehensive Alarm set, Peak Level Report
- 16 direct-access user presets
- Integral XGA TFT color LCD display
- Illuminated controls and indicators
- Ultra-quiet cooling system
- DVI-I output
- USB port for control and data transfer
- 10/100BaseT Ethernet, SNMP agent, Web Server
- SpyderWeb II Remote Control and Logging
- GPI and Router control Options

Options

- Dual HD/SD-SDI Input Module w/Eye Pattern
- Additional Dual HD/SD-SDI Input Module
- Dual SD-SDI Input Module
- Dual Analog Composite Input Module: NTSC, PAL
- Dual ASI Input Module
- RGB Dual Link
- A³, Advanced Audio Analysis:
 - Meter and monitor up to eight channels of Analog, AES/EBU and Embedded
 - Dolby® Digital, Dolby® Surround EX™, Dolby® E, Pro-Logic I formats
 - Dolby® decoded outputs
 - "Loudness" metering and alarm
 - Multiple audio Lissajous display
- Remote Control Panel RCU-1000



TVM Back Panel

SLS - STABILIZED LASER SOURCE



The Harris SLS series is a pocket-size, lightweight and easy-to-use stabilized laser source. Based on advanced technologies of precision laser control, the SLS-21 has been designed to provide high capability of laser source for engineering, R&D, and equipment manufacturers, and is favored for its quality, value, reliability and safety.

Features

- Fast response, no warm up
- Damp-, dust- and shock-proof design
- Modulation in CW and modulated frequencies
- Single/dual/triplex wavelength selectable
- Interchangeable fiber-optic adapters (choice of FC, SC, or ST)
- Highly stabilized output of optical signal
- Dual-way powering system
- Auto-off function conserving battery life
- CE, FCC, FDA certificates

PALMOTDR-S20 - OPTICAL TIME DOMAIN REFLECTOMETER



The Harris palmOTDR-S20 is an optical fault locating and analyzing tool for optical fiber networks. With its excellent performance and higher user value, it offers an innovative test method for telecommunication networks.

Features

- Lightweight, portable and ideal for FTTx
- Full functions, single-mode fiber applications
- High-precision measurement, large memory capacity (300 Test curves)
- Without hard disk design, anti-dust, damp-, and shock proof for field testing
- RS-232/USB data upload port
- PC software for measurement data analyzing and reporting
- LCD indicators for battery charging and LD lasing status
- NiMH rechargeable battery supports 4 hours continuous operation
- Low-battery annunciator
- CE, FCC, FDA certificates
- Drop test up to 1 meter

VLS-20A - VISIBLE LASER SOURCE



The Harris VLS-20A is a visible red laser source for finding breaks and tight bends in optical fibers. The unit generates red laser, and the visible red laser that escapes from optical fibers allows for testing and finding breaks in LANs, verifying continuity, checking the validity of patch cables or looking for cracked fiber in splice cases, bad connectors, and tight bends in fiber cable.

Features

- CW/1 Hz modulation
- One meter drop test
- CE, FCC, FDA certificates

OLT-20A - OPTICAL LOSS TESTER



The Harris OLT-20A is a handheld Optical Loss Tester multi-functional testing instrument for optic fiber networks. The useful applications include installation, routine inspection and daily maintenance of MAN, WAN, and CATV systems as well as for laboratory testing and research work.

Features

- Multi-wavelength measurements
- Direct loss measurement units in dB
- Link loss testing
- Absolute power measurement units in dBm or μ W
- Modulation in CW and modulated frequencies
- 270 Hz, 1 kHz and 2 kHz modulated frequencies
- Dual-wavelength output in single optic output
- Dual-way powering system
- Low-power indicator
- Auto-off function conserving battery life
- CE, FCC, FDA certificates

OPM-15 - OPTICAL POWER METER

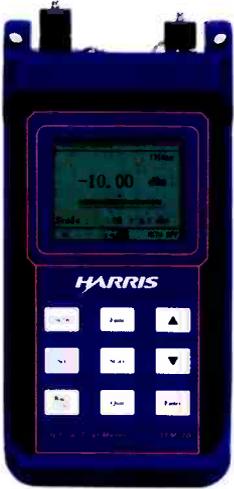


The Harris OPM-15A and OPM-15B optical power meters are compact, lightweight and easy-to-use testing instrument for optic fiber networks with unique characteristics of quick testing. This unit is widely favored for its quality, value, reliability, accuracy and safety.

Features

- Fast response, no warm up
- Measure up to six wavelengths through a single connector
- Direct loss measurement units in dB
- Absolute power measurement units in dBm
- Interchangeable fibre-optic adapters (choice of FC, SC, or ST)
- Dual-way powering system
- Damp, dust and shock proof design, ideal for field operation
- Auto off function conserving battery life
- CE, FCC certificates

OTM-20 - OPTICAL TEST METER



The Harris OTM-20A and OTM-20C are integrated testers for fiber optic networks. These handheld Optical Test Meters features intelligent design, multi-functionality, fast test, dual-way powering system and a large LCD display.

Features

- Measurement units in dB, dBm and W (or mW)
- Large memory capacity (up to 4000 measurements)
- Support auto test of optic fiber loss
- Draw changing curve of power value
- Support the optical power alarm function
- Automatic data storage
- Damp-, dust- and shock-proof design; ideal for field operation
- Interchangeable fiber-optic adapters (choice of FC, SC, or ST)
- RS-232 data upload port and PC software for data analyzing, graphic drawing and reporting
- Low-battery indicator and auto recharging display
- Auto-off function conserving battery life
- CE, FCC, FDA certificates

OFI-20B - OPTICAL FIBER IDENTIFIER



The Harris OFI-20B is a handheld, easy-to-use optical test instrument that identifies optical fibers without any damage by detecting the optical signals being transmitted through the fibers. By non-destructive macro-bend detection technology and mechanism damp technology, it avoids opening the fiber at the splice point for identification and interruption of service.

Features

- Equipped with corresponding adapter for bare fiber and tail fiber
- Intensity display of optical signal
- Low-battery indication
- Buzz indication function
- Display of transmission direction light
- Identification of various signal frequency: 270 Hz, 1 kHz, 2 kHz
- CE, FCC, certificates

PERSONAL TEST MONITOR



The Harris Videotek® **PTM-305** portable, battery powered, personal test monitor provides multi-format functionality and versatility that set it apart from other handheld devices on the market. With a powerful array of features and functions that include Composite and SD-SDI Video Signal Generators, Color Monitor, Waveform, Vectorscope and an Audio Analyzer/Monitor, the lightweight PTM-305 is ideal for monitoring field production camera setup, equipment installation, or troubleshooting signal path issues related to analog and standard definition digital formats.

This PDA-sized personal test monitor was designed to offer the convenience of portability without sacrificing function and performance. To enhance the user's experience, the PTM-305 features an integrated 320 x 240 color LCD display, utilizing touch-screen technology and the provided stylus to control and configure each operation. And maintaining power in the field won't be a problem—the PTM-305 runs on standard "AA" NiMH batteries for up to four hours when fully charged (dependent on enabled functions). No special battery packs are required.

The PTM-305 includes two video inputs, one for monitoring composite analog NTSC and PAL video signals and the second for monitoring SD-SDI signals formatted in SMPTE 259M with embedded audio. The test signal generator has both composite analog video and SD-SDI outputs. A balanced analog audio output from an internal audio tone generator is also included.

Standard accessories include a sunshield, stylus, batteries, battery charger, power adapter, and a belt-style pouch.

Specifications

- Multiple functionality
 - Color Monitor
 - Vectorscope
 - Waveform Monitor
 - Test Signal Generator
 - Embedded Audio Monitor
 - Serial Data Analyzer
- Multi-formats
 - SD-SDI
 - Composite Analog
- Portable, handheld PDA-sized
- Weighs under one pound
- Integrated 320 x 240 color LCD Display
- Touch Screen Operation

Features

- EDH generation
- One Group Audio embedding
- Audio Frequency & Amplitude adjustable
- Zoom and Pan for Picture and Waveform
- RGB or Y,Pb,Pr Waveform
- Digital Line Select
- 75% or 100% Vectors
- Adjustable Persistence
- Analyze any one pair from 4 groups of embedded audio
- Stereo Headphone output
- Analog Audio tone output
- Auto shutdown of unused functions

VTM TELEVISION SIGNAL MONITOR



Monitor Optional

The Harris Videotek® **VTM-100** Television Signal Monitor displays waveform, vector and audio information for analog composite, Y/C (requires optional YC-1 adapter), and component video signals plus analog audio on a composite video monitor. The VTM-100's three passive looping inputs auto-detect the incoming video format for NTSC or PAL and change the graticule and output format accordingly. The VTM-100 provides a waveform and/or vector display of the input video. The waveform and vector can be displayed independently or as a combination of both. All waveform/vector displays can be keyed or mixed with the picture on screen. Other features include line select, waveform filters, V Gain, and H Mag. The input format and SC/H measurement are displayed on screen with alarms for SC/H, Burst and Sync level, for easy reference and user convenience. The VTM-100 provides convenient operation and control from the front panel through a drop-down menu or remotely via a mouse or any PC. With features usually found only in more expensive test instruments such as waveform parade and overlay, vertical and horizontal sweep rates and magnifications, flat/low pass and chroma filters or full field line select the VTM-100 is the complete test instrument for any analog video testing application in a cost effective package.

Features

- Waveform, Vector, and stereo audio displays in multiple combinations
- Selectable formats, composite, Y/C, or component
- Three composite or one component passive looping inputs
- Composite waveforms include parade or overlay of up to three inputs with filters
- Sync, burst, and SC/H phase numeric readout and alarms
- SC/H phase, sync and burst amplitude alarm limits are user selectable
- Alarm indication of text message and display color change
- Menus and displays controlled via front panel, mouse, or PC
- Component waveforms include parade, overlay, and bowtie
- Picture mixed or keyed
- Bright, full field line select
- Time base modes: 1H/2H/3H/ and 1V/2V/3V
- Magnifications: x1, x5, x10, and x20
- Flat/low pass/chroma filter selection
- NTSC and PAL standards

	SD-SDI Inputs	Analog Composite Inputs	CAV Inputs	Looping Inputs	WFM	Vector	Line Select	Audio	Output Type	Size
VTM-203	2	2	1	NO	YES	YES	YES	Option	VGA CMO-200 (Optional)	1RU
VTM-200	2	2	NO	NO	YES	YES	YES	Option	VGA CMO-200 (Optional)	1RU
VTM-180	NO	2	NO	NO	YES	YES	YES	Option	VGA CMO-200 (Optional)	1RU
VTM-150	2	2	1*	YES	YES	YES	YES	Analog Standard	VGA TMO-150 (Optional)	1RU
VTM-100	NO	3**	1**	YES	YES	YES	YES	Analog Standard	Analog Composite	1RU

*Input "B" assigned as composite or CAV ** Inputs are shared formats

VTM MULTI-FORMAT ON-SCREEN MONITORS

VTM-200 Multi-format On-Screen Monitor



Monitor Optional

The **VTM-200** Multi-format On-Screen Monitor provides Harris' patented means to monitor and measure SD–SDI and AES digital and composite analog (NTSC or PAL) video and audio signals. The primary output is SVGA compatible for display on any standard computer monitor capable of locking to 50 Hz (PAL /625) and 59.94 Hz (NTSC/525) vertical sweep rates. The output display includes video picture, waveform, vector and optional audio—each in one high resolution quadrant of the screen or any element in a full screen view. Standard inputs include two SD–SDI serial digital (525 or 625) and two analog composite (NTSC or PAL). The VTM-200 also optionally accepts four AES stereo pairs and four analog stereo pairs as inputs and displays two stereo pairs plus the phase differences in the standard audio display. For accurate setup, a

“zoom” feature allows the user to individually adjust and measure black level, white level and audio reference levels. Easy to operate, all functions are via dedicated buttons or knobs. The VTM-200 is at home in mixed format facilities, graphics suites, production and post production areas and remote vehicles. The popularity of our VTM-200 Multi-Format On Screen Monitor has led to the expansion of the family of NTSC/PAL compatible models: the VTM-180 and the VTM-203. All models support VTM-200 features and specifications, and are distinguished by unique input options.

Features

- Two Analog Composite and two SD–SDI Serial Digital inputs
- Dedicated buttons for all common functions
- Versatile user configuration
- SVGA display output
- Zoom view on waveform Black (0 Units) and White (100 Units)
- Zoom view on vectors - each quadrant plus a center zoom for checking each color and black/white balance
- Zoom view on audio to set 0 dB reference
- Universal switching power supply 90 to 260 VAC, 50 or 60 Hz.

VTM-150 Multi-format On-Screen Monitor



The **VTM-150** Multi-format On-Screen Monitor combines a cost-effective display output at SVGA resolution to monitor and measure 601 digital, CAV, and composite analog (NTSC or PAL) video and analog audio signals. The output display includes a waveform and vector overlay, alarms, and analog stereo audio levels mixed or keyed over internally generated color background or picture. Inputs include two composite analog NTSC/PAL with one shared CAV and two 601 SDI digital inputs. Standard output is compatible for display on any SVGA computer monitor. The VTM-150 is easy to operate with dedicated buttons or knobs. Front panel setups are capable of being stored as 8 user presets. Alarms include Gamut (RGB) and EDH for SDI, Peak video, SC/H, Loss of Signal (sync or carrier), and Peak audio. The unit offers an output option for SDI and analog composite.

Features

- Two looping composite inputs, with NTSC/PAL auto detection
- Two looping SDI inputs, with 525/625 auto detection
- One CAV input (3 BNCs) configurable as Y/C, RGB, Y CB CR
- On screen display includes waveform, vector, audio and alarms mixed or keyed over internally generated color background or picture
- Standard display output for display on a computer monitor
- Alarms include Gamut (RGB) and EDH for SDI, Loss of Signal (sync or carrier) for composite and SDI, Peak video and SC/H for composite and Peak audio
- Eight user presets
- Four analog audio inputs
- Standards supported: NTSC and PAL composite, RGB, Beta 75 & 100, MII 75 & 100, EBU 75 & 100, SMPTE and Y-C component, plus 525/59.97 and 625/50 SDI
- Standards available: NTSC, PAL, 525 and 625

VTM Series Preconfigured Packages and Options

	Standard HD/SD	Standard SD Inputs	Video Optional Inputs	Looping Inputs Inputs	WFM	Gamut	Eye Pattern	Vector	Pixel Locator/Data Word	Line Select	Relative Timing	Closed Caption	Alarm Log	Audio	Output Type	Size
VTM -4100 PKG	2	0	2	YES	YES	YES	Option	YES	Option	YES	YES	YES	YES	Advanced Audio Analysis Option	XGA DVI	1RU
VTM -3100 PKG	0	2	2	YES	YES	YES	Option	YES	Option	YES	YES	YES	YES	Advanced Audio Analysis Option	XGA DVI	1RU

VTM Console (model VTM-ASX)

Console for all VTM Series™ on screen monitor instruments. Included are the chassis, power supply, cooling system fans, and system controller. Front panel controls with USB port, and back panel connections for Ethernet, 2nd USB port, one router and remote port, and LTC/GPI interface. A Graphic Display Engine and at least one input module are required for operation.

Options

VTM-OPT 40, GDE Module (graphic display engine) affords unit display capability of four (4)—input sources at a time (requires optional input module). Includes Video Relative Timing display Pixel Locator/Data Word Analyzer and Alarms with Peak Level Reporting.

VTM-OPT 10, GDE Module (display engine) affords unit display capability of one (1)—input source at a time. Includes Video Relative Timing display and Alarms with Peak Level Reporting.

VTM-OPT AAP, Advanced Analysis Package. Software upgrade only. Adds Pixel Locator/Data Word Analyzer.

VTM-OPT EYE-1, Dual SD-SDI Input module with SD Eye pattern. Two active looping connections with auto-detection (525/625). Monitoring output.

VTM-OPT SD-SDI, Dual SD-SDI Input module. Two passive looping connections with auto-detection (525/625) and Line Select. Internal and Blackburst references. Monitoring output.

VTM-OPT EYE-2, Dual HD/SD-SDI Input module with HD/SD Eye pattern. Two active looping connections with auto-detection (1080i, 1080p, and 720p at all popular frame rates including SD 525/625). Monitoring output.

VTM-OPT HD/SD, Dual HD/SD-SDI Input module. Two passive looping connections with auto-detection (1080i, 1080p, and 720p at all popular frame rates including SD 525/625) and Line Select. Internal and Blackburst/Tri level references. Monitoring output.

VTM-OPT ACV-2, Dual Composite Analog Input module. Two passive looping connections (NTSC/PAL) with auto-detection and Line Select.

RCU-1000, Remote Control Panel for VTM Series instruments. Replicates all of the front panel controls. 1RU.

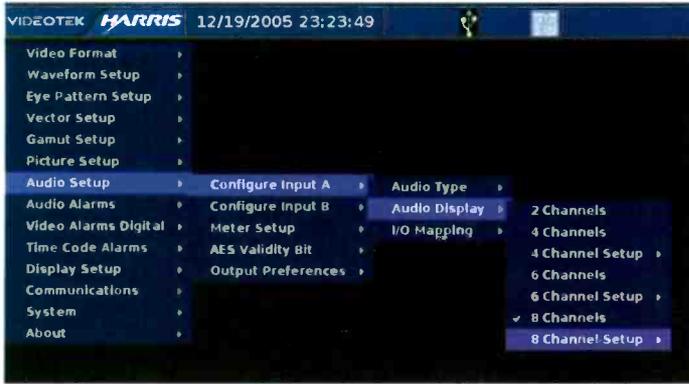
VTM-OPT ASI, Dual DVB-ASI/SMPTE 310 Input Module. Two passive looping connections with auto detection. ATSC/DVB table analysis.

A³, Advanced Audio Analysis Options for VTM Series Instruments

Harris offers a wide range of audio options to complement the advanced technology of the VTM Series test instruments. Options provide the ability to monitor/decode Dolby® Digital, Dolby® Digital Surround EX, Dolby® E, embedded, AES/EBU and analog audio. Additional tools include numerous International meter scales and ballistics, Metadata information display, Lissajous and CineSound® displays plus many more professional features. Please refer to the chart below for additional information.

Audio Options	Loudness Monitoring	SNR	Channels Displayed	Embed. Audio	Analog Input	Analog Outputs	AES/EBU Inputs	AES Input Expansion Channels	AES/EBU Outputs**	Channel Map	Dolby Digital Output	Dolby 2-ch. Decode	Dolby 8-ch. Decode	Alarms	Dolby Metadata Display
VTM A ³ -Opt. 2	NO	100dB	8	YES	B	B	4	4*	4	NO	NO	NO	NO	YES	NO
VTM A ³ -Opt. 3	YES	100dB	8	YES	B	B	8	Standard	4	YES	NO	NO	NO	YES	NO
VTM A ³ -Opt. 5	YES	100dB	8	YES	B	B	8	Standard	4	YES	YES	YES	YES	YES	YES

*Provided by A³-4004, Audio Expansion module option. Adds 4 AES/EBU input pairs. ** Shared with AES/EBU Inputs 1 thru 4.



Example of Intuitive SETUP Navigation

The VTM Series™ console is easily configured via direct access-to-display functions, selectable location and context-sensitive pop-up menus. The intuitive navigation system enables easy access to all functions for even the most inexperienced users.



Q-SEE™, Harris' patented display technology, enables users to configure their screen for any specific need. Whether full-screen, quadrant with picture thumbnail, or the convenient MULTI mode, Q-SEE™ can make it happen. Choose from waveform, vector, gamut, audio, picture and timing displays, and place each in any quadrant on the screen.

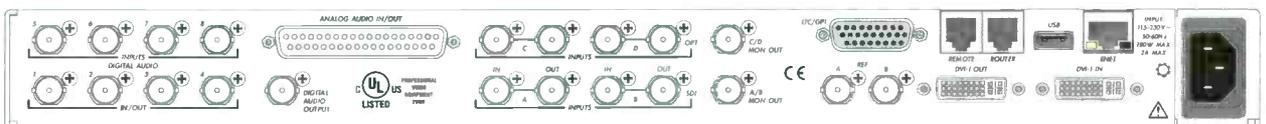
Q-SEE™ is just one more way the VTM Series™ proves it is the most versatile instrument in its class. When equipped with the proper input options, the VTM Series™ can output four different waveforms to the Q-SEE™ display, from four distinct signals — in essence, handling a job that used to require four separate monitoring instruments.

Features

- User-configurable hardware
- Display engine flexibility
- Dual auto detecting inputs for HD/SD-SDI, SD-SDI, or Analog Composite
- Standards: SMPTE-292M, SMPTE-259M-C, NTSC/PAL
- Multiple Reference Inputs
- Capability of displaying up to four different inputs simultaneously
- Customizable display functions, screen location, multiple displays
- Video Relative Timing display
- Patented Gamut display
- Multiple Picture Thumbnail
- A/B Parade and Overlay
- 608/708 Closed Caption detect/alarm/display
- Comprehensive Alarm set, Peak Level Report
- 16 direct-access user presets
- Illuminated controls and indicators
- DVI-I output
- USB ports front and back
- 10/100BaseT Ethernet, SNMP agent, Web Server, SpyderWeb II
- GPI and Router control

Options

- Selectable Graphic Display Engines
- Pixel locator/Data Word Analyzer
- Selectable Video Input Modules
 - Dual HD/SD-SDI Input
 - Dual HD/SD-SDI Input with Eye Pattern
 - Dual SD-SDI Input
 - Dual SD-SDI Input with Eye Pattern
 - Dual Composite Analog Input (NTSC/PAL)
 - Dual ASI Input
- RGB Dual link
- A³, Advanced Audio Analysis Modules
 - Meter and monitor up to eight channels of Analog, AES/EBU and Embedded
 - Dolby® Digital, Dolby® Surround EX™, Dolby® E, Pro-Logic I formats
 - Dolby® decoded outputs
 - "Loudness" metering and alarm
 - Multiple audio Lissajous display



VTM Series Back Panel



Monitor Optional

Harris' Videotek® VTM Series™ features the world's first user configurable, field upgradeable, multi-format test and measurement console. The innovative modular platform makes the VTM Series™ fully customizable and affords broadcasters unprecedented flexibility to choose exactly how they'll apply the award-winning Videotek technology. It's the perfect solution for today's multi-format environment.

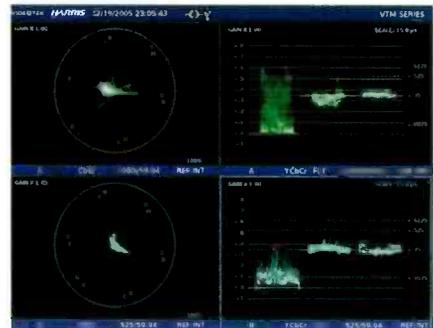
Start with the number of signals that can be monitored. When fully equipped, the VTM Series™ is the only test instrument of its kind that monitors and displays as many as four inputs simultaneously. Videotek's proprietary graphic display engines enable multiple input configurations to accommodate any environment. HD/SD, SD and composite analog inputs are available. Users can mix and match the appropriate graphic display engine to other options like eye-pattern with jitter display, ASI and audio packages featuring Dolby® decoding to create the ideal instrument for their specific need. A further benefit is a clear upgrade path when technical requirements change.

Based on the popular VTM products and featuring the same technological advances introduced in Harris' Videotek TVM instruments, the new VTM Series™ will impress with its functionality offering Waveform, Vector, Gamut, Audio, Picture, Timing, and Data Analyzer screens. But that's just the beginning. The unique patented Q-SEE™ display enhances the performance of this instrument when viewed on any common XGA monitor.

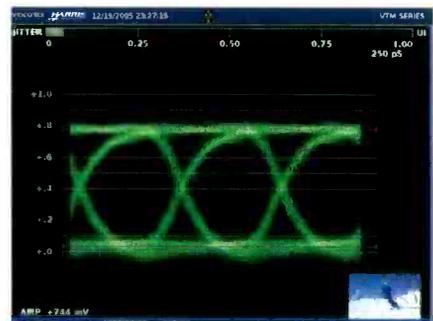
The VTM Series™ is also loaded with features designed to enhance the user's experience: illuminated controls, simple and intuitive navigation and a compact 1RU console. Favorite display configurations are instantly recalled using the assignable one-touch presets.

Whether customized with specially selected options or preconfigured by Harris' experts, the VTM Series™ is the optimal choice for any facility.

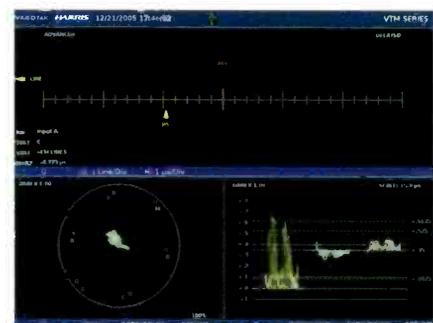
VTM Series™ Display Versatility Featuring Q-SEE™ Technology



Vector and Waveform Display of HD and SD signals.



HD Eye Pattern Waveform and Jitter Display with Amplitude Cursors and Picture Thumbnail.



MULTI Mode Display showing Relative Timing with Waveform and Vector.



NetVX™—Integrated High-Speed Networking Platform

With a totally modular architecture, NetVX can be configured to support any contribution and/or distribution application. Select either a 5RU chassis with slots for up to 17 modules (15 applications, 2 control) or a 1RU "starter system" chassis that holds up to three modules. Then, choose the modules you need for your specific application. As your needs expand, upgrades are as simple as plugging in additional modules.

Features

ATSC and DVB-[T/C/S] Compression Platform

- Encoding [HD, SD]
- Multiplexing [including Stat-Mux]
- Networking [IP, ATM, DS3/E3, OC-3/STM-1]
- Full ATSC and DVB Table [re-] Generation

Video [and Data and Voice] Networking Platform

- Encoding/Decoding, MPEG-2, MPEG-4/AVC, HD, SD
- Fully SFN Capable and proven, over ATM and IP
- Transport Video and data services over same links
- Map Video to/from IP, simultaneously for many streams
- Map Video to/from ATM, simultaneously for many streams
- Scheduling/Service Management for large network deployments



Intraplex® NetXpress™—IP Multiplexer

Intraplex® NetXpress™ takes IP audio transport to a new level of performance and reliability. It provides transport over packet switched networks for a wide range of real-time audio, voice, video and data applications.

Features

- Supports up to 32 Streams
- Simultaneous IP and T1/E1 Network Operation
- Broadcast Quality Performance
 - Forward Error Correction (FEC)
 - Low System Delay (less than 3ms)
 - Priority Tagging of Traffic
- System Management and Control Tools
 - Packet size control, jitter buffer adjustment, out-of-sequence packet restoration, stream performance statistics
 - Managed via SNMP and Browser
- Redundancy & Resiliency within Platform



Intraplex® STL Plus & AudioLink Plus

The Intraplex STL PLUS digital T1 STL system provides a fast and simple solution for linking studios and transmitter sites. With the STL PLUS, your station can be up and operating quickly and profitably, with the highest quality on-air sound available today.

The Intraplex AudioLink PLUS digital E1 system combines digital program audio with telephone and data traffic for studio to transmitter and studio to studio links.

The STL PLUS and AudioLink PLUS systems combine bidirectional transport of program audio with a wide variety of other traffic, including LAN/WAN data, telephone, intercom, fax, DAB audio, remote control, and video all over the same link. The systems can be deployed in a wide area network for data, voice and audio transport allowing multiple locations to share talent and administrative resources, thereby reducing station operating costs.

Features

- Crystal clear digital audio across town or across the country
- Accommodates a wide range of plug-in audio, data, and voice modules
- T1/E1 is bi-directional and allows simultaneous transport of LAN data, telephone circuits, and control channels over the same link
- T1/E1 links cost less than the multiple leased circuits they can replace

CONTROL PANELS



Hardware-Based Control Panels

NUCLEUS™



The NUCLEUS™ user-configurable control panel offers real-time control and monitoring of all Harris routers, as well as other CCS™ Protocol-enabled devices, including Harris processing, test and measurement and master control and branding products. Easily configured with an intuitive, drag-and-drop wizard, the NUCLEUS control panel is completely customizable for single-bus, multi-bus and X/Y crosspoint operation.

NUCLEUS™ provides 16 programmable LCD buttons including Category/Index, Source (button-per-source) select/status and Destination select/status, allowing users to tailor control to their specific applications. Additional paging keys allow quick access to more than 16 choices. Each of up to five local configurations can be set to limit users to specific levels, destinations and sources.

RCP-ID



RCP-ID control panels provide large, easy-to-read LCD buttons and easy download of text and/or graphics, allowing for fast changes and setup. Completely customizable, RCP-ID control panels can be configured for single-bus, multi-bus and X/Y operation. Panels can be set to limit users to specific levels, destinations and sources.

Also now available—new Ethernet versions of the RCP-ID panels offer paging for quick access to a large number of sources and/or destinations, and provide alarm indication on sources and destinations. The new panels support both coax and Ethernet connectivity.

ABA

The RCP-ABA series of control panels provides easy-to-read, eight-character displays and user-assignable buttons. RCP-ABA control panels are available in single-bus, multi-bus and X/Y

versions, but can be completely customized by the user. Panels can be set to limit users to specific levels, destinations and sources. Ethernet versions are available for any size system, and coax-only versions are available for systems 128x128 or smaller.

Programmable Pushbutton

The RCP-PB series of pushbutton control panels is available as both local panels on the front of Panacea routers and as remote control panels. Almost every size from 4x1 to 64x1 or 4x4 to 32x32 is available to meet your needs. Buttons are completely user-customizable, and panels can be set to limit users to specific levels, destinations and sources.

Control Software Applications

RouterWorks®—Advanced Software Control

Suited to a wide variety of PC-based control applications, the Windows®-based RouterWorks® provides simple control and monitoring of any size routing switcher. RouterWorks® offers single-bus, multi-bus and matrix views to combine the flexibility of the most powerful hardware control panel with the simplicity of a graphical user interface.

RouterMapper®—Free Configuration Software

The free RouterMapper® software provides a graphical configuration utility for configuring your routing system. Its easy-to-use, drag-n-drop interface allows you to partition your matrices, assign source and destination names, and assign specific functionality to buttons on your control panels.

CCS Navigator™ – Advanced, Fully Customizable System Management Application

CCS Navigator™ is an innovative software application that provides advanced tools for creating customizable GUIs (Graphical User Interfaces) that simplify your operations. Whether you are creating GUIs for use with Routing, Master Control, Quality Assurance (QA) Stations, Control and Monitoring, Network Management or other applications, CCS Navigator™ reduces the complexity of everyday actions to simple point-and-click operations.

Third-Party Interfaces

Edge

Edge is a 1RU device that acts as a bridge between Harris XY router protocols and other third-party router control/monitoring protocols. Edge is distinguished from existing Harris SPTs (Serial Protocol Translators) in that it can support third-party TCP/IP protocols as well as serial protocols. Edge provides support for the Thomson/Grass Valley Group SMS-7000 protocol and the Utah routing protocol. Please check our website for information on future protocol support releases.

Third-Party Routers and Control Systems Harris can Interface with:

Grass Valley/Thomson
Image Video
Lightwave
Nexus
NVision
Panasonic
Pro-Bel Control
Sandar Control
Sony
Tandberg Control
Television Systems Ltd. (TSL)

Panacea™



The affordable, compact Panacea™ routing switcher line has become the market leader for small routing applications. Offering the largest selection of matrix sizes, options and built-in control features, Panacea allows you to purchase a router tailored to your applications.

Features

- Flexible matrix partitioning options allow for flexibility and customization
- Choose either integrated universal AC or DC power supplies or external (brick) universal power supplies
- Redundant power supplies
- Clean switching of discrete SDI or HD-SDI video option
- Quiet switching of discrete AES/EBU digital audio option
- Signal diagnosis capabilities (i.e., signal presence, error detection)
- Control via X/Y, serial RS-232/422, local control panel, optional remote control panel or direct-to-frame IP/Ethernet/SNMP

Panacea™ Lite



Panacea™ Lite offers mixed-format, broadcast-quality, 12x1 utility routing—all within an affordable, compact 1RU frame.

Features

- Competitive pricing
- Shallow 1RU frame with adjustable mounting ears — mount in the rear of an equipment rack!
- Comprehensive support of signal formats
- Built-in AC Supply
- Available as a dual-format router (analog video and audio)
- SDI video and AES, HD-SDI video and AES router, or in standalone formats (analog video, analog audio, SDI and HD-SDI video)
- Control via X/Y, serial RS-232/422, local control panel, optional remote control panel, or GPI

Panacea™ Clean and Quiet



Panacea™ Clean and Quiet Switch is the industry's most powerful dual-channel clean video with embedded audio routing switcher — providing more features, functions and signal outputs than any similar product available today.

Features

- 16 inputs, 2 clean + 6 auxiliary outputs
- Unique HD-SDI and SD-SDI simulcasting
- Transitions supported for both video and audio



Capable of routing digital, analog and data (port) signal formats in the same frame, Integrator® is a multiformat, medium-scale router that is ideal for true analog video and audio applications, digital routing up to 270 Mb/s, telco routing and mixed signal routing where no conversion is required.

The Integrator router is scalable in groups of 32 I/O up to 128x64 in 6RU for video formats, and up to 128x128 for audio/data signals. Particularly suited to rack-space limited applications, Integrator® is also available in a 4RU frame that provides routing up to 64x64, or dual 32 x32 formats such as analog video and stereo audio, SD-SDI and stereo audio, SD-SDI and AES, etc. Front-loading, hot-swappable modules and redundant power supplies and controllers ensure maximum reliability.

Comprehensive Control

A powerful and complete control system is provided through programmable control panels and our RouterMapper, RouterWorks®, CCS Pilot™ and CCS Navigator™ control software. Our control options free you from hardware constraints with virtual crosspoint mapping and soft-matrix partitioning; crosspoint restrictions such as locks and protects; uploadable drivers for diagnostics and control of other vendors' equipment; system polling for new or added component configuration without interrupting operations; and traceable system signal paths. Integrator® is fully compatible with existing Harris control software and hardware, allowing you to easily integrate into or upgrade existing or new router installations.



INTEGRATOR™

Key Features

- Scalable, mid-size routing
 - Up to 64x64 in 4RU
 - Up to 128x64 in 6RU
 - Up to 128x128 in 8RU (audio/data only!)
- Especially well suited for:
 - True analog video and audio applications
 - Mixed signal routing where no conversion to/from is required (see Platinum™ MX)
 - Telco routing including DS3/E3 signals
 - Data/port routing
 - Rack space-limited applications <= 64x64 (with 4RU frame)
- Front-loading, hot-swappable, modular I/O scalable in groups of 32 ins or outs
- Redundant PSUs and controllers

Important:

- No HD-SDI support (see Platinum™, Platinum™ MX or Panacea™)
- Integrator® Gold to be phased out over time with new Platinum™ MX



PLATINUM™ MX

PLATINUM™ MX

The Platinum™ MX provides cost-effective, scalable routing up to 128x128 in a compact 9RU frame. Platinum™ MX extends the innovative Platinum™ line of large routers into medium-scale configurations, while delivering the same advanced capabilities and features of the larger 256x256 and 512x512 Platinum routers.

Platinum™ MX supports a mix of any signal—video and audio, from analog to HD—all in the same frame. It also features built-in processing, allowing for internal format conversion automatically as needed. Designed with the same advanced architecture as the large Platinum router, Platinum™ MX provides flexible control capabilities, redundant power supplies, controllers and cross-points, and cost-effective, built-in, expansion potential.

Built for maximum reliability in even the harshest, 24/7 operating environment, Platinum™ MX is ideal for network, local broadcaster, mobile production, cable, telco, military, government and corporate applications.

Enhanced Control and Monitoring

The Platinum™ MX distributed control system is unique in the industry, requiring no separate, centralized controller. Each Platinum™ MX frame features redundant control modules that store configuration information related to that frame in non-volatile memory and contain all the information that frame needs to operate within a system.

Platinum™ MX routing switchers are supported by an extensive line of Harris applications, protocol interfaces and control panels. This includes several new hardware-based control panels applicable to control and monitoring of routing, as well as other product lines.



Key Features

- Scalable routing up to 128x128 in 9RU
 - Larger systems are possible with multiple frames
- Video Routing
 - HD-SDI digital multi-rate from 3 Mb/s to 3.0 Gb/s
 - Digital video signals including SMPTE 310, SDI, ASI, HD-SDI
 - Analog video via conversion to/from SD-SDI on I/O modules
- Audio routing
 - Digital audio signals including balanced and un-balanced AES
 - Analog stereo audio via conversion to/from AES on I/O modules
- Module I/O in groups of 8
- Route to/from digital and analog signals with no external processing
- Front-loading, hot-swappable modules for 24/7 operation
- Redundancy throughout
 - Power supplies, controllers and cross-points
- Enhanced control and monitoring capabilities with support for Harris
- Command Control System™ (CCS™)
 - New desk and rack-mount HW-based control panels
 - Enhancements to award-winning CCS Navigator™ application
- Secure access rights with restrictions by level, source and destination
- CCS™ Protocol, SNMP, Leitch pass-through and third-party Protocol support



Platinum™ routing switchers combine a highly robust architecture with the flexibility required to future-proof your investment, delivering unsurpassed value for your larger routing needs.

Designed to support high-quality routing for mission-critical applications, Platinum™ routing switchers are well-suited to network, local broadcaster, mobile production, cable, telco, military, government and corporate applications—any environment that requires routing of a large number of signals.

Higher Reliability

Platinum™ routing frames are designed for harsh, 24/7 operation (including mobile truck environments), and feature front-loading, hot-swappable modules for ease of serviceability. Employing the latest technology, Platinum™ allows more functionality at lower power consumption, and is supported by redundant, load-sharing power supplies. Airflow is from front to back, with each fan individually replaceable without taking the system off-line.

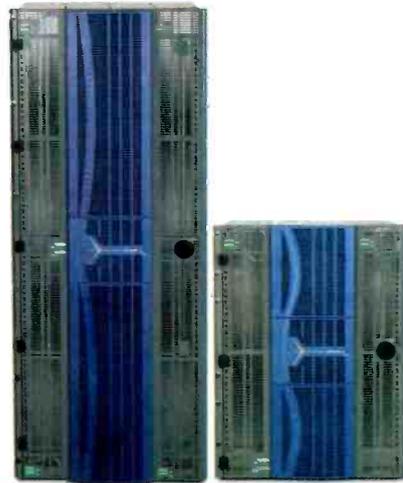
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Platinum™ routing switchers are supported by an extensive line of Harris applications, protocol interfaces and control panels. This includes several new hardware-based control panels applicable to control and monitoring of routing, as well as other product lines.

Exceptional Serviceability and Support

In environments that require routing of a large number of signals, exceptional serviceability is critical. The Platinum™ line is designed to provide maximum ease of serviceability, allowing problems to be easily detected even in multichannel facilities and ensuring that your system remains online even during upgrades.



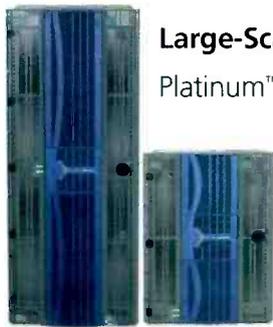
Key Features

- Routing for large systems
 - 256x256 in 15RU
 - 512x512 in 28RU
 - Larger systems are possible with multiple frames
- Video routing
 - HD-SDI digital multi-rate from 3 Mb/s to 3.0 Gb/s
 - Digital video signals including SMPTE 310, SDI, ASI, HD-SDI
 - Analog video via conversion to/from SD-SDI on I/O modules
- Audio routing
 - Digital audio signals including balanced and unbalanced AES
 - Analog stereo audio via conversion to/from AES on I/O modules
- Module I/O in groups of 8
- Route to/from digital and analog signals with no external processing
- Front-loading, hot-swappable modules for 24/7 operation
- Redundancy throughout
 - Power supplies, resource modules, signal paths
- Enhanced control and monitoring capabilities with support for Harris Command Control System™ (CCS™)
 - New desk and rack-mount HW-based control panels
 - Enhancements to award-winning CCS Navigator™ application
- Secure access rights with restrictions by level, source and destination
- CCS™ Protocol, SNMP, Leitch pass-through and third-party protocol support



ROUTING SWITCHERS

No matter what your requirements, we've got the router for you. Any size, any budget, any signal format—our portfolio can deliver. And you won't sacrifice quality or performance for price. We offer affordable, broadcast quality routing switchers that route all signal formats from analog to HD for any sized application. Which ever system you choose, you're investing in world-renowned Harris routing technology. Robust architecture, exceptional scalability, space-saving frames, superior control, unsurpassed reliability—that's what you can expect from every router in our portfolio.



Large-Scale Routing

Platinum™

Innovative, large-scale routing

- Up to 256x256 in 15RU, up to 512x512 in 28RU
- Larger systems possible with multiple frames (call for details)
- HD, SD, ASI, analog video, AES, analog audio in the same frame
- Modular I/O in groups of 8
- Highly reliable with enhanced control and monitoring
- Built-in processing with automatic conversion as required

Medium Routing

Platinum™ MX



Advanced, medium-scale routing

- Up to 128 X 128 in 9RU
- HD, SD, ASI, analog video, AES, analog audio in the same frame
- Modular I/O in groups of 8
- Highly reliable with enhanced control and monitoring
- Built-in processing with automatic conversion as required

Integrator®



Mid-size, analog, telco, and digital routing up to 270 Mb/s

- Up to 64x64 in 4RU, 128x64 in 6RU, 128x128 in 8RU (audio/data)
- SDI, ASI, DS3, E3, AES, stereo, mono and data/port routing
- Modular I/O in groups of 32
- Optional conversion to/from AES and analog audio

Small Routing

Panacea™



Broadcast-quality small routing

- 8x8 to 32x32 and monitoring sizes from 16x1 to 256x4
- Mixed signal routing for any format from analog to HD-SDI
- Also available as dual-channel Clean/Quiet switch

Panacea™ Lite



Cost-effective, utility 12x1 routing

- Mixed signal routing for any format from analog to HD-SDI
- Ultra low-cost routing

Panacea™ Clean/Quiet



Dual-channel, HD-SDI/SD-SDI clean switch with quiet embedded audio

- 16x2 clean + 6 aux buses OR dual 8x1 clean + 3 aux buses
- Unique HD-SDI and SD-SDI simulcasting
- Transitions supported for both video and audio

SD/HD Configurable Master Control With Embedded Multilayer Branding

Based on the industry-leading NEO® modular platform, IconMaster™ is the only master control that can be combined with other advanced applications to create a complete, self-contained channel release system.

IconMaster™ is a fully configurable SD/HD master control and branding solution that combines critical master control functions with multilayer branding in a cost-effective, modular card format.

Harris offers an easy upgrade path from our IconLogo modular branding solution to a full IconMaster™, ensuring maximum protection of your investment.

IconMaster™ — For today's and tomorrow's master control and branding needs.



Future-proofed

- SD and HD configurable with no hardware changes
- Compact, two-slot solution leaves 10 free NEO® slots for future growth

Flexible

- Assignable (two-channel) squeezeback position
- Internal routing and/or external routing

Control

- 12-input desk mount/rack mount control panel
- Industry-standard buttons with LEDs for bus selection & transitions
- Automation interface for core functions
- Optional intelligent audio control panel
- Optional touch-screen capable auxiliary control application with audio metering (IconMasterNAV)
- 12 AUX control buses

Features

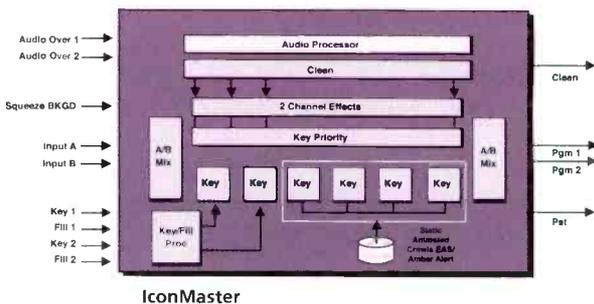
- 12-input HD/SD configurable master control with embedded Branding
- Full next-event preview
- 6 Keys—2 external (key/fill), 4 internal branding keys
 - Static and animated
 - Analog and digital clocks
 - Crawls and EAS/Amber Alert

- Flexible audio with 16 channels embedded (HD)
- 2 audio overs with dedicated inputs
- Machine control

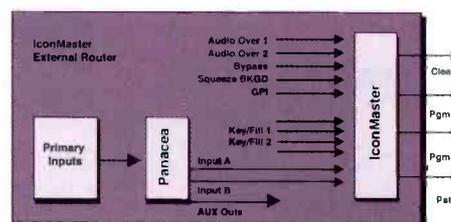
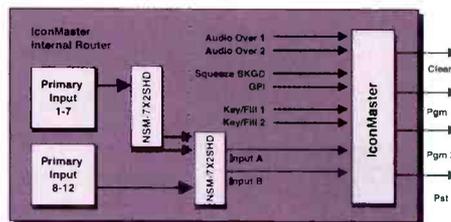


Options

- Relay bypass with dedicated bypass input
- Discrete AES audio (embedded audio standard)
- 2-channel video squeeze back
- Crawl with dynamic data insertion
- RSS and ODBC connectivity
- EAS and Amber Alert (Emergency Alert System) insertion
- Control panel with fader bar



IconMaster: Internal Routing



IconMaster: External Routing

Icon™ — A Family of Products and Integrated Applications for Master Control & Branding

When it comes to master control and branding, you want unrivaled choice and flexibility. You also want an advanced, future-proofed set of solutions that allow your businesses to grow as individual needs dictate. The Harris Icon™ family delivers the broadest suite of master control and branding products on the market, from master control switching to master control graphics and channel presentation. And with the Icon™ family, you can feel confident your investment is truly protected — all our Icon™ products are tightly integrated to ensure your master control and branding solution can adapt as your needs evolve.

IconLogo™ — Master Control Channel Branding



IconLogo™ is a modular branding solution based on the Harris NEO® platform. The next-generation IconLogo™ supports four layers of branding for analog, SD and HD applications. IconLogo™ provides an easy upgrade path from SD to HD and even to a full IconMaster™. It is ideal for channel branding applications such as time/temperature, stills/animations, audio clip playback and text crawls for breaking news or EAS requirements. These features are made possible as software functionality and advanced graphics capabilities are shared across the Icon™ family.

IconMaster™ — SD/HD Configurable Master Control with Embedded Branding



IconMaster™, also based on the industry-leading NEO® modular platform, combines critical master control functions with multilayer integrated branding. Providing traditional master control core functionality in a significantly smaller size, IconMaster™ is the only master control that can be combined with other NEO® advanced applications to create the ultimate plug-and-play system — all in the same frame. IconMaster™ supports internal routing using NEO® routing modules and/or external routing with Harris or third-party routers. A uniquely future-proofed system, IconMaster™ is fully configurable between SD and HD formats without the need for expensive upgrades or replacements.

IconStation™ — Master Control Graphics and Channel Presentation



IconStation™ is the first branding solution to combine logo insertion with multiple real-time data crawls and a squeezeback DVE for maximum channel branding impact. Ideally suited to either large or small broadcasters seeking a reliable on-air branding solution, IconStation™ includes award-winning Inscribe® character generation for superior title and graphic creation, and is ideal for enhanced or demanding applications requiring functions such as L-bars effects, template-driven channel layout, unlimited layering and multilevel animation/still insertion. IconStation™ is SD/HD configurable depending on your requirements.

Icon™ — For today's and tomorrow's master control and branding needs.



USM6800 Utility Video Distribution Amplifier

The USM-6800+ is a one in, eight out SDI video utility distribution amplifier, ideal for SDI component video installations.

VSI6800+ SDI/ASI Equalizing Reclocking Distribution Amplifier

The VSI-6800+ is a one in, eight out SDI/ASI video distribution amplifier. It meets the requirements of MPTE259ABC and DVB-ASI. Because of its excellent signal transition performance, it is an ideal distribution amplifier for ASI distribution. The VSI6800+ comes in two models, VSI6800+S: 1 input and 4 outputs, VSI6800+D: 1 input and 8 output.

VTM6800+ SDI Triple Monitoring Distribution Amplifier

The VTM6800+ 3-channel SDI monitoring distribution amplifier combines the functions of an equalizing, reclocking SDI DA and a 4:2:2 to NTSC/PAL converter for 3 channels on a single DA-sized card. Three SDI 4:2:2 isolated inputs. Each SDI input has one corresponding composite and one corresponding SDI copy output that is equalized and reclocked.

DVSE6800+ SDI/ASI Dual Video Equalizing and Reclocking Distribution Amplifier

The DVSD/DVSE6800+ Dual DAs provide 2 channels of SDI/ASI video distribution with cable equalizing (and reclocking on DVSE only). The DVSD/DVSE6800+ Dual DA will provide 4 outputs for each input (2-1x4) as well as a jumper that provides a method allowing for a single-channel DA with 8 outputs(1x8). The DVSE/DVSD6800+(D) has a unique LOS (loss of signal) feature. With LOS, an automatic changeover switch can be set to switch input 1 to input 2 at loss of input 1.

HSD / HSE6800+ HDTV ASI, SDI Distribution Amplifier

The HSD6800+ and HSE6800+ are SD/HD serial digital video distribution amplifiers in the 6800+™ family:

The HSD6800+ is an SD/HD/ASI serial digital video distribution amplifier with cable equalizing.

The HSE6800+ is an SD/HD/ASI serial digital video distribution amplifier with cable equalizing and reclocking. Both DAs feature high-performance video, low cost, remote control, and diagnostic capability in Harris' control system. You can set up, control, and monitor the HSD/HSE6800+ either locally via a card-edge jumper or remotely on a PC. For remote control, you can use either a serial RS-232 or optional ICE6800+ Ethernet connection.

DHSE6800+ HD / SD/ASI Dual Video Equalizing and Reclocking Distribution Amplifier

The DHSE6800+ and DHSD6800+ dual DAs provide 2 channels of HD/SD-SDI video distribution with cable equalizing (and reclocking on DHSE only). The DHSD/DHSE6800+ Dual DA will provide 4 outputs for each input (2-1x4) as well as a jumper that provides a method allowing for a single-channel DA with 8 outputs(1x8). The DHSE/DHSD6800+(D) has a unique LOS (loss of signal) feature. With LOS, an automatic changeover switch can be set to switch input 1 to input 2 at loss of input 1.

INT-EX1x2 and INT-EX1x6 Analog Video, Digital Video, Digital Audio Distribution Amplifier Packages

The INT-EX1x2 is a 1RU package containing 16 one input, two output distribution amplifiers for analog composite/component, 75 ohm AES digital audio and SDI digital video signals.

For applications where price and space are limited, the INT-EX1x6 distributes 16 signals of virtually any format without extra processing and cost, allowing distribution of wideband analog video, SDI video, and AES audio. The INT-EX1x6 offers 16 channels of 1 input, 6 output distribution and redundant power supplies with fail alarms via GPI contacts in a single 2RU frame that can be mounted in either the front or rear of your equipment rack.

HDA-1508 HD / SD Digital Distribution Amplifier

Standalone, 1/3RU digital distribution amplifier with cable equalization and eight outputs for HD/SDI and SDI video data rates of 143 Mb/s to 1.45 Gb/s.

DDA-108 Digital Distribution Amplifier

Standalone, 1/3RU digital distribution amplifier with cable equalization and eight outputs for serial digital video data rates of 143, 177, 270 and 360 Mb/s.

DDA-144 Serial Digital Distribution Amplifier with Analog Composite Monitor Outputs

Standalone, 1/3RU SDI monitoring distribution amplifier with equalization, reclocking and composite video encoding. Includes four serial component digital outputs and four composite analog outputs.

VDA-16 Video Distribution Amplifier

Standalone video distribution amplifier with cable equalization, one looping video input, and six isolated video outputs.

AMD-880 Mono Audio Distribution Amplifier

The AMD-880 is a one in, eight out monaural analog audio distribution amplifier for balanced 66 or 600 ohm signals.

ASD-880 Stereo Audio Distribution Amplifier

The ASD-880 is a one in, four out stereo (2 channels) analog audio distribution amplifier for balanced 66 or 600 ohm signals.

APD-880 Mono / Stereo / Summing Programmable Audio Distribution Amplifier

The APD-880 can be programmed using plug-in submodules to provide monaural, stereo or summed, or a combination of outputs.

ARG-880 Audio Remote Gain Amplifier

The ARG-880 is a one in, eight out monaural analog audio distribution amplifier for balanced 66 or 600 ohm signals with remote gain control.

AES-880 AES / EBU Digital Audio Distribution Amplifier

The AES-880 is a one in, eight out AES/EBU digital audio distribution amplifier for use in 110 ohm balanced installations.

ATG-880 Audio Tone Generator

The ATG-880 provides audio tones of 400 and 1000 Hz on four dual outputs at levels of +8, +4, 0 and -10 dBm. 440 Hz tone may be requested in place of 400 Hz.

ADC-880 Analog to Digital Audio Converter

The ADC-880 is a two-channel analog audio to 110 ohm balanced AES digital audio converter with 20-bit precision.

DAC-880 Digital to Analog Audio Converter

The DAC-880 is a 110 ohm balanced AES digital audio to two-channel analog audio converter with 20-bit precision.

INT-EX1x4A2 Analog Audio Distribution Amplifier Package

The INT-EX1x4A2 is a 2RU package containing 32 one input, four output stereo (two channels) distribution amplifiers.

ADA-16 Audio Distribution Amplifier

Standalone audio distribution amplifier with one balanced/unbalanced audio input and six unbalanced audio outputs. Uses barrier strip input/output connectors.

ADS-24 Stereo Audio Distribution Amplifier

Standalone audio distribution amplifier with one stereo balanced/unbalanced audio input and four stereo balanced/unbalanced audio outputs.

Additional Distribution Amplifiers

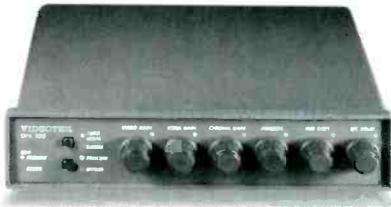
ARG6800+	Analog Audio Remote Gain Distribution Amplifier	HDC-3901-AD	HDTV Down-converter and Distribution Amplifier with audio outputs
VSM6800+	SDI Monitoring Distribution Amplifier	VSM-3901	SDI Monitoring Distribution Amplifier
VTM6800+	Triple Monitoring Distribution Amplifier	HSE-3901	HDTV / SDI Reclocking Distribution Amplifier
VCA6800+	Composite Video Equalizing & Clamping Distribution Amplifier	VSE-3901	SDI Reclocking Distribution Amplifier
VDA6800+	Composite Video Distribution Amplifier	AES-3981	AES Audio Distribution Amplifier
VEA6800+	Composite Video Equalizing Distribution Amplifier	VEA-3901	Video Equalizing Distribution Amplifier
VRG6800+	Composite Video Remote Gain Distribution Amplifier	ADA-3981	Analog Audio Distribution Amplifier
VPD-6830	Composite Video Programmable Distribution Amplifier	UDA-683	Utility Video Distribution Amplifier
AES6800+	AES Audio Distribution Amplifier	VDA-683	Video Distribution Amplifier
VSE6800+	SDI Video Equalizing Distribution Amplifier	VEA-683	Video Equalizing Amplifier
VSD6800+	SDI Video Distribution Amplifier	VEH-683	Video Wide Band Equalizing Amplifier
HDC6800+	HDTV Down-converter		
DHSD6800+	Dual HDTV, ASI, SDI, Distribution Amplifier		
DVSD6800+	SDI, ASI Video Equalizing Distribution Amplifier		
HDC-3901	HDTV Down-converter and Distribution Amplifier		

SDC-101 Serial Digital Video Color Corrector



The **SDC-101** digital color corrector accepts a SMPTE 259M-C input and produces an output of the same format. It provides the user with real-time control over common video parameters for the purpose of correcting or enhancing video signals. Familiar and understandable analog terms give the user the traditional look and feel of an analog color corrector, while 10-bit digital processing guarantees optimum signal quality. The SDC-101 lets you inexpensively correct picture errors and alter video levels in component serial digital video. It accurately corrects and enhances more than 40 critical parameters and stores 50 user-defined presets.

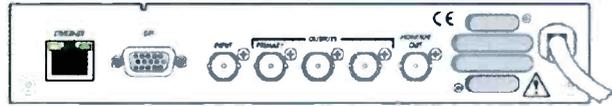
DPA-100 Serial Digital Processing Amplifier



The **DPA-100** serial digital processing amplifier provides the controls that are familiar in the analog world, while working in a pure component serial digital format. The unique, automatic "Broadcast Legal" function monitors the signal and looks for colors which, while legal in the component digital environment, fall outside the limits legal for NTSC or PAL broadcast. The DPA-100 automatically adjusts these values to provide a clean, properly modified signal to feed an encoder, transmission system or storage device. The DPA-100 also provides control, via dedicated knobs, of six video parameters including Video Gain, Luminance Gain, Chroma Gain, Hue, Black Level and Y/C Delay. Front panel LEDs provide constant system status monitoring. The system includes two optional, separate remote control units, which operate over an RS-422 interface.

LEGALIZATION & COLOR CORRECTION

DL-860 HD/SD Serial Digital Legalizers



Features

- Instantaneous pixel-by-pixel evaluation and correction
- Adjustable Encoded Clip softness
- Fully adjustable RGB and Encoded limits
- Fully adjustable HD and SD Clip levels
- Corrects for HD and SD color space
- Blank or pass ancillary data
- Adjustable alarm mask
- Harris standard front-panel EQ display
- CRC monitoring with error indication, recalculation and insertion

Following on from the multiple-award-winning DL-850HD high-definition serial digital legalizer, the unique, new DL-860 is an industry-leading legalizer for HD and SD program signals. The DL-860 accepts all popular HD and SD formats, and offers complete flexibility for legalizing HD and SD signals. The DL-860 output format tracks the input format, and the signal can be legalized to HD, SD, RGB, and/or encoded color space. CRC values are monitored and recalculated to ensure proper output values. Input EQ added to the incoming video is displayed on the front panel. The DL-860 has a selection to pass or blank all ancillary data without any alteration except CRC correction. All legalization limits are variable, allowing for many custom configurations to the HD Clips, SD Clips, Encoded gamut and RGB gamut limits. Direct access and operation of the DL-860 is straightforward, from the backlit front panel LCD display to the LED status indications, function selection buttons, and knob for easy menu navigation. All operational parameters, including the selectable bypass function, are also supported via Ethernet using the embedded Web server interface. The DL-860 also supports CCS Navigator™ control and monitoring software, and the NUCLEUS™ user-customizable control panel. Options for HD/SD processing amplifiers and gamut monitoring provide a complete monitoring and processing tool for legalizing your HD and SD signals.

DL-810 SD Serial Digital Legalizer



For SD-only applications, the DL-810 provides the same capabilities for monitoring and processing as the DL-860 with the exception of HD input and output and HD color space legalization.

Neural Surround™ Audio Processing

There are many considerations when bringing surround sound into the home: Adding surround to an existing infrastructure; ensuring seamless transition between mono, stereo and surround sound mixes; and dealing with loudness variations from program to commercials and back.

Neural Surround™ products enhance the audio experience in the home by providing seamless transitions between mono, stereo, and 5.1 mixes and by managing loudness between commercials, bumpers and program audio. Neural Surround™ products integrate easily with X75™, 6800+™ and NEO®; DownMix, UpMix and MultiMerge with PowerLift processing enables seamless audio transitions before Dolby® E and Digital (AC-3) compression and provide effective means of adding 5.1 into a stereo audio infrastructure.

As the fastest growing surround format in the consumer industry, Neural Surround™ has been adopted by the leading receiver companies such as Yamaha, Onkyo, Denon, Pioneer and Sony.

Neural Surround™ Features

- **Economy**—Enables broadcasters to move to 5.1 surround sound using existing stereo audio infrastructure
 - Using UpMix, DownMix and MultiMerge, a complete 5.1 infrastructure can be added economically into today's television systems
- **Processing**—Add an "upconvert" to an audio signal while upconverting a video signal
 - The UpMix or MultiMerge adds a pleasing surround sound image to an upconverted video signal
 - Neural Audio's Stereo to 5.1 UpMix operates in the frequency domain, allowing for better performance over PLII (ProLogicII) and SRS upmixers by offering surround sound rear speaker audio consistency with a natural sound, removing dialog leakage providing an overall more consistent and stable audio experience.
- **Improved "audio experience"**—Any audio signal can be processed to a pleasing 5.1 before compressing at the Dolby Digital (AC-3) encoder
 - MultiMerge is the easy choice to improve the audio experience in the home by providing a 5.1 mix at all times

Neural Surround™ DownMix: A surround sound 5.1 mix, mixed down to a stereo program with the capability to be passed through the stereo infrastructure, mixed with other audio signals (eg: voice-over) and later upmixed to 5.1 maintaining the surround sound.

Neural Surround™ UpMix: Any mono, stereo or stereo mix with encoded surround sound information is mixed up to a 5.1 surround sound.

MultiMerge: Processes any mono, stereo or stereo mix with encoded surround sound information and 5.1 mixes to a 5.1 surround sound before compression and transmission.

Neural PowerLift: Manages stereo and 5.1 paths for loudness management.

For more information, visit: <http://www.neuralaudio.com/>.



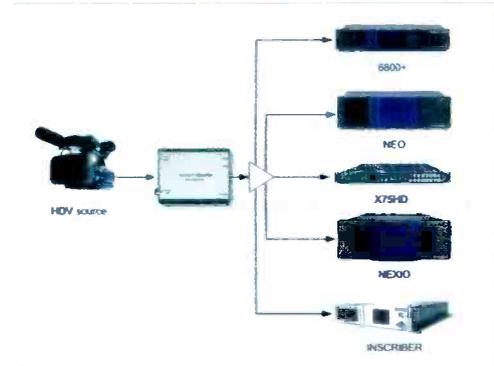
X25-DC-1

X25-DC-1

X25-DC-1—HDV to HD-SDI Converter

HDV is becoming more popular as a consumer and prosumer tape transport for use in HDTV television and news productions.

In a professional television facility, HD-SDI is the interface for HDTV equipment. The X25-DC-1 provides a conversion from HDV (720p or 1080i) to HD-SDI with embedded audio and timecode. As well, the X25-DC-1 can cross-convert from 1080i to 720p or downconvert to 480i with ARC settings for anamorphic, letterbox, or edge crop output.



Features

- HDV to HD-SDI conversion
- Selection for SD-SDI downconverted with ARC or HD-SDI cross-converted output
- Embedded stereo audio and timecode
- Small form factor
- Supports the following formats:
 - 1440 x 1080i, 29.97Hz
 - 1440 x 1080i, 25Hz
 - 1440 x 1080i, 23.98Hz
 - 1280 x 720p, 59.94Hz
 - 1280 x 720p, 50Hz
 - 1280 x 720p, 29.97Hz
 - 1280 x 720p, 25Hz
 - 1280 x 720p, 23.98Hz
- Supports Avid® Adrenaline HD™, Avid® DS Nitris®, Avid Media Composer®, Final Cut Pro (with AJA or Blackmagic card), Adobe® Premiere®, Media 100®, and Quantel Products. Compatible with Sony HDCAM, DigiBeta Decks, Sony, JVC and Canon camcorders.
- Eliminates long render times associated with HDV editing
- Enables real-time conversion of HDV to DNxHD, DVCProHD and other I-Frame CODECS, as well as uncompressed HD or SD 4:2:2 video + audio



The Harris CCS (Command and Control System) Navigator™ software and NUCLEUS™ customizable control panels further enhance the remote control aspects of the X75™ for any application. The CCS Protocol allows for integration into automation systems.

Limitless Applications

Expanding video processing to include “anything in” to “everything out” and M-PATH Multiple Path and Simulcast conversions, the X75™ is equally suited for use in analog, digital, or high-definition hybrid facilities. The X75™ provides a simple solution for even the most complex applications. For production and editing, the X75™ provides conversion to and from any signal type for HDTV productions. In news environments, it can time base correct any tape format — analog, digital or HDTV. For broadcast, the X75™ can perform upconversion for HD output, downconversion for monitoring/logging, and cross-conversion for programs that are recorded in other than the native format for the station. For ease of timing video relative to audio over large systems, the video to audio timing tool allows for an out of service robust video and audio test signal that can be analyzed for any video to audio timing differences through analog/digital, MPEG code/decode, and up/down/cross conversion processing.

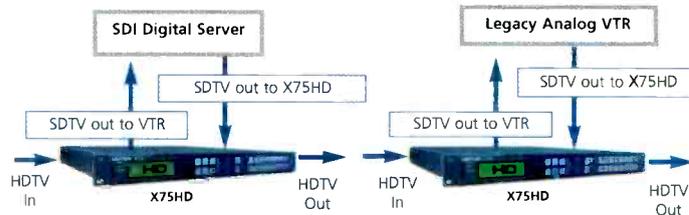
M-PATH™ Multiple Path Processing Supports Bidirectional Processing

The exclusive M-PATH™ feature provides multiple directional connectivity between analog, digital and high-definition tape transports or routing systems. Enabling simultaneous converter and frame synchronizer operation, M-PATH mode routes HDTV optical fiber or HD-SDI and converts and synchronizes directly to the SDTV analog and SDI video outputs, which feed the inputs of analog composite and component and digital tape machines and routing systems. The analog or digital

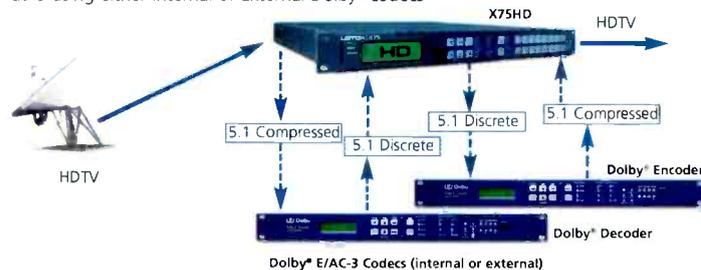
outputs of tape machines or routing systems can be simultaneously connected to one of the synchronizer’s SDTV analog or digital inputs where it can be processed and output via the HDTV optical fiber and HD-SDI port. Audio signals are handled in a similar fashion, with eight or sixteen channels of processing in each direction. Analog (two stereo pairs) and two or five AES inputs and outputs or eight AES inputs and outputs with embedded HD-SDI and SDI audio are also supported.

X75™

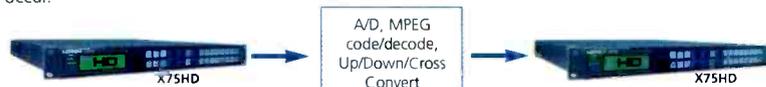
M-PATH — Simultaneous UP and DOWN Conversion Example



Compressed/Embedded Audio — Audio Processing for Discrete, Embedded and Compressed Audio using either Internal or External Dolby® codecs



Video to Audio Timing Measurement Tool — Send robust video/audio test signals through your system (inter/intra-facility) and measure the video to audio timing differences that may occur.



X75™ HD/SD

Multiple Path Converter, Synchronizer ... and More

Combining HD and legacy, standard-definition video and audio processing capabilities, all in a space-saving 1RU package, the X75™ is the definitive, all-in-one solution for broadcasters who have made or are making the transition to HDTV.



X75™

More Than Just a Synchronizer

- Upgrade from SDTV to HDTV
- Audio Embedder/De-Embedder for SDI and HD-SDI
- Bidirectional Standard/High-Definition Converter
- Video Processor with Auto-Switch Time Base Corrector
- 8-, 16- or 32-channel internal audio processing with up to 8 AES I/O
- Integrated optional Dolby® E compression and/or Dolby® E/AC-3 decompression options
- Video and Surround Sound Audio Processing
- Closed Caption Processing
- MPEG-4 Monitor Streaming Option
- Video to Audio Timing Tool Option
- Video and Audio Test Signal Generators
- Digital Noise Reducer with Digital Bandwidth Filtering Option
- Audio Limiter Option
- Auto-sensing, multi-standard device (PAL-B/PAL-M/NTSC/SECAM/NTSC) for worldwide use
- Redundant Power Supplies

More Functionality with Less Equipment

With capabilities that far exceed a synchronizer, the X75™ allows broadcasters to do more with less equipment. Video processing features include level/color control; 3D adaptive color decoding; noise reduction; frame synchronization and time base correction for nonsynchronous signals; and up-, cross-, and down-conversion with aspect ratio conversion for hybrid facilities. The X75's 8, 16 or 32 channels of internal audio processing include level control, analog/digital conversions, and embedding and de-embedding for both SDI and HD-SDI serial digital signals for interfacing any audio signal in a professional environment. Integrated Dolby® compression and decompression and voice-over bring even more functionality.

Infinitely Flexible I/O

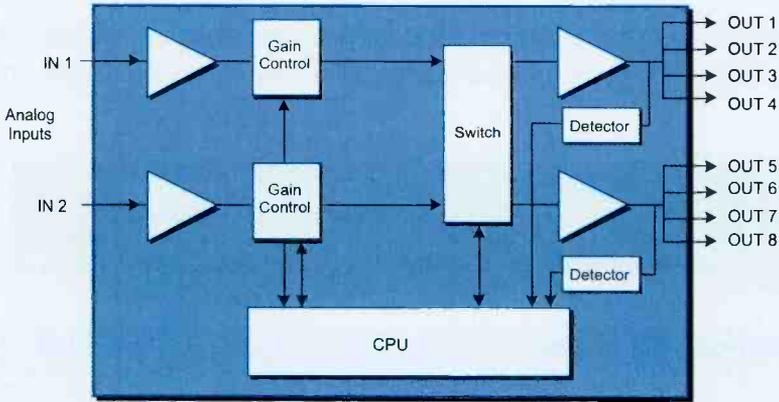
The exceptionally flexible input options for the X75™ with HD upgrade capability provide up-, down- and cross-conversion from up to seven input video formats — more than any similar product currently on the market — to almost any output video format. In addition, the X75™ features auto-detected inputs with auto-changeover and user-selectable alarms for reduced downtime. Providing separate connections for all video input and output formats, the X75™ allows for convenient front panel selection between multiple input devices—all of which may be connected simultaneously. Video input format options for HDTV optical fiber, HD-SDI, and optional analog composite/component/(Betacam®) and Y/C (S-VHS/Hi-8) inputs are possible. Dual SDI inputs are included. Ten broadcast-quality outputs of the

same signals are provided, as well as optional streaming video and audio over Ethernet, RGBS, DVI-D, or auxiliary PAL-B/PAL-M/SECAM/NTSC composite video outputs.

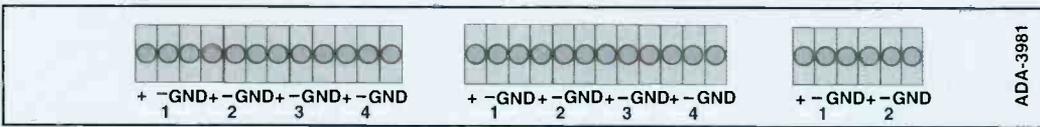
Effortless Control

Control and monitoring of signals passing through the X75™ are enabled using IP over Ethernet. Instant operator control from the local or remote control panels allows for easy manipulation of video and audio signals. Using two Ethernet ports per unit (one for control, monitoring and video thumbnails, and the other for MPEG-4 CIF full motion video and audio streaming) makes PC control and monitoring over large networks entirely manageable. A built-in Web Server and optional SNMP (Simple Network Management Protocol) are industry-standard means of controlling and monitoring the X75™ over Ethernet.

ADA-3981-66, 600 — Analog Audio Distribution Amplifier



- 1 in, 8 out (mono) or 2 in, 4 out (stereo)
- 20-20kHz bandwidth
- +30dBu (66ohm), +24dBm (600ohm) maximum input level
- Gain range of -6 to +33dB
- Remote gain (.5dB steps), channel swap, mute
- Channel swap and mute
- Left and right inputs can be summed to mono



NEO® DISTRIBUTION

AVM-3901-C



AVM-3901-B4



AVM-3901-C4



MXA-3901-C



AS-3901-C



AS-3981-DA



MSA-3901-C



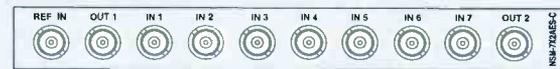
MSA-3901-B4



MSA-3901-C4



NSM-7X2AES-C



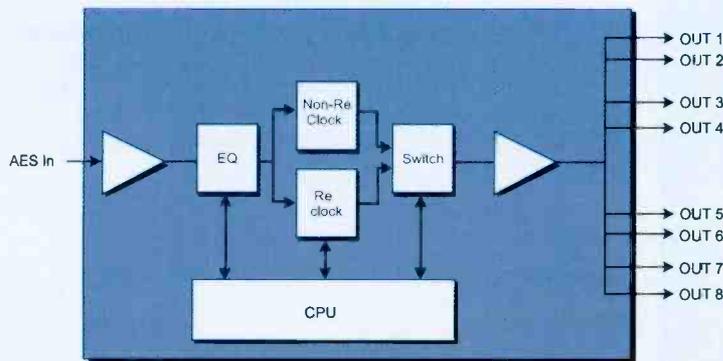
NSM-8X1AES-C



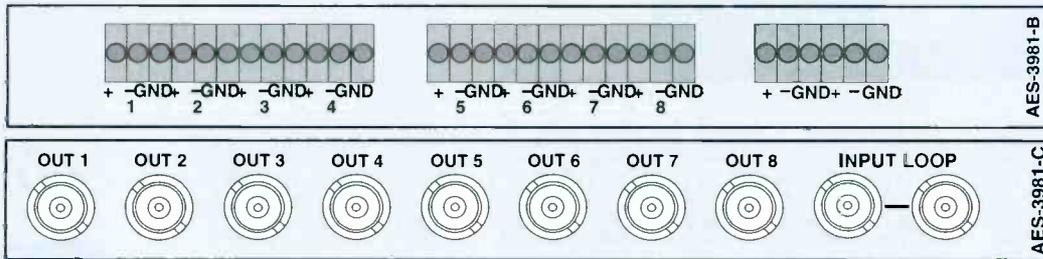
Additional back modules intended to complement product information provided on product pages.

BACK PANELS

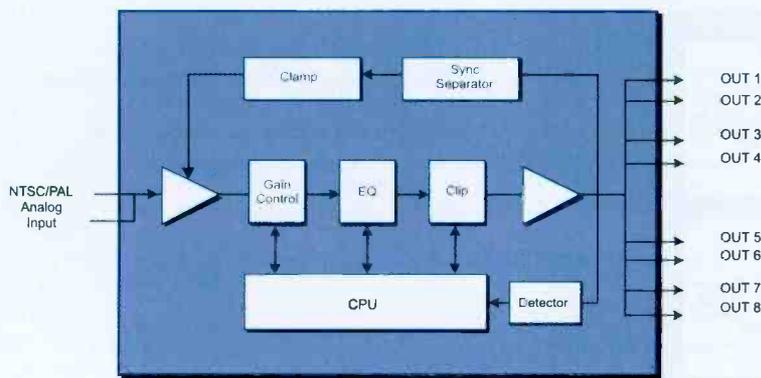
AES-3981 — AES Audio Distribution Amplifier



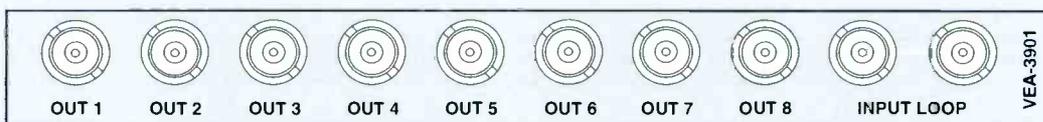
- Input signal types:
AES 75 and 110 Ohm interfaces
- Data-only mode for compressed audio signals
- AES frame rates up to 96kHz
- Auto EQ, auto relock up to 96kHz



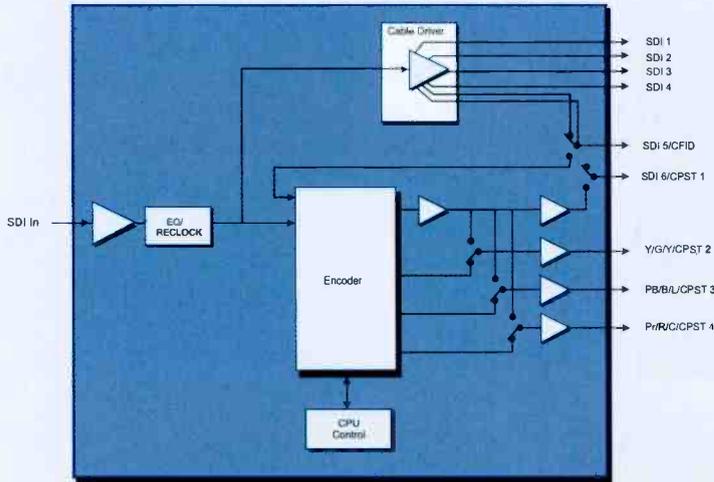
VEA-3901 — Composite Video Equalizing Distribution Amplifier



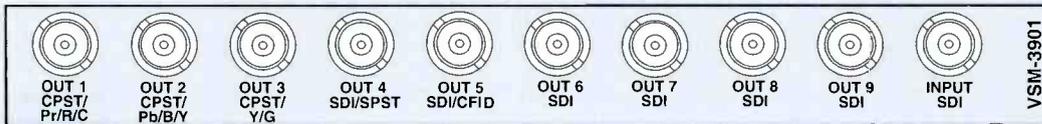
- Input signal type: passive looping 1Vp-p video
- Clamp off/soft/hard
- White clip, hard and soft
- AC/DC coupling (jumper selectable)
- Remote control of gain (-3 to + 3dB)
- Remote control of EQ (300m)



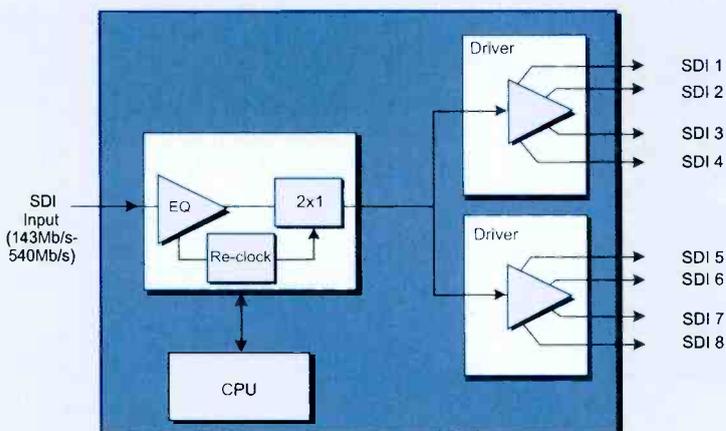
VSM-3901 — SDI Monitoring Distribution Amplifier



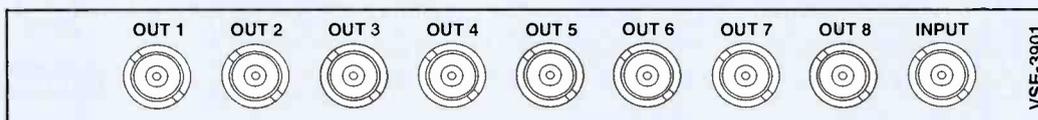
- 10-bit signal processing path
- Up to 6 reclocked, equalized 4:2:2 serial outputs
- Up to 4 NTSC/PAL-B analog composite color outputs or 1 component (GBR / Y, Pb, Pr, / YC)
- Delete, chroma on/off, setup on/off, burst on/off and chroma filter bandwidth select



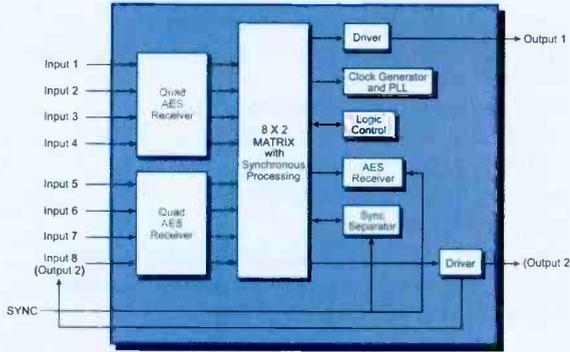
VSE-3901 — SDI and ASI Reclocking Distribution Amplifier



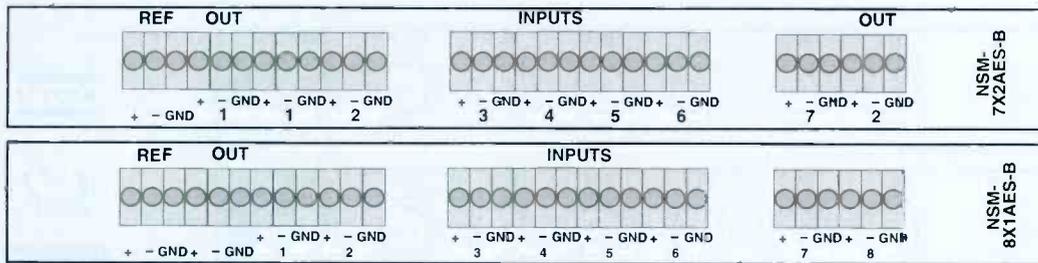
- Input signal types: SMPTE 259M, 344M, DVB-ASI
- Differential input, transformer coupled inputs and outputs
- 8 reclocked and auto-equalized outputs
- Automatic bypass if unable to lock at the above rates
- Forced bypass capability
- ASI compliant



NSM-8X1AES-B, C, NSM-7X2AES-B, C — AES Audio Switches



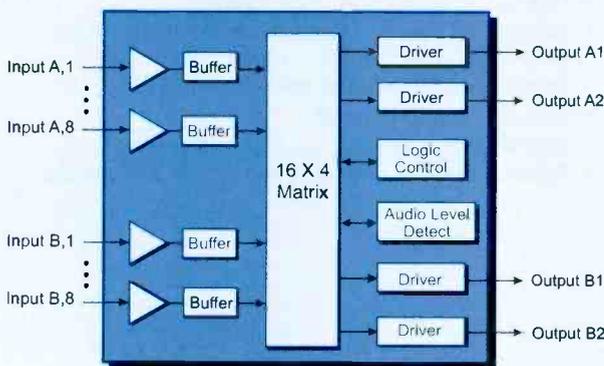
- High-quality AES audio routing switcher
- 8x1 switcher with auto-detect switchover configuration or 7x2 switcher configuration
- Supports these signal types:
 - AES3 – 30kHz – 100kHz frame rates
 - Any 50% duty cycle digital signal within the voltage and frequency range
- Relay bypass



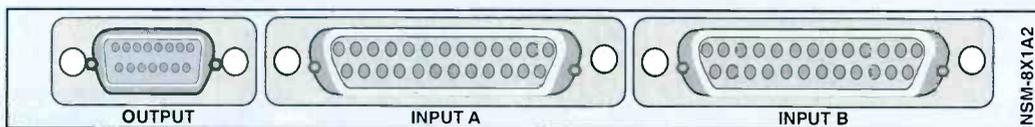
See page 64 for other back panels: NSM-7x2AES-C and NSM-8x1AES-C



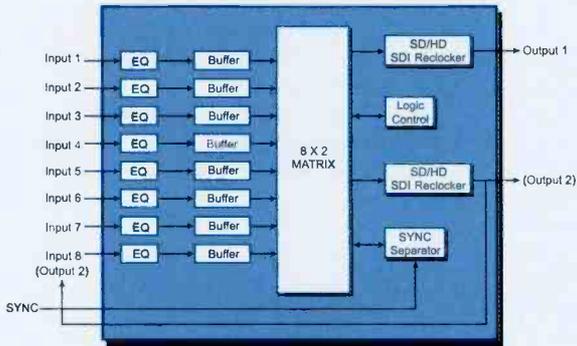
NSM-8X1-A2 — Analog Audio Switches



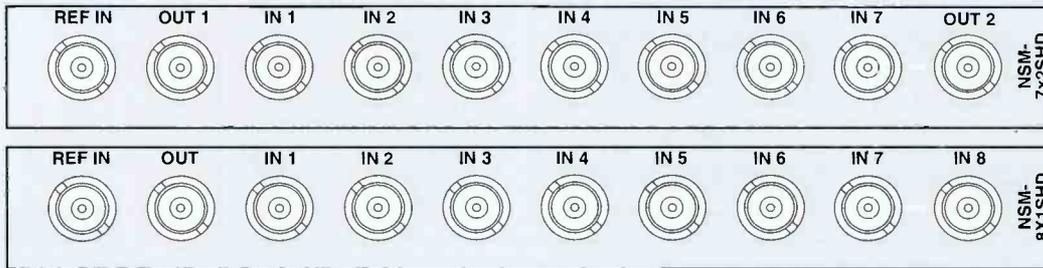
- High-quality analog audio routing switcher
- Can be user-configured for the following matrix sizes:
 - single stereo 8x2
 - single mono 16x4
 - stereo 8x1 with dual outputs
 - quad mono 4x1 (married)
 - quad mono 4x1 (breakaway)
- Relay bypass
- Swap/sum capability



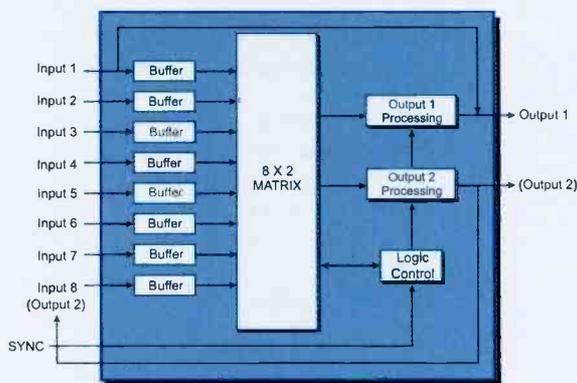
NSM-8X1SHD, NSM-7X2SHD — HDTV and SDI Video Switches



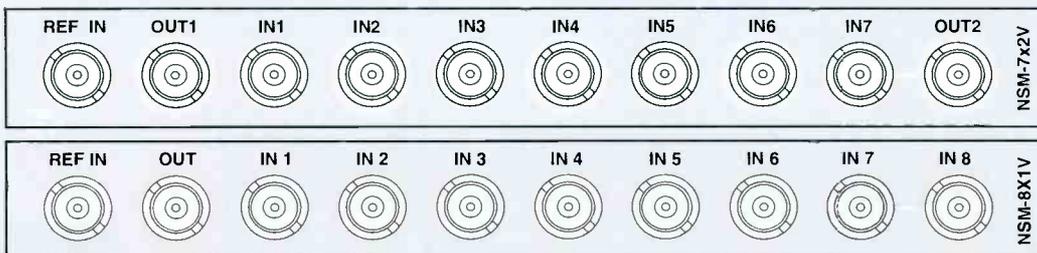
- High-quality HD/SDI wideband video routing
- 8x1 switcher with auto-detect switchover configuration or 7x2 switcher configuration
- Supported signal types (10Mb/s to 1.5 Gb/s):
 - SMPTE 259 — 143, 177, 270, 360, and 540 Mb/s
 - SMPTE 292 — 1.485 Gb/s
- Deterministic, line-accurate switching
- Relay bypass
- Reclock both SMPTE 259M and SMPTE 292M bit rates
- Bypass operation for signals at nontraditional video rates
- Auto-equalize all inputs up to 1.5 Gb/s



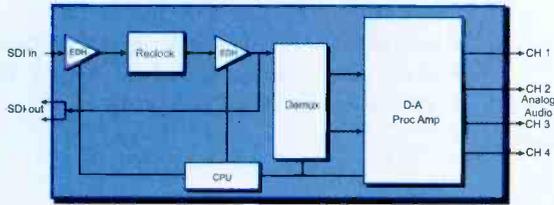
NSM-8X1V, NSM-7X2V — Composite Video Switches



- High-quality analog video routing switcher
- 8x1 switcher with auto-detect switchover configuration or 7x2 switcher configuration
- Deterministic, line-accurate switching
- NTSC/PAL analog reference
- Relay bypass
- Bypass operation for signals at nontraditional video rates



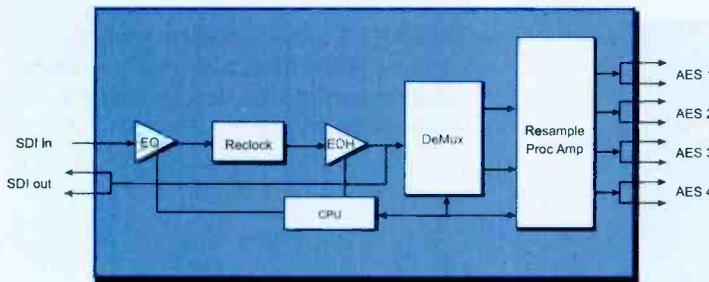
DMX-3901-A — SDI De-multiplexer to 4-Channel Analog



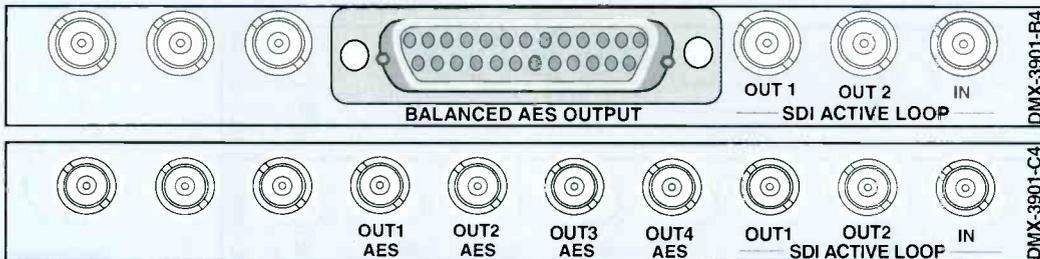
- Selectable 16/20/24-bit audio delay/processing
- Variable audio delay up to 1.3 seconds



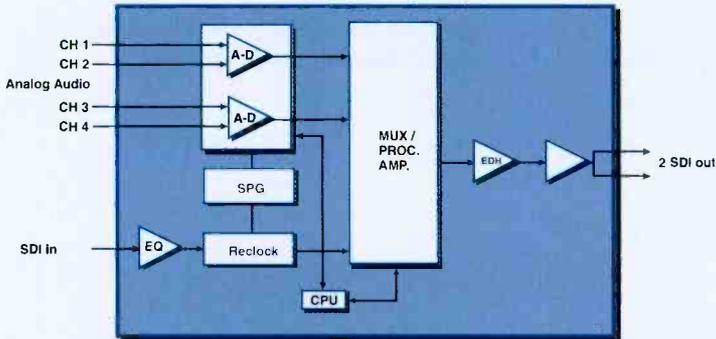
DMX-3901-B4, C4 — SDI De-multiplexer to 4 AES Audio



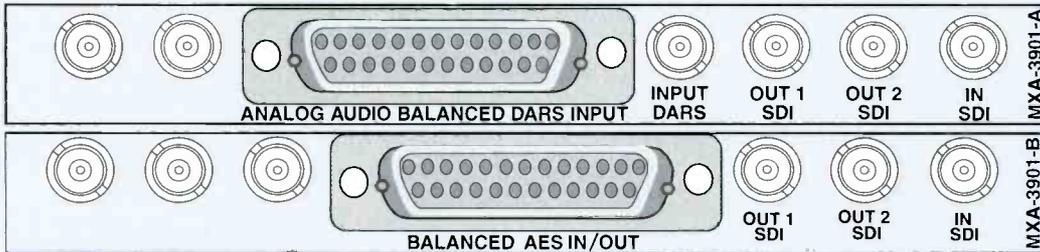
- 4-channel AES output
- Selectable 16/20/24-bit audio delay/processing
- Passes compressed audio data, i.e., Dolby[®] E, AC-3[™]
- Variable audio delay up to 1.3 seconds



MXA-3901-A, B, C — 4-Channel Analog or 2 AES Audio to SDI Multiplexer



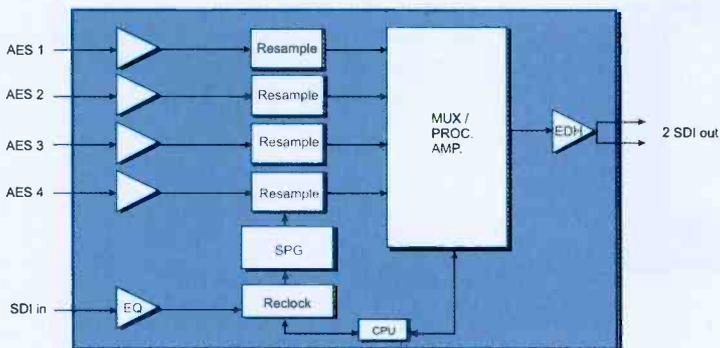
- 4-channel analog or 2-channel AES audio multiplexing into SDI
- Selectable 16/20/24-bit audio delay/processing
- Passes compressed audio data, i.e., Dolby® E, AC-3™
- Variable audio delay up to 1.3 seconds



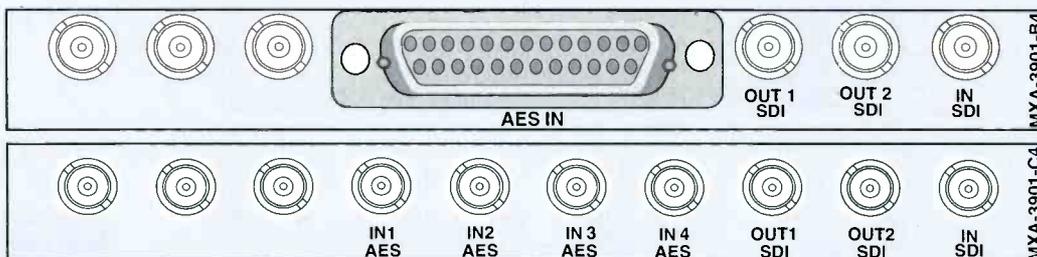
See page 64 for other back panel: MXA-3901-C



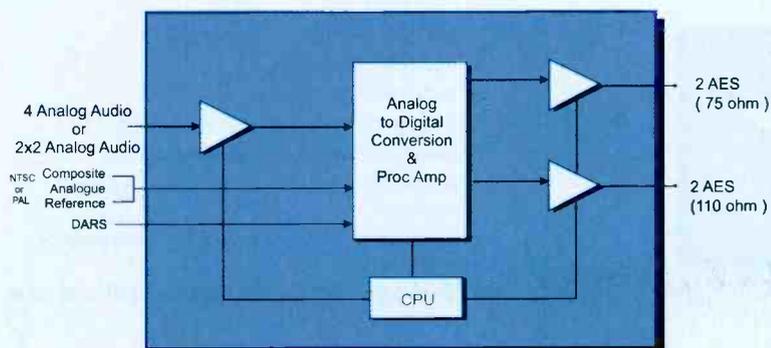
MXA-3901-B4, C4 — 4 AES Audio to SDI Multiplexer



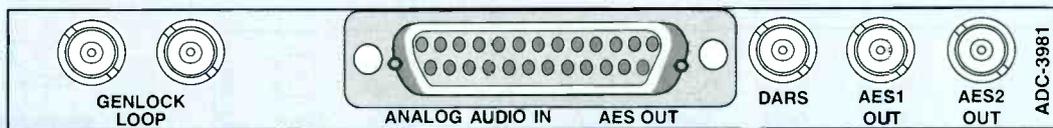
- 4-channel AES audio multiplexing into SDI
- Selectable 16/20/24-bit audio delay/processing
- Passes compressed audio data, i.e., Dolby® E, AC-3™
- Variable audio delay up to 1.3 seconds



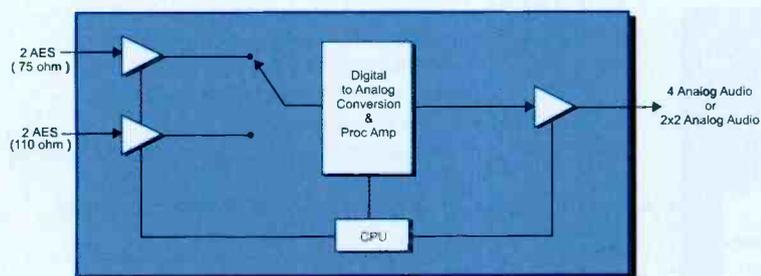
ADC-3981 — 4-Channel Analog to 2 AES Audio Converter



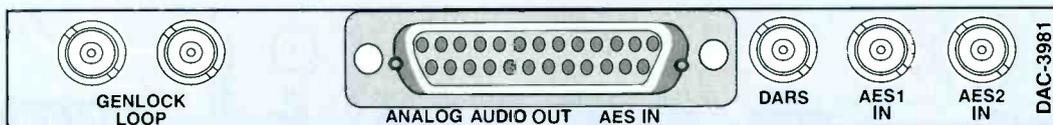
- Simultaneous balanced and unbalanced AES outputs
- 32/44.1/48/96 kHz output sampling rate
- 16/20/24-bit quantization
- Audio processing amplifier with: channel invert, channel swap, gain, delay
- Variable audio delay up to 1.3 seconds



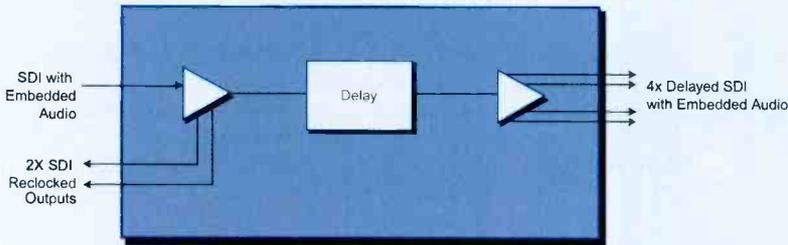
DAC-3981 (-600) — 2 AES 4-Channel Analog Audio Converter



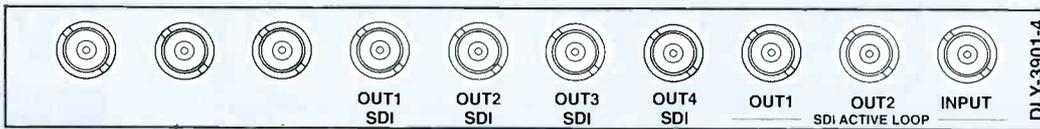
- Input signal types: 2 AES-75 or 2 AES-110 (selectable)
- 4 balanced analog audio outputs (4-channel or 2 x 2channel)
- Audio processing amplifier with: channel invert, channel swap, gain, delay
- Variable audio delay up to 1.3 seconds
- 32/44.1/48/96 kHz sampling rate support



DLY-3901-4 — SDI Delay Processor

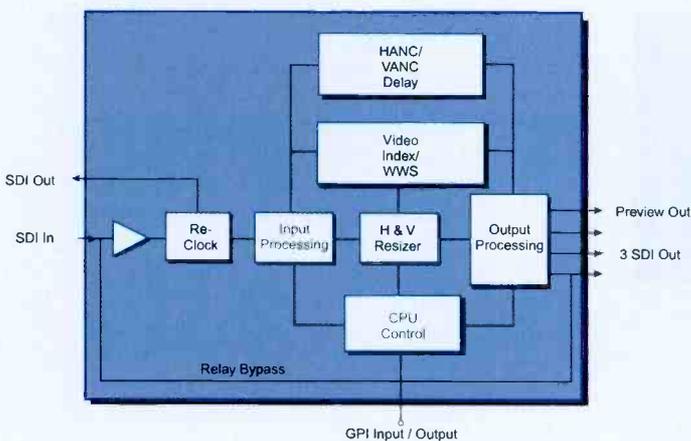


- Up to 4 seconds of video delay
- 525/625 SDI input
- 4 delayed SDI outputs
- 2 reclocked, non-delayed SDI outputs
- HANC and VANC passed transparently
- Auto-detect or user-selectable input video standard
- EDH status monitoring of SDI input (presence, error count)
- NeoScope™ video signal monitoring at card edge

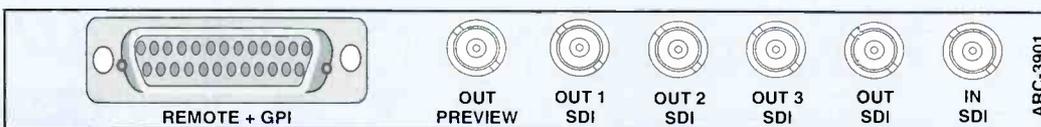


NEO® VIDEO

ARC-3901 — Aspect Ratio Converter

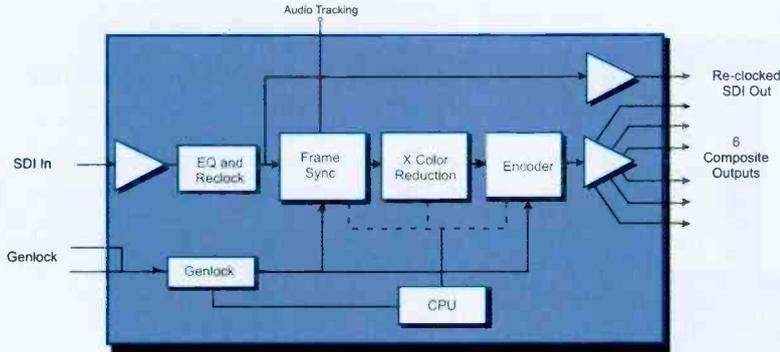


- Motion-adaptive, 4-field, 4-line conversion for enhanced vertical resolution with minimal interlace artifacts
- Fixed and variable picture resizing ratios
- 10-bit video processing
- Video Index and Wide Screen Signaling handling and insertion
- Relay bypass upon loss of power or module failure
- VANC and HANC are passed transparently
- Monitor BNC output with selectable "used area" overlay or key output

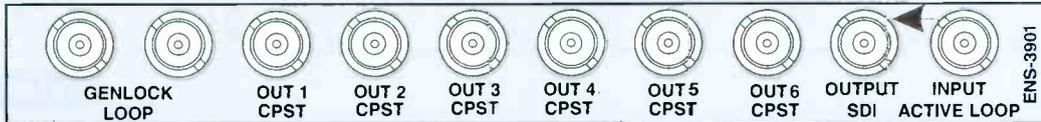


NEO® VIDEO

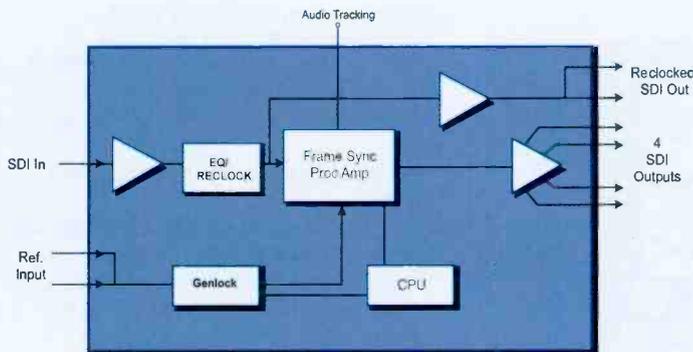
ENS-3901 — SDI to NTSC/PAL Color Encoder/Synchronizer



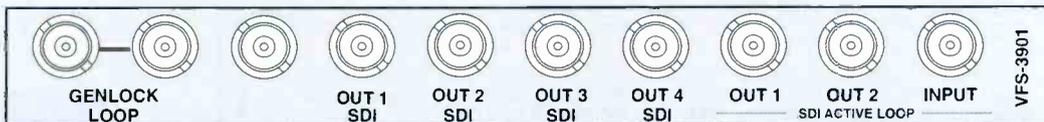
- High-quality, chroma-locked broadcast composite encoder with processing amplifier and frame synchronizer
- 12-bit signal processing
- Vertical Blanking Field/Line/Mode Control
- Timing Controls: Vertical, Horizontal, Fine SC (from Genlock)
- IQ or UV modulation for the composite output
- Cross Color Reduction (525) and Aperture control (2 dimensional)
- Frame sync or delay mode
- Provides internal audio tracking to audio-synchronizers



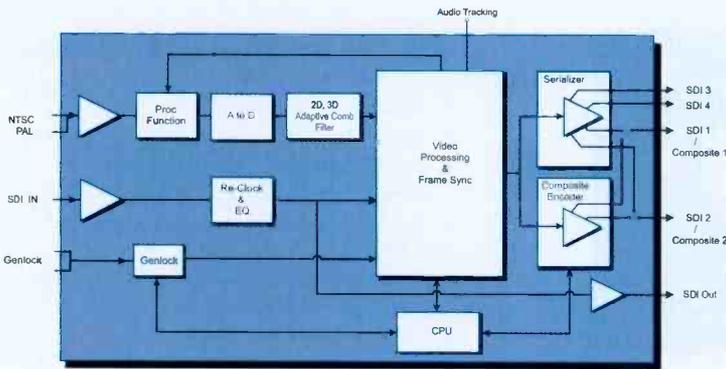
VFS-3901 — SDI Frame Synchronizer/Processor



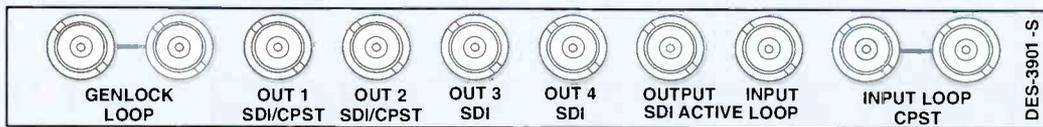
- Frame sync with infinite timing
- Video Processing Amplifier: black level, luminance level, chrominance level, black/white clip, hue (525 only)
- Video delay mode— up to 1 frame delay
- Provides internal audio tracking to audio synchronizers



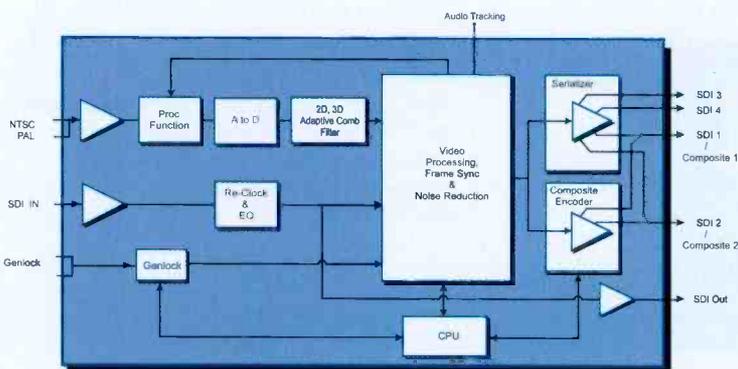
DES-3901-S — Composite Video to SDI Decoder/Synchronizer with SDI Input



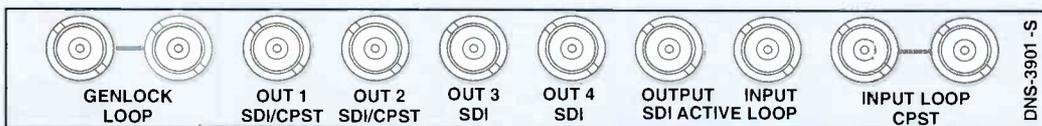
- Industry-leading, 12-bit, fully adaptive frame/field/3-line/notch composite decoding, processing amplifier with clipping
- SDI input with internal decoder bypass
- A to D 12-bit input processing
- Video proc amps for analog and digital inputs
- Input noise immunity and input video soft clipping
- 2 user-selectable outputs (SDI with embedded EDH or composite analog monitoring)
- Line-by-line VBI selection (normal, simple, bypass, delete)
- Provides internal audio tracking to audio synchronizer



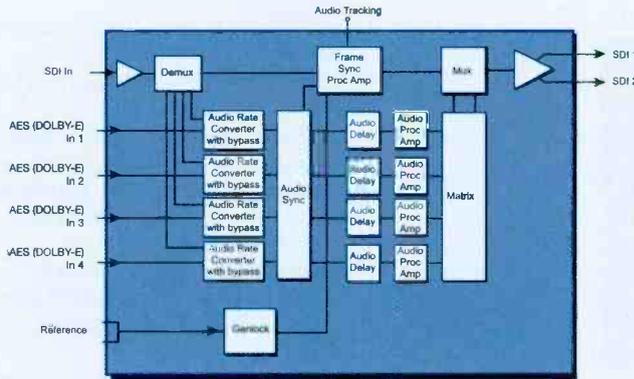
DNS-3901-S — Composite Video to SDI Decoder/Synchronizer/Noise Reducer with SDI Input



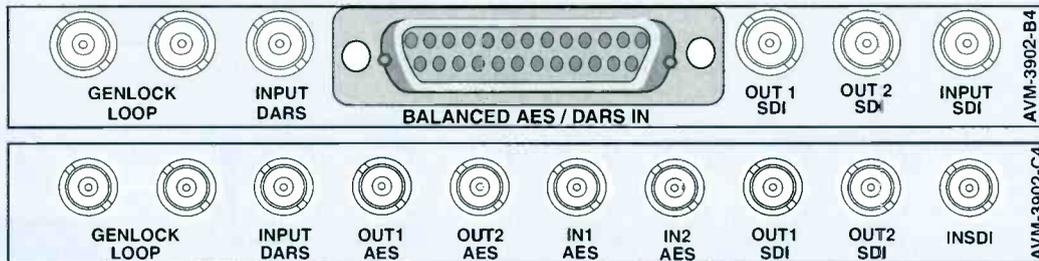
- Industry-leading, 12-bit, fully adaptive frame/field/3-line/notch composite decoding, processing amplifier with clipping
- SDI input with internal decoder bypass
- Noise reduction removes impulse and random noise
- Input noise immunity and input video soft clipping
- 2 user-selectable outputs (SDI with embedded EDH or composite analog monitoring)
- Video proc amps for digital and analog inputs
- Line-by-line VBI selection (normal, simple, bypass, delete)
- Provides internal audio tracking to audio synchronizers



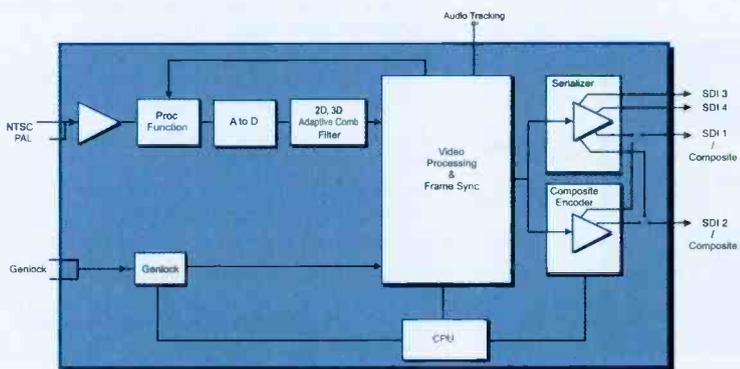
AVM-3902-B4, C4 — SDI/AES and Embedded Audio Synchronizer/Processor and Multiplexer



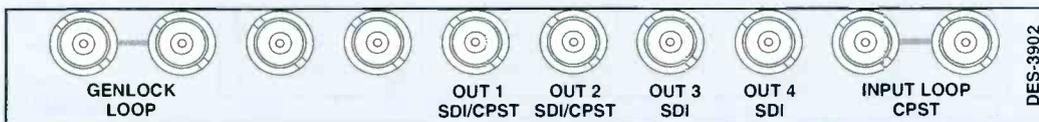
- Cleanly handles hot switch on input for video AES and embedded audio
- Embedded audio is demultiplexed and subsequently remultiplexed to avoid audio distortion during frame drop/repeat
- 3-color space video processing amplifier (YPrPb/composite/GBR)
- 16/20/24-bit AES and embedded audio synchronization/delay/processing
- Up to 30 frames video delay in delay mode
- Variable audio delay up to 1.3 seconds
- Provides internal audio tracking to additional audio synchronizer



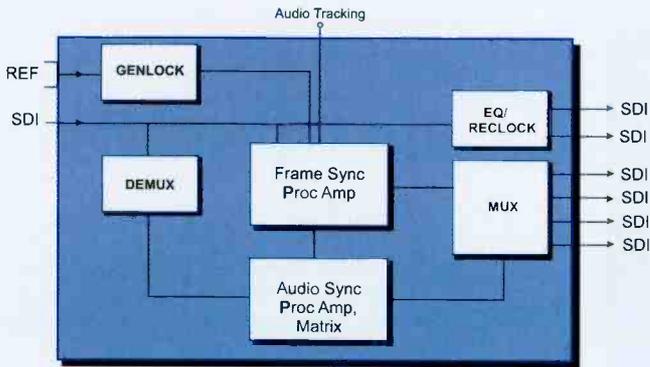
DES-3902 — Composite Video to SDI Decoder/Synchronizer



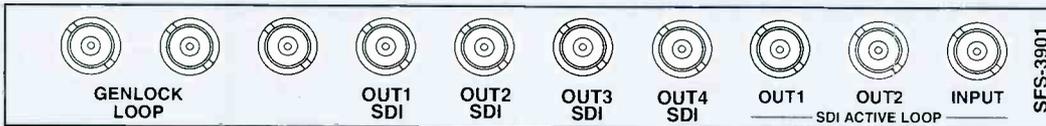
- Industry-leading, 12-bit, fully adaptive frame/field/3-line/notch composite decoding, processing amplifier with clipping
- 2 user-selectable outputs (SDI with embedded EDH or composite analog monitoring)
- Line-by-line VBI selection (normal, simple, bypass, delete)
- Provides internal audio tracking to audio synchronizers



SFS-3901 — SDI and Embedded Audio Synchronizer/Processor

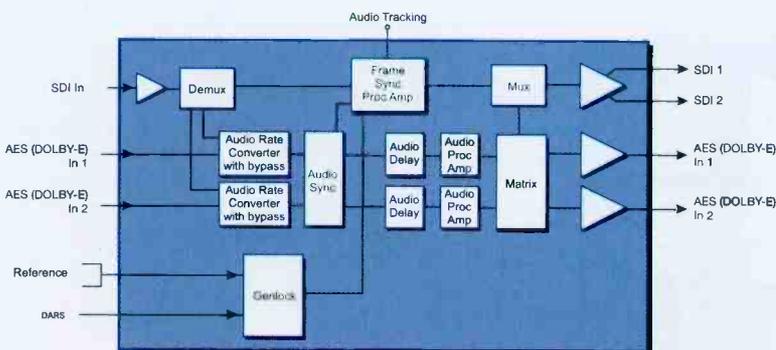


- Cleanly handles hot switch on input for video and embedded audio
- 3-color space video processing amplifier (YPrPb/Composite/GBR)
- Up to 30 frames video delay in delay mode
- Embedded audio is demultiplexed and subsequently remultiplexed to avoid audio distortion during frame drop/repeat
- 16/20/24-bit embedded audio synchronization/delay/processing
- Variable audio delay of up to 1.3 seconds
- Passes compressed audio data, i.e., Dolby® E, AC-3™
- Provides internal audio tracking to additional audio synchronizer

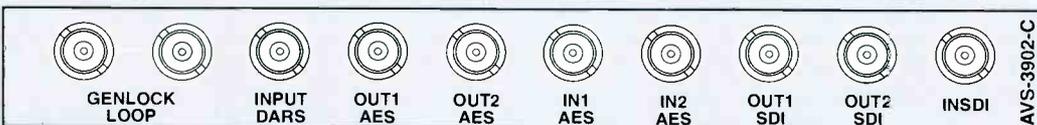
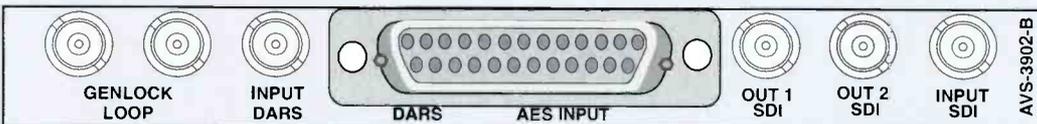


NEO® SIMPLICITY

AVS-3902-B, C — SDI/AES and Embedded Audio Synchronizer/Processor

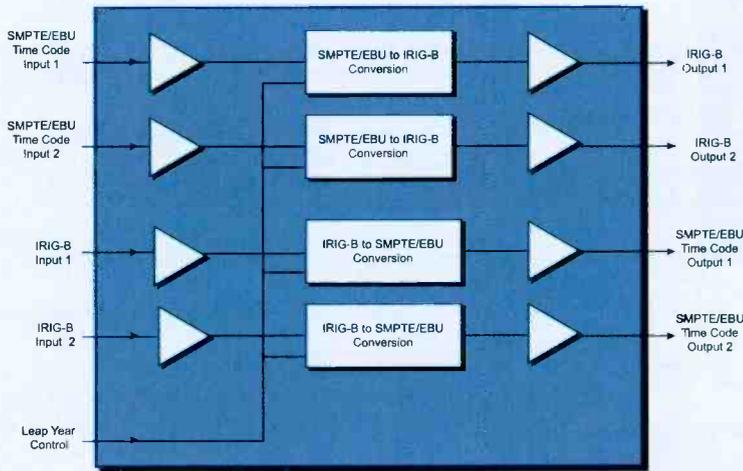


- Cleanly handles hot switch on input for video AES and embedded audio
- Embedded audio is demultiplexed and subsequently remultiplexed to avoid audio distortion during frame drop/repeat
- 3-color space video processing amplifier (YPrPb/composite/GBR)
- 16/20/24-bit AES and embedded audio synchronization/delay/processing
- Variable audio delay up to 1.3 seconds
- Passes compressed audio data, i.e., Dolby® E, AC-3™
- Up to 30 frames video delay in delay mode
- Provides internal audio tracking to additional audio synchronizer

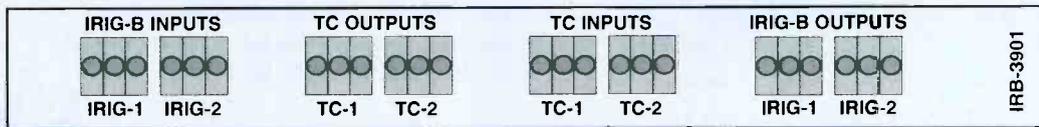


NEO® SIMPLICITY

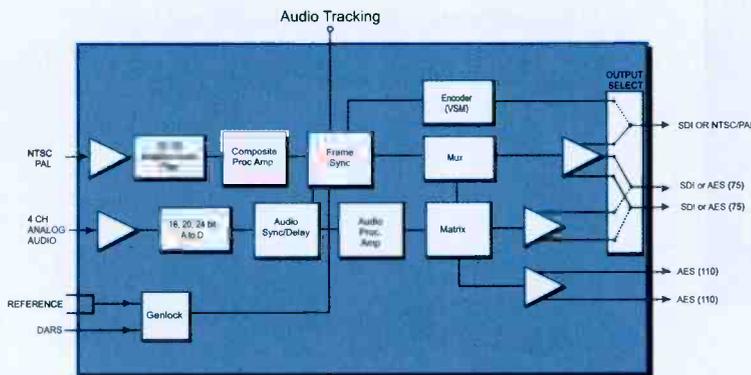
IRB-3901 — IRIG-B to/from SMPTE/EBU Timecode Converter



- Simultaneous conversion of IRIG-B to SMPTE/EBU timecode and SMPTE/EBU timecode to IRIG-B
- 2 IRIG-B inputs
- 2 IRIG-B outputs, each with selectable timecode inputs
- 2 SMPTE/EBU timecode inputs
- 2 SMPTE/EBU timecode outputs, each with selectable IRIG-B inputs
- Output locked to input timecode



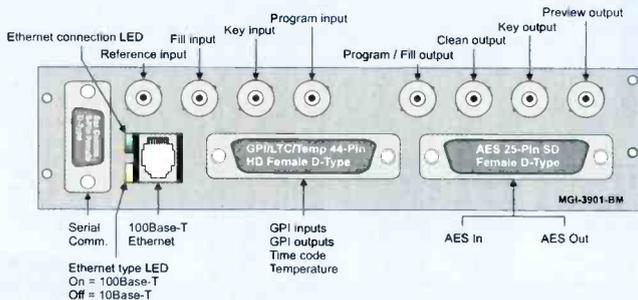
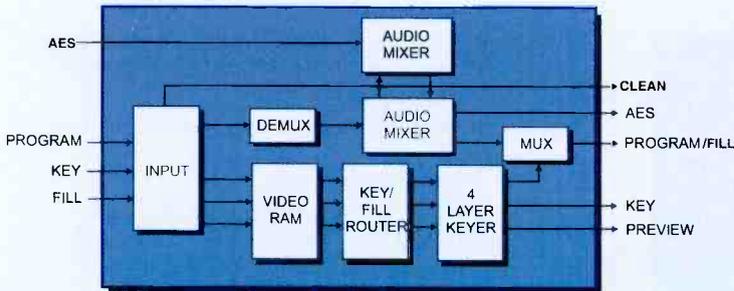
DAS-3901 — Composite Video/Analog Audio Synchronizer/Processor/Multiplexer



- 12-bit, fully adaptive frame/field/3-line/notch composite decoding, synchronization, processing amplifier with clipping (hue, chroma, video, setup controls)
- Line-by-line VBI handling and processing
- Selectable 16/20/24-bit A to D, synchronization, delay and processing amplifier (gain, swap, delay, invert, mix) for audio input
- Variable audio delay of up to 1.3 seconds
- Audio multiplexer
- Provides internal audio tracking to additional audio synchronizer



MGI-3902 — SDI IconLogo™



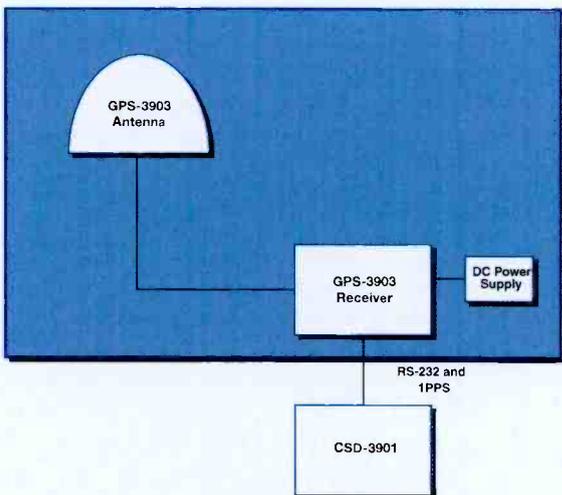
- SD IconLogo™ upgradeable to new HD IconLogo™ with four layers
- Bypass relay equipped as standard
- User-configurable “apology/trouble slide” airs automatically if loss or errors in program or reference inputs
- Up to four logos in SDI; each layer (logo) can be:
 - Static logo, animated logo, digital clock (with or without time & temperature), analog clock or external key
- Logos may be any size and may be positioned anywhere with varying transparencies and prioritized overlap, if desired
- Up to 999 logos can be “online” and instantly accessible on any layer
- Multiple native graphics formats supported
- Transfer files using the Compact Flash Card and/or over Ethernet from other file systems, machines or servers via NFS
- 4-channel AES capability (SDI)
 - 24-bit resolution, embedded and/or discrete, associate audio clips with logos or independently
- Operates in Program/Preview or Key/Fill modes
- Upgrade path to IconMaster™



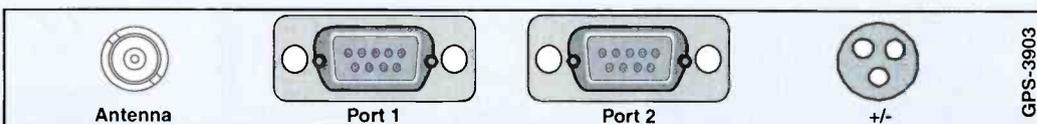
NEO® ADVANCED APPLICATIONS

GPS-3903 — GPS Receiver and Antenna

PRELIMINARY

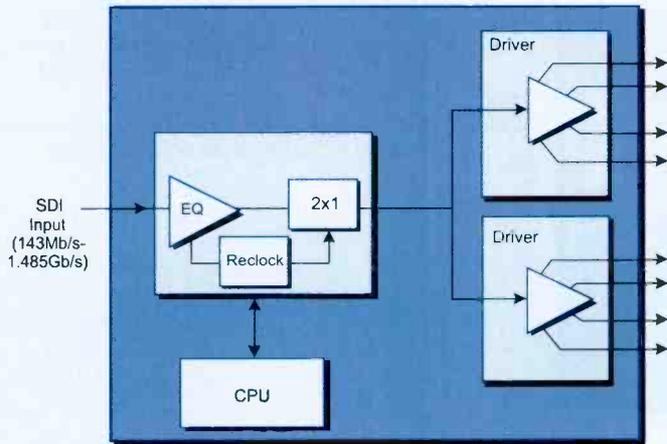


- Compatible with CSD-3902, MTG-3901 and CSD-5300
- GPS provides an accurate time reference available globally
- Separate antenna and receiver for mounting flexibility
- Accurate to 10ms

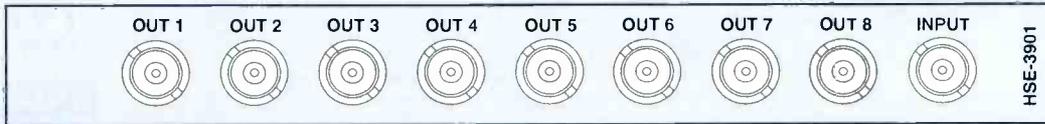


NEO® ADVANCED APPLICATIONS

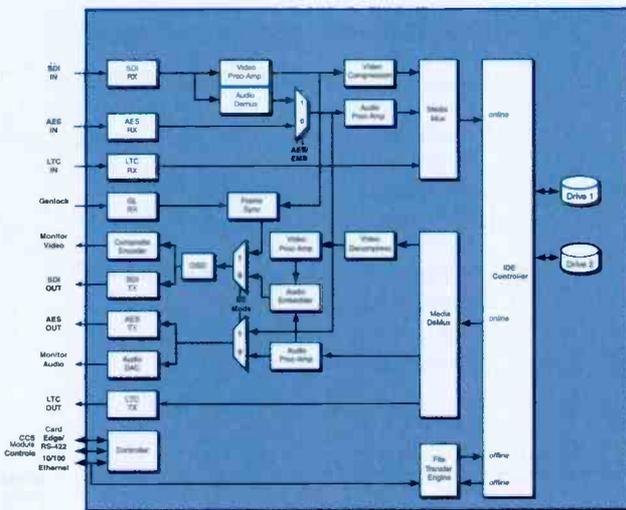
HSE-3901 — HDTV and SDI Reclocking Distribution Amplifier



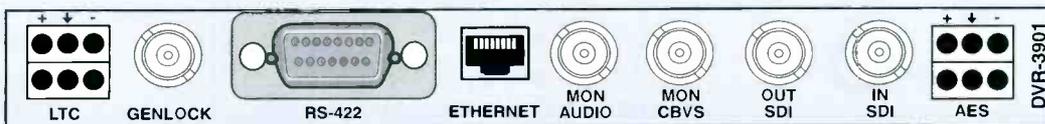
- Input signal types: SMPTE 259M, 292M, 344M
- Auto EQ for 300m (983ft.) for 270 Mb/s and 159m (483 ft.) for 1.485Gb/s
- Auto reclocking at 1.5Gb/s, 143Mb/s, 177Mb/s, 270Mb/s, 360Mb/s and 540Mb/s
- Auto bypass if unable to lock at the above rates
- DVB-ASI compatible (outputs 2,4,6,8)



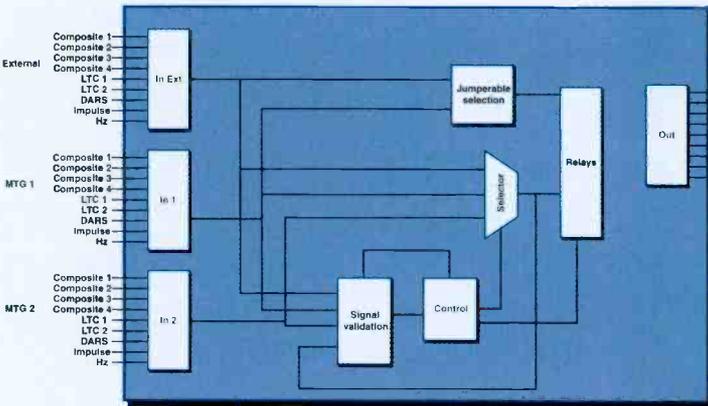
DVR-3901 — Digital Video Recorder



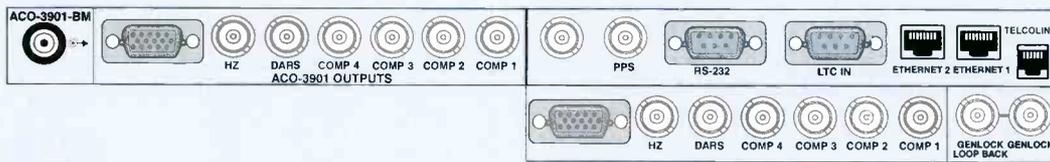
- Enhanced functionality including record and playback, variable speed playback, and jog and shuttle
- Supports RS-422 control link
- Dual onboard 2.5" IDE hard drives, 40GB each
- Motion JPEG compression ranges from 4:1 to 10:1
- Record time per drive: 2-8 hours, depending on selected bit rate
- 1 channel video and 1 stereo audio being recorded/played
- LTC input and output
- FTP file transfer of content via Ethernet connector



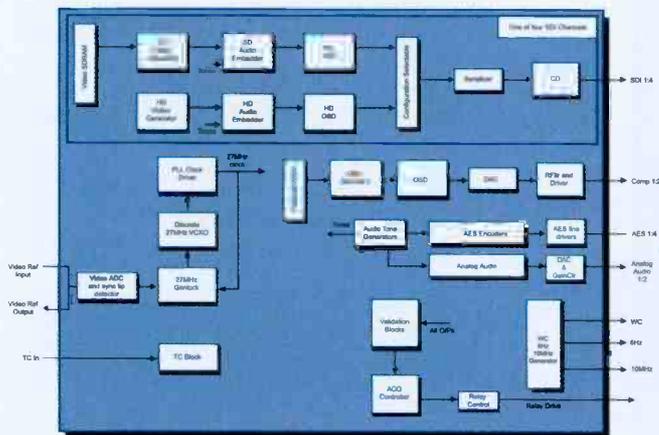
ACO-3901 — Automatic Changeover Module



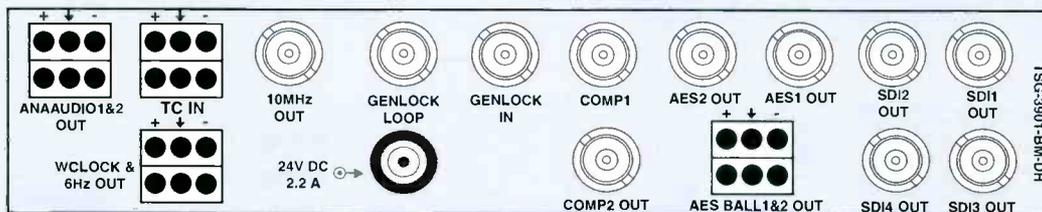
- Compatible with MTG-3901 and CSD-3902
- Redundant switching of up to 2 MTG-3901s/CSD-3902 internally and a third reference source externally for enhanced reliability
- Optional standalone power supply for enhanced reliability (power modules only, not frame)



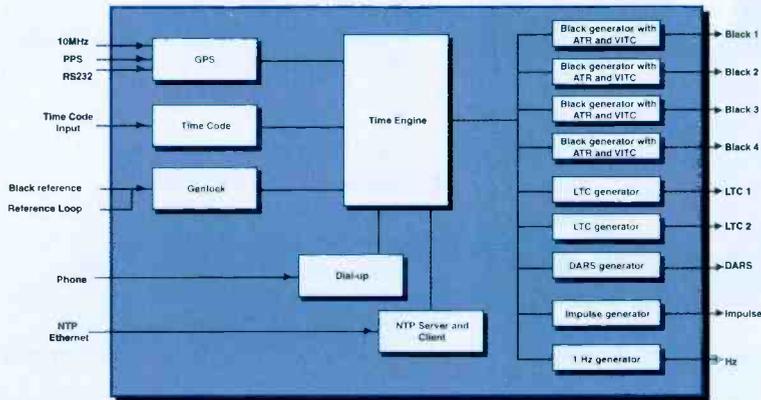
TSG-3901 — Test Signal Generator



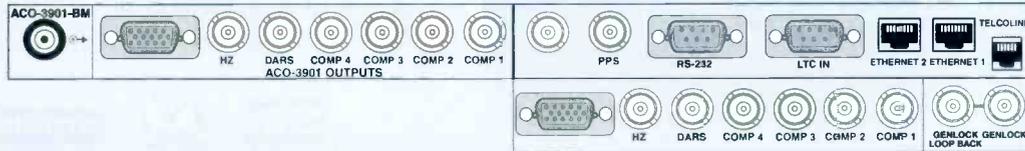
- HDTV, SDTV analog video test signal generator module
- Integrated automatic changeover (optional) for maximum reliability
- SDI/HD-SDI independent test signal outputs x4 with embedded tone or silence
- AES balanced tone outputs x2
- AES unbalanced tone outputs x2 (linked to balanced outputs)
- Independent analog audio tone channels x2
- 10MHz output
- 6Hz output
- Word Clock



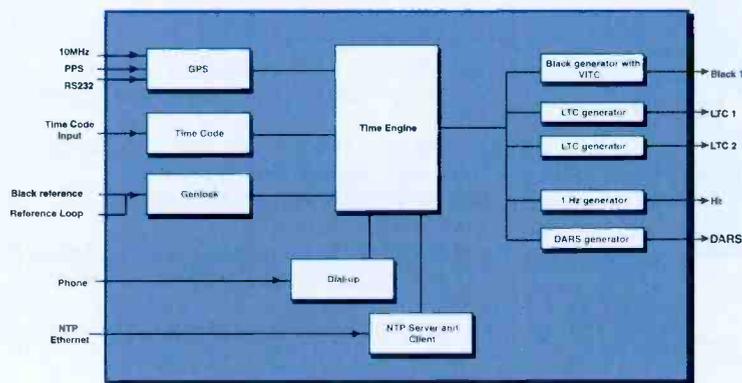
MTG-3901 — Master Timing Generator



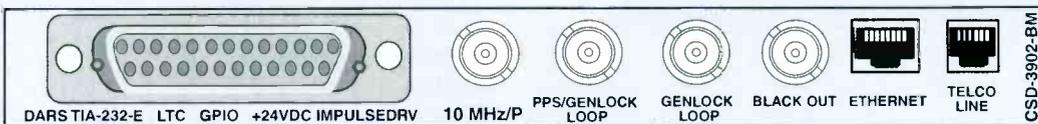
- Fully integrated reference signal generator system
- High-density modular packaging for any application
- Comprehensive array of reference signals for maximum flexibility and economy (reference signals include Black Burst, LTC, DARS, VITC, NTP)
- GPS synchronization for maximum precision (Optional)
- Integrated automatic changeover unit for enhanced reliability (Optional ACO-3901)
- Fully redundant and standalone configurations available



CSD-3902 — Master Clock Driver



- GPS Interface for time reference (standard)
- Timecode input
- SMPTE/EBU drop-frame or non-drop timecode (Time/Date)
- Programmable DST settings
- Built-in modem for dial in/out
- Dual timecode configurable for offsets and drop-frame and non-drop frame timecode
- Ethernet port for supplying NTP (Network Time Protocol)
- Impulse drive output
- Compatible with ACO-3901 automatic changeover



NSV-xxxx — NEO® SuiteView™ Multisource Display Processors

Highly scalable, modular, multisource display processor renders multiple video & computer graphic signals in real-time to plasma, LCD, high-resolution computer monitors and projection displays.



- Up to 44 inputs in 3RU frame, up to 12 inputs in 1RU frame
- Future-proof auto-format detecting HD, SD-SDI, & composite inputs
- NTSC, PAL, PAL-M, VGA & DVI inputs supported
- Outputs configurable up to UXGA
- Redundant outputs standard
- Separate external graphics input
- Reliable flexibility with NEO®
 - Ideal for mission-critical applications (24/7 operation)
 - Redundant PSU & controllers (in 3RU)
 - Front-loading, hot-swappable modules and PSUs
 - Mix-and-match with other NEO® modules in the same frame
- Audio metering & alarm support for embedded, analog stereo & AES/EBU audio
- Dynamic UMDs & multiple tallies
- Extensive alarming capabilities

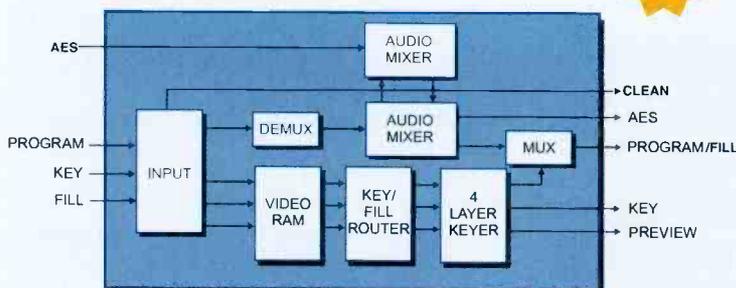
NEO® SuiteView™ Related Modules

- NSV-H4 Quad auto-detecting HD/SDI/composite video input module
- NSV-S4 Quad auto-detecting SDI/composite video input module
- NSV-V4 Quad analog composite video input module (also supports fewer YUV, Y/C inputs)
- NSV-G3 Triple VGA/DVI graphics input module
- NSV-OUT Output module with redundant outputs
- NSV-EAxx Embedded audio option, per video input (xx)
- NSV-AUD16-xx 16 channel stereo analog audio input module
- NSV-AES16 16 AES channel audio input module

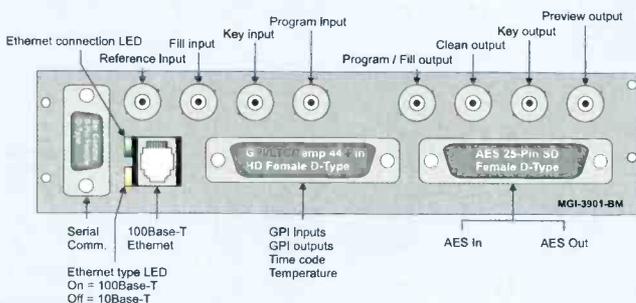
See page 107, 108 for more information.



MGI-3902H — HDTV IconLogo™



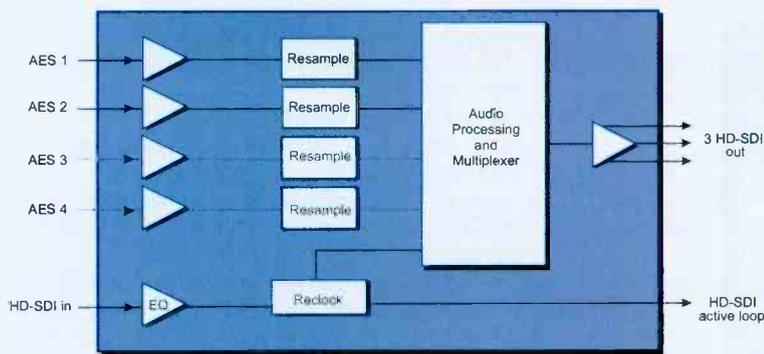
- SD IconLogo™ upgradeable to new HD IconLogo with four layers
- Bypass relay equipped as standard
- User-configurable “apology/trouble slide” airs automatically if loss or errors in program or reference inputs
- Up to four logos in HDTV; each layer (logo) can be:
 - Static logo, animated logo, digital clock (with or without time & temperature), analog clock or external key
- Logos may be any size and may be positioned anywhere with varying transparencies and prioritized overlap, if desired
- Up to 999 logos can be “online” and instantly accessible on any layer
- Multiple native graphics formats supported
- Transfer files using the Compact Flash Card and/or over Ethernet from other file systems, machines or servers via NFS
- 4-channel AES capability (SDI)
 - 24-bit resolution, embedded and/or discrete, associate audio clips with logos or independently
- Operates in Program/Preview or Key/Fill modes
- Upgrade path to IconMaster™



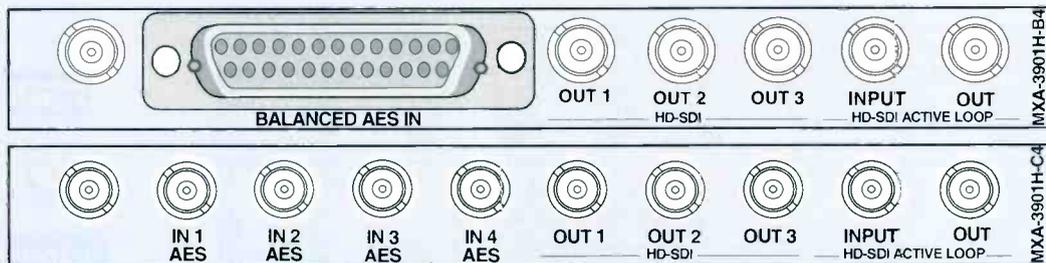
See page 73 for more information.



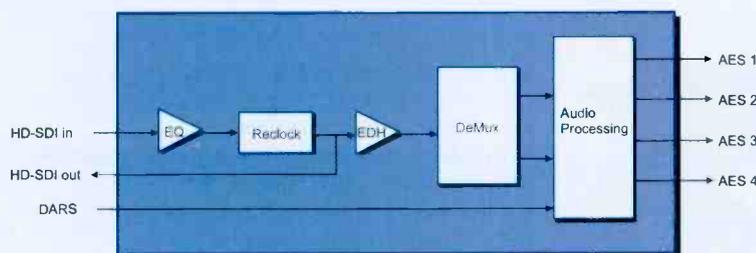
MXA-3901H-B4, C4 — HDTV 4 AES Audio Multiplexer



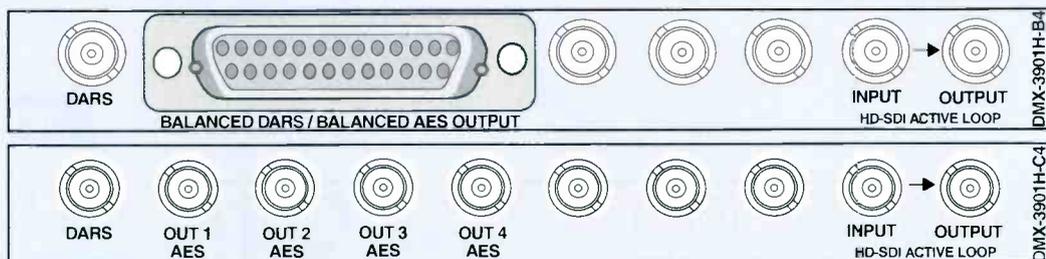
- 4 AES audio multiplexing into HDTV
- Selectable 16/20/24-bit audio delay/processing
- Passes compressed audio data, ie., Dolby[®] E, AC-3™
- Variable audio delay up to 1.3 seconds



DMX-3901H-B4, C4 — HDTV 4 AES Audio Demultiplexer

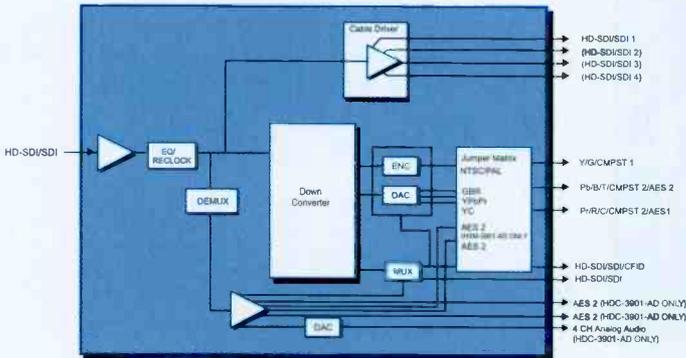


- 4 AES audio demultiplexing from HDTV
- Selectable 16/20/24-bit audio delay/processing
- Passes compressed audio data, ie., Dolby[®] E, AC-3™
- Variable audio delay up to 1.3 seconds

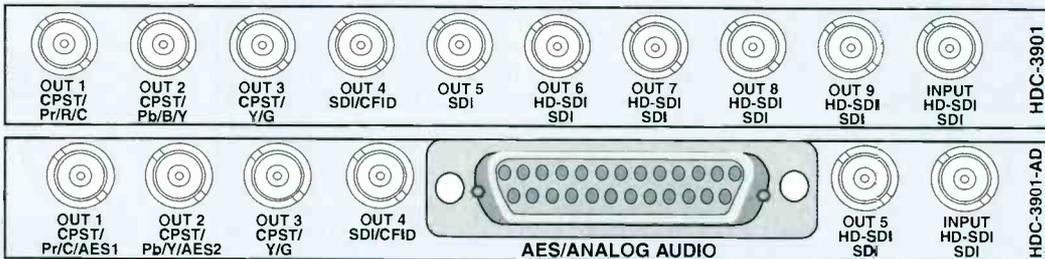


HDC-3901 — HDTV Downconverter

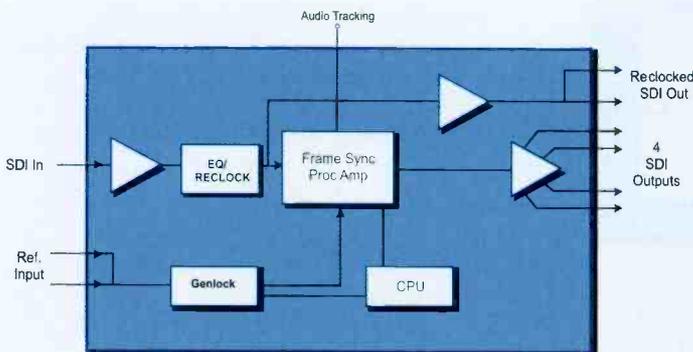
HDC-3901-AD — HDTV Downconverter with Demultiplexer



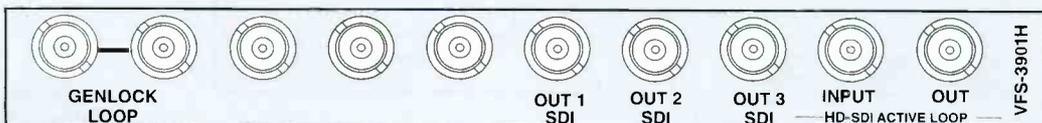
- Supports HDTV signals for 1080i/59.94, 1080i/50, 720p/59.94, 720p/50, 1080p/25 for down-conversion
- SD and HD input capability
- NTSC/PAL (3) or GBR, YPrPb (1) converted video monitoring outputs
- Supports five display types for downconverted HDTV signal: Anamorphic, Letter Box, Crop, 14:9 and Zoom In
- Embedded audio (one group) is passed from the HD-SDI input to the SDI output
- Monitoring outputs for analog and digital audio: 2 AES audio outputs; 4-channel analog audio outputs



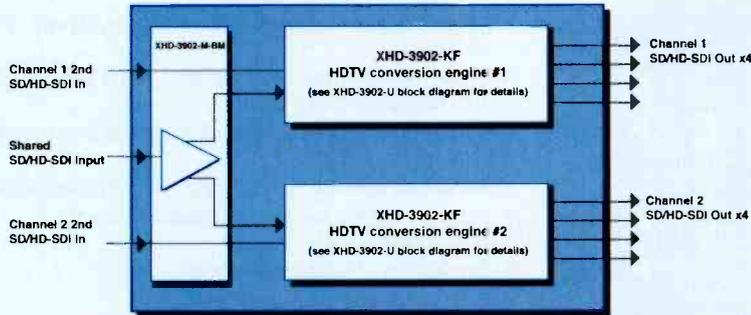
VFS-3901H-1 — HDTV Video Frame Synchronizer/Processor



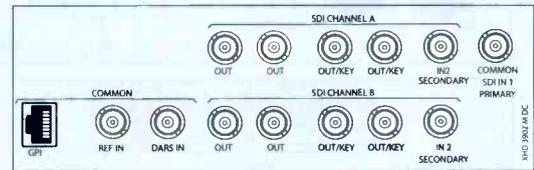
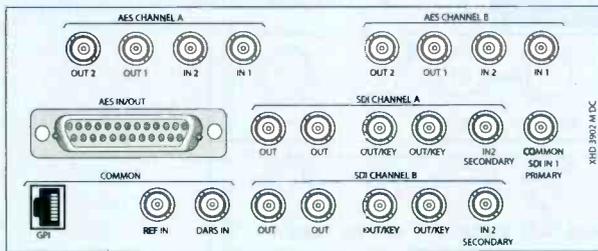
- HDTV video frame sync for 1080i-50/59.94 and 720p-59.94
- Passes entire VANC and HANC
- Provides audio tracking and hot-switching internally to a companion audio synchronizer
- Color, black or tri-level sync reference input
- Built-in video processing amplifier
- Cleanly handles hot switch on input
- Provides internal audio tracking to audio synchronizers
- Up to 16 frames of delay



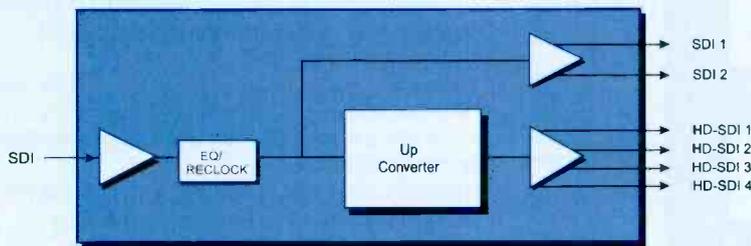
XHD-3902-KF — Advanced HDTV Key/Fill Upconverter



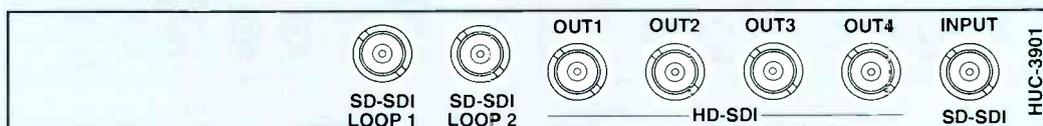
- Dual-Channel HDTV Upconverter
- Ideal for applications requiring upconversion of Key and Fill signals
- Automatic input format detection
- SDTV aspect ratio conversion capability
- Integrated frame sync and proc
- Integrated embedded audio sync and proc
- Optional AES support
- User-configurable ARC and picture positioning
- Transcoding of closed captioning between SDTV and HDTV formats
- Field upgradeable for additional HDTV down and cross conversion capability



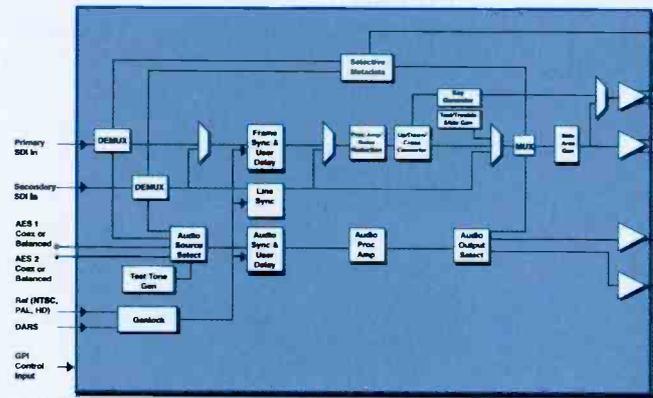
HUC-3901 — HDTV Upconverter



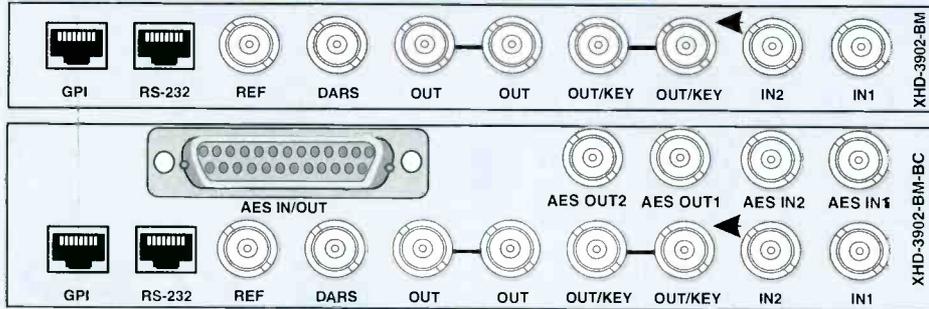
- Single-channel HDTV upconverter
- Supports 480i, 720p and 1080i formats
- Ideal for up-conversion of existing SDI content



XHD-3902-UCD — Advanced Broadcast-quality HDTV Converter

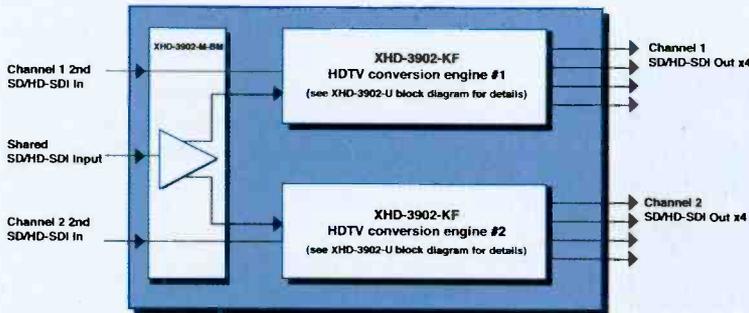


- Dual switchable SDI inputs
- Single-channel motion-adaptive HDTV up/down/cross converter
- Supports conversion between 720p, 1080i and 525 and 625 formats
- AES audio support (optional), 2 groups of embedded audio proc standard
- Integrated video proc, audio proc and noise reduction
- Separate sidebar key channel output to feed downstream keyer
- Remapping of closed captioning
- Dual input protection switching
- Automatic SD/HD input format detection
- SDTV aspect ratio conversion capability

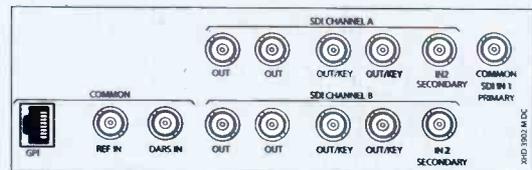
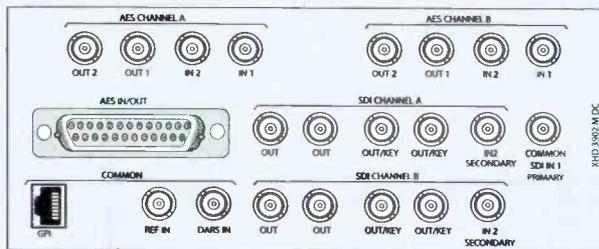


NEO® HDTV VIDEO

XHD-3902-M — Advanced Broadcast-quality Multi-Path HDTV Converter

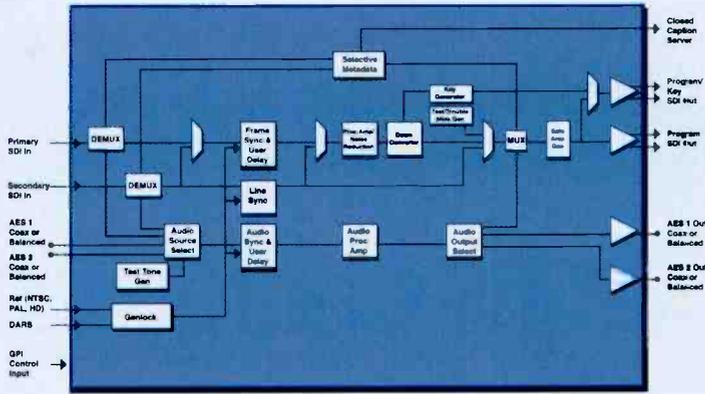


- Dual-channel motion-adaptive HDTV up/down/cross converter
- 2 X independent up/down/cross-conversion engines
- Dual SDI input protection switch for each HDTV conversion engine
- Transcoding of closed captioning between SDTV and HDTV formats
- AES audio support (optional), 2 groups of embedded audio proc standard
- Integrated video proc, audio proc and noise reducer
- User-configurable ARC and picture positioning
- Separate sidebar key channel output to feed downstream keyer
- Automatic SD/HD input format detection
- SDTV aspect ratio conversion capability

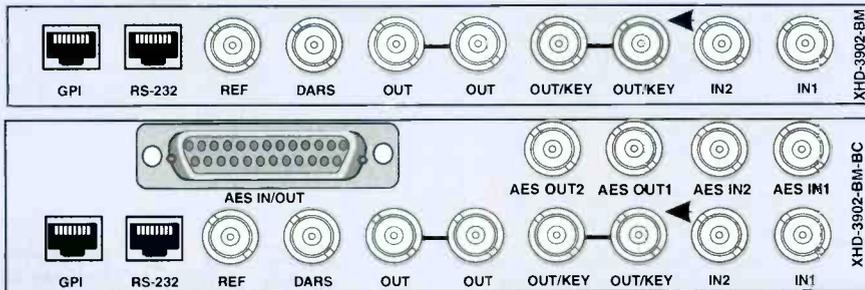


NEO® HDTV VIDEO

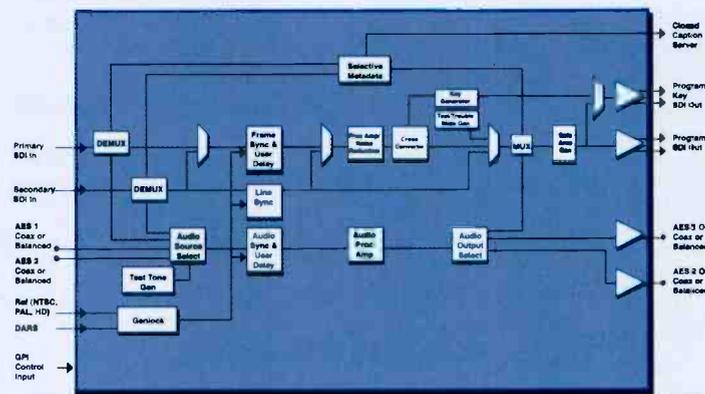
XHD-3902-D — Advanced Broadcast-quality HDTV Downconverter with Audio Processing



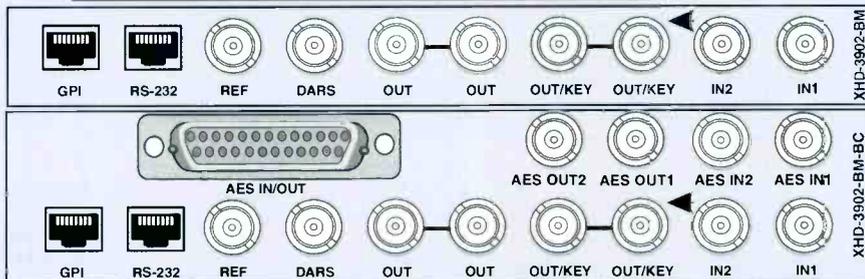
- Dual switchable SDI inputs
- Single-channel motion-adaptive HDTV down-converter
- Software-upgradeable up- and cross-conversion (optional)
- Supports down-conversion of 720p and 1080i formats
- AES audio support (optional), 2 groups of embedded audio proc standard
- Integrated video proc, audio proc and noise reducer
- Remapping of closed captioning
- Dual input protection switching
- Sidebar key channel output
- Automatic SD/HD input format detection
- SDTV aspect ratio conversion capability



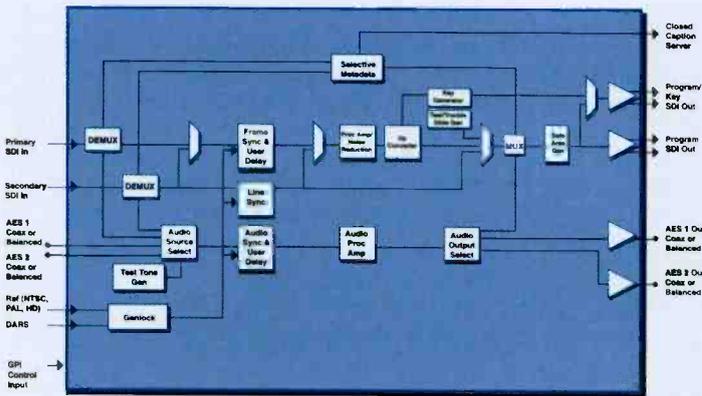
XHD-3902-C — Advanced Broadcast-quality HDTV Cross-converter and Frame/Audio Synchronizer



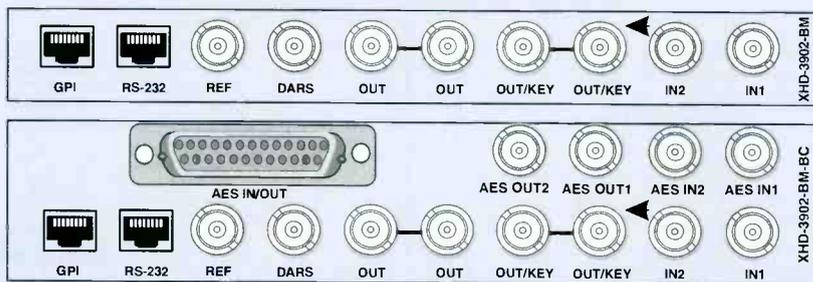
- Dual switchable SDI inputs
- Single-channel motion-adaptive HDTV cross converter
- Software-upgradeable up- and down-conversion (optional)
- Supports cross-conversion between all 720p and 1080i HDTV formats
- AES audio support (optional), 2 groups of embedded audio proc standard
- Integrated video proc, audio proc and noise reduction
- Dual input protection switching
- Separate sidebar key channel output to feed downstream keyer
- Automatic SD/HD input format detection
- SDTV aspect ratio conversion capability



XHD-3902-A — Advanced SDTV Aspect Ratio Converter



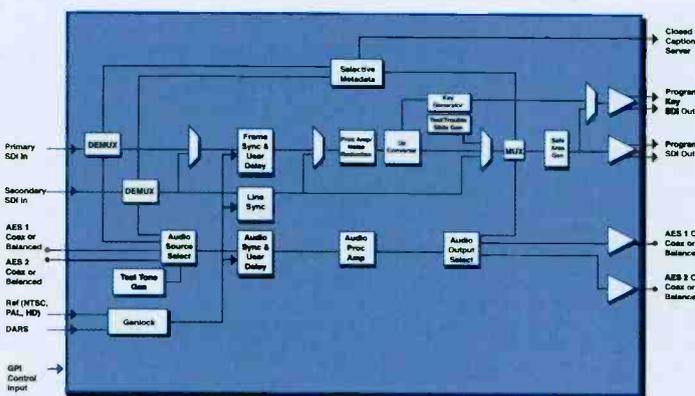
- Single-channel, motion-adaptive SD aspect ratio converter
- 525 and 625 operation
- Separate discrete AES audio processing and synchronization (optional)
- Integrated frame sync and proc
- Integrated audio sync and proc
- Preset aspect ratios for Anamorphic, Letterbox, 16:9 cut, 14:9, 4:3, 16:9 stretch, 4:3 shrink and pixel true
- User-configurable output image aspect ratio and picture position with 10 user presets
- Separate sidebar key channel output for keying content into unused portion of picture. (Downstream keyer required)



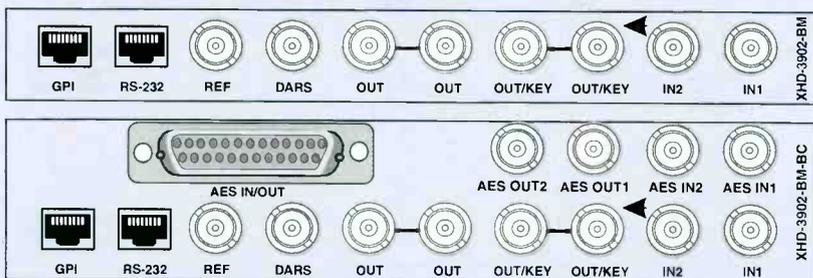
- Optional field upgrade for up/down/cross conversion functionality
- Dual SDI inputs for protection switching. Signal failure on the primary input will trigger the XHD-3902-A to switch to the secondary input



XHD-3902-U — Advanced Broadcast-quality HDTV Upconverter with Audio Processing



- Single-channel motion-adaptive HDTV upconverter
- Software-upgradeable down- and cross-conversion (optional)
- Supports upconversion to 1080i and 720p
- AES audio support (optional), 2 groups of embedded audio proc standard
- Integrated video proc, audio proc and noise reducer
- Transcoding of closed captioning between SDTV and HDTV formats
- User-configurable output image ARC and picture position
- Dual input protection switching
- Separate sidebar key channel output to feed downstream keyer
- Automatic input format detection
- SDTV aspect ratio conversion capability



NEO® FRAMES

NEO® FRAMES

NEO® For Advanced Applications—NEO® frames have been designed with the future in mind, offering flexibility for multiple applications and housing any combination of video/audio, analog/digital conversion and distribution modules. The frames offer an easy video and audio upgrade path from analog to SDI and HD for broadcast, post production, cable and telco applications requiring monitoring and control capability of incoming and outgoing feeds. There are two frame sizes available for NEO® products: a 1RU frame that holds four NEO® products and a 3RU frame that holds twelve NEO® products. Additionally, a local control panel can be provided at time of order or can be field retrofitted for the 1RU frame.

CCS™-Resource Communications Module

When external communications and/or a local control panel are necessary, a resource communications module is required. External contact closures and Ethernet communications are supported. The FR-3901-E, FR-3901-E-P and FR-3923-E frames contain this module. There is room for one resource module in the 1RU frame and room for two (redundant) resource modules in the 3RU frame.

3901PS Power Supply

The 3901PS provides power to the modules inside the 1RU frame. The 1RU frame can hold a single power supply. It is hot-swappable from the front of the frame.

3923PS Power Supply

The 3923PS provides power to the modules inside the 3RU frame. The 3RU frame can hold up to two power supplies. The 3923PS is hot-swappable from the front of the frame.

Features

- Capacity of four modules in the FR-3901 and twelve modules in the FR-3923
- No power or thermal limits for any module combination within the NEO® frame
- Front-loading, hot-swappable modules, fans, power supplies and resource modules
- DeJaView™ provides rapid automatic restoration of last known valid parameter settings from a failed module into newly inserted spare module, significantly reducing downtime
- NEOSCOPE™ provides a visual display of the video passing through the module on the card edge display, allowing for quick confirmation of signal presence from input to output

NUCLEUS™ Network Control Panel

NUCLEUS™ streamlines the control and monitoring of NEO® and other Harris processing products. NUCLEUS™ is completely user programmable (by means of an intuitive panel wizard), ensuring that each network control panel can be tailored to meet the exacting demands of every user.



NUCLEUS™ Control Panel



FR-3901

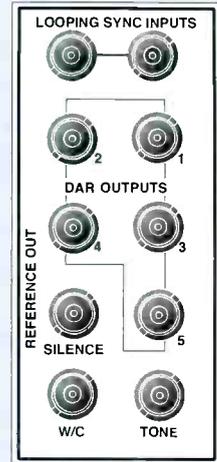
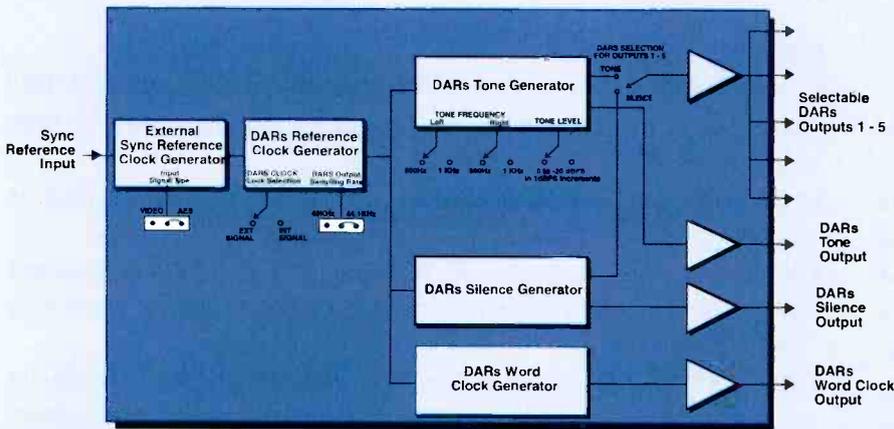


FR-3923



DAR-6880 — AES Audio Reference and Test Generator

- Locks to video or AES audio
- Auto-detects PAL/NTSC
- Provides 8 Digital Audio Reference Signal (DARS) outputs:
 - 5 DARS outputs with card edge selection of tone or silence
 - 3 dedicated DARS outputs (1-tone, 1-silence, 1-word clock)
- Generates self-locking AES grade-2 reference at loss of sync or in free-run mode
- Versatile DARS tone signal – Output level adjustable from 0 to 31 dBFS in 1dB increments
- **Note:** This is a 6800 series module

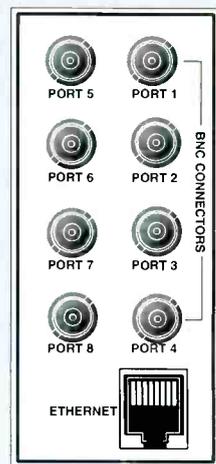
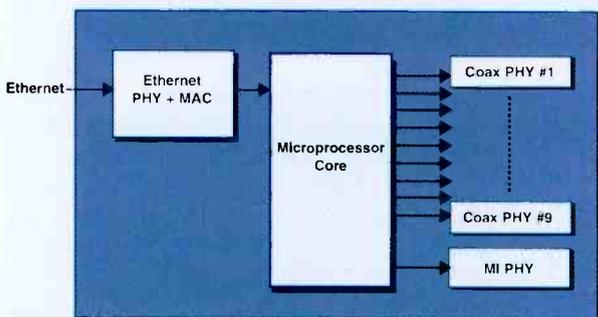


DAR-6880
Back Connector

ICE6800+ — CCS™ Ethernet Communications Card

Each CCS™ Ethernet card provides connectivity of up to nine 6800+ frames to Harris CCS™ networks.

- Fits in FR6802+X(F) and FR6802+QXF frames
- Controls 8 additional frames via simple coaxial interconnections
- Full CCS client support including Pilot, Navigator, CCS Control Panel, etc.
- Supports real-time remote control access via Ethernet to PC for get/set/adjust, automatic status monitoring and alarming
- Status and change monitoring is achieved off of the network, minimizing traffic for optimal use
- Interface option to external SNMP monitoring systems
- Supports full Harris External Protocol (EP) with third-party automation capability

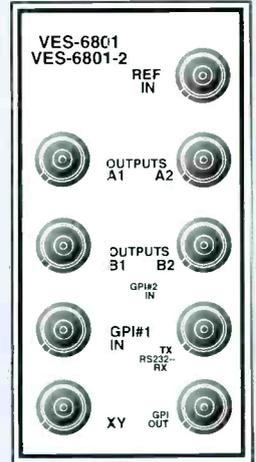
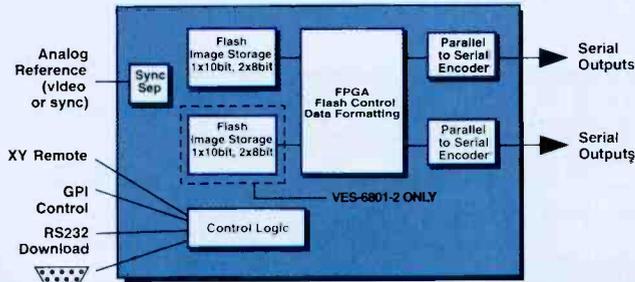


ICE6800+
Back Connector



VES-6801, VES-6801-2 — SDI Video Slide Generators

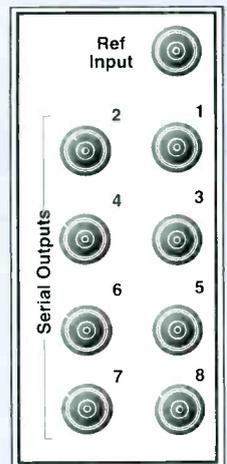
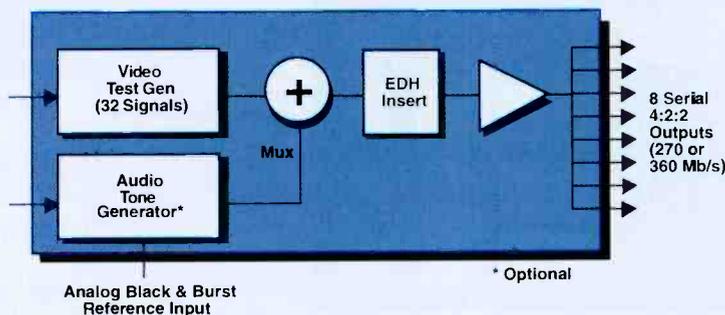
- Single-channel and dual-channel models
- Storage for two 8-bit or single 10-bit images per channel
- 4 serial digital 270Mb/s outputs with embedded EDH
- Analog reference input (black or sync) provides genlock capability
- Infinite phasing relative to reference, s/w controlled V and H adjust
- Supports both 525- and 625-line standards, and can accommodate slides of both standards on a single module
- Card edge controls for timing and slide selection
- GPI input for slide selection
- Fully compatible with complete set of Logo Graphics Utilities (LogoWIN and LogoDOS)
- Front PCB-mounted DB-9 serial port for image downloading, RS232 also available on two BNCs
- **Note:** This is a 6800 series module



VES-6801 and VES-6801-2 Back Connector

VTG-6801-1 — SDI Test Signal Generator

- Up to 32 selectable 4:2:2 digital test signals (10-bit)
- 8 serial outputs
- Optional embedded digital audio (AES/EBU) test signals
- Optional embedded EDH check words in test signal
- 4:3, 270Mb/s interlaced
- Free run or genlock operation
- Infinite timing range
- **Note:** This is a 6800 series module

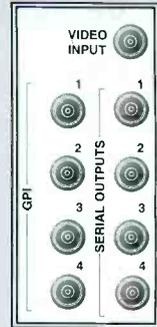


VTG-6801-1 Back Connector

LGI-6801 — SDI Logo Generator/Inserter

- 525/625 line formats supported (auto detect)
- TARGA, TIFF, JPEG, PICT file formats supported
- GPI control interface
- **Note:** These are 6800 series modules

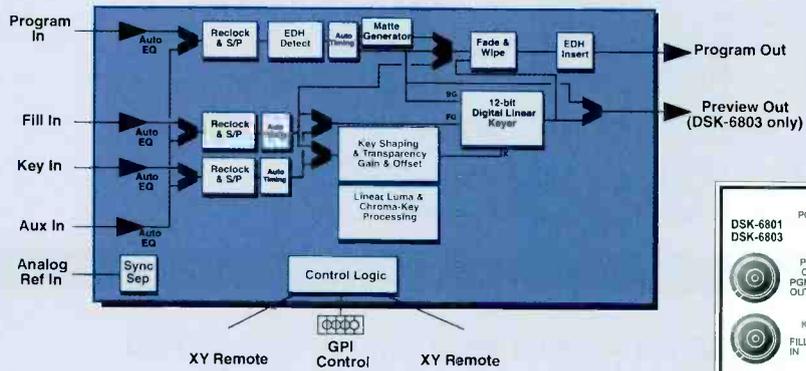
LGI-6800
Double-Slot Back Connector



DSK-6801, DSK-6803 — SDI Downstream Keyers

Both DSKs Feature:

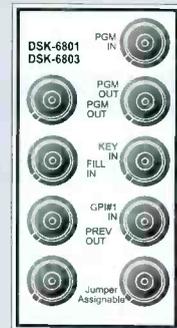
- Full 10-bit program path with 12-bit keyer for optimum quality
- MIX keying mode
- Control via card edge controls or GPI contact closures
- RS232/422 serial port for automation and editor control
- Luminance or linear keying
- Adjustable transparency, gain, offset, fade rates
- Fade-to-black



DSK-6803 Adds:

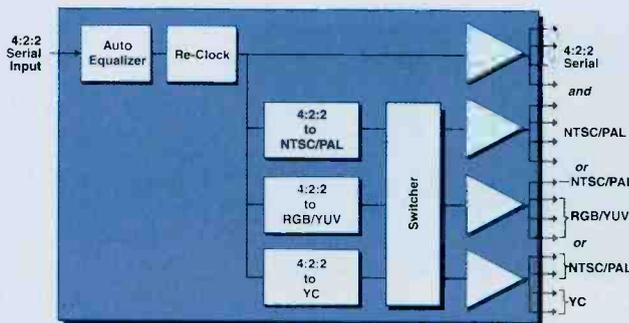
- Preview path
- Additive keying mode
- Simple chroma keyer
- Simple wipe transitions
- **Note:** These are 6800 series modules

DSK-6800 and
DSK-6803 Back Connector

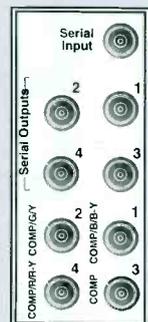


USM-6800 — Universal SDI Encoder/Distribution Amplifier

- PAL/NTSC Monitoring Encoder
- Selectable outputs, all with 4 serial outputs
 - 4 NTSC/PAL composite analog
 - 1 RGB or YUV and 1 composite analog
 - 1 YC and 2 composite analog
- Automatic data reclocking of 143, 177, 270 & 360 Mb/s
- 525/625 line auto-switching/4 equalized, reclocked serial outputs
- **Note:** This is a 6800 series module

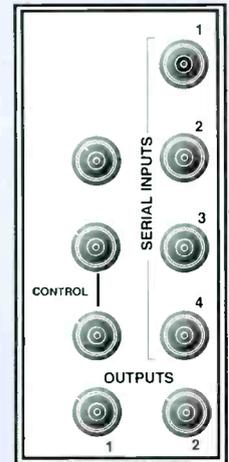
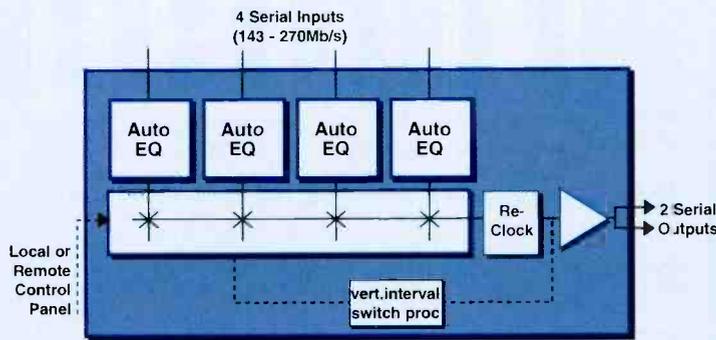


USM-6800
Double-Slot Back Connector



VSR-4041 — SDI 4x1 Switch

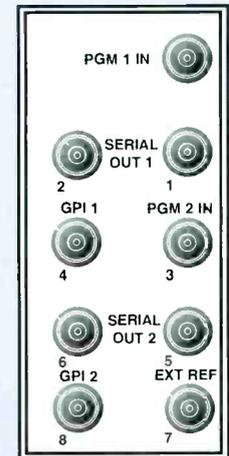
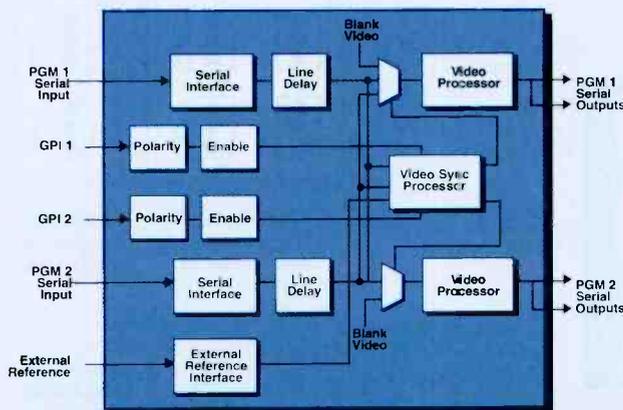
- 4x1 serial digital switcher
- Digital component or composite video
- Two serial outputs
- Local and/or remote operation
- All inputs equalized for up to 200m (675ft)
- Reclocked outputs
- **Note:** This is a 6800 series module



VSR-4041
Double-Slot
Back Connector

VTS-6801 — Video Timing Switch

- Fixes SAV/AEV errors
- Fixes illegal codes in active picture
- Recalculates EDH (Error, Detection and Handling)
- 2 x 1 clean-switch router
- Used to time input signals for devices with no time buffers on inputs
- Can be used as two independent delay lines (no reference input)
- GPI control for video switching
- Horizontal phase adjustment
- **Note:** This is a 6800 series module

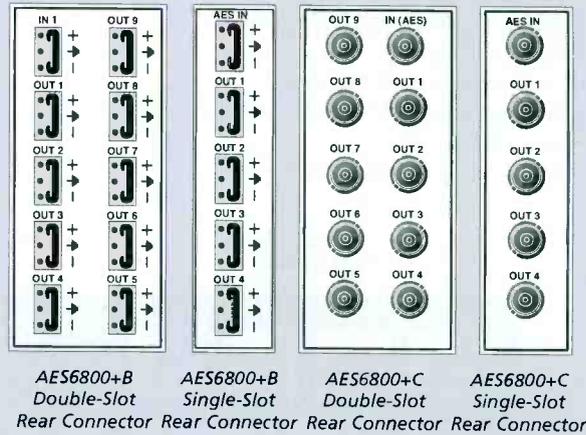
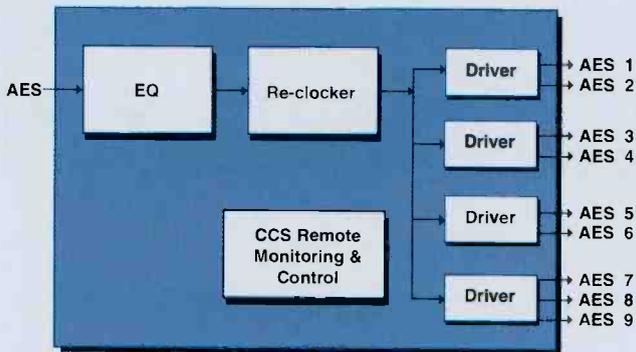


VTS-6801
Double-Slot
Back Connector

AES6800+B, C — AES Audio Distribution Amplifier

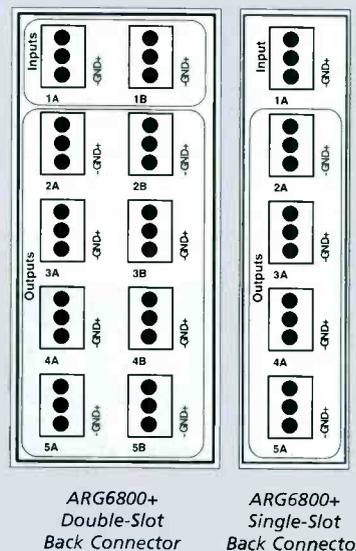
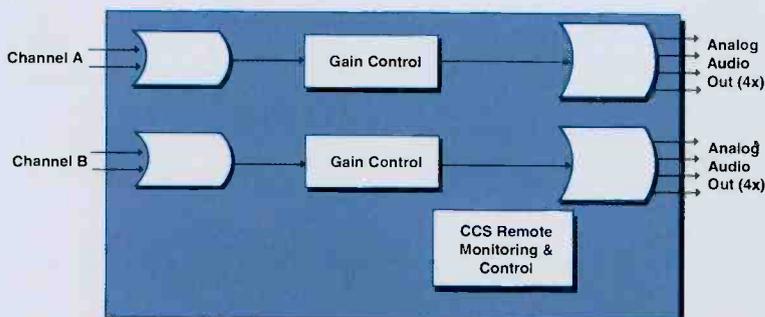
The AES6800+ B/C is a differential input, nine outputs AES/EBU digital audio distribution amplifier for use in balanced or unbalanced installations.

- Manual or automatic equalization modes
- Bypass mode for non-AES (non bi-phase encoded) signals up to 30MHz 50% duty cycle
- Data reclocking provides jitter reduction
- LED indication of input lock and other important errors



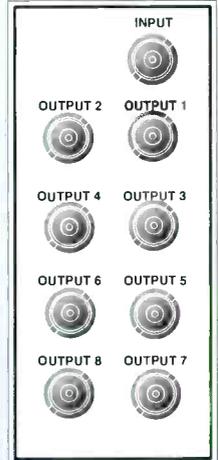
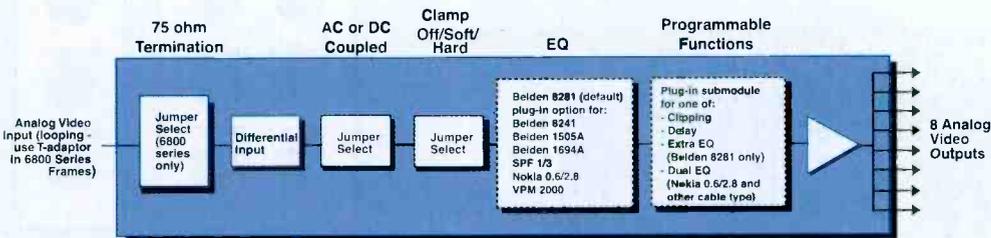
ARG6800+ — Analog Audio Remote Gain Distribution Amplifier

- Balanced inputs and outputs
- Remote control for mute settings
- Remote indication for channel state and overload
- Remote and local control for independent channel gain adjustment
- Local control for selecting output configuration
- Configurable outputs to one of the following options:
 - 8 outputs designated to 1 channel (1x8)
 - 4 outputs designated to channel A, 4 outputs designated to channel B (dual 1x4)
 - 8 outputs designated to the combined stream of both channels (2x8 sum)



VPD-6830 — Composite Video Programmable Distribution Amplifier

- Differential input, 8 outputs
- 30 MHz bandwidth (-3dB)
- Jumper-selectable soft back porch clamp
- Jumper-selectable AC or DC coupling
- **Note:** This is a 6800 series module

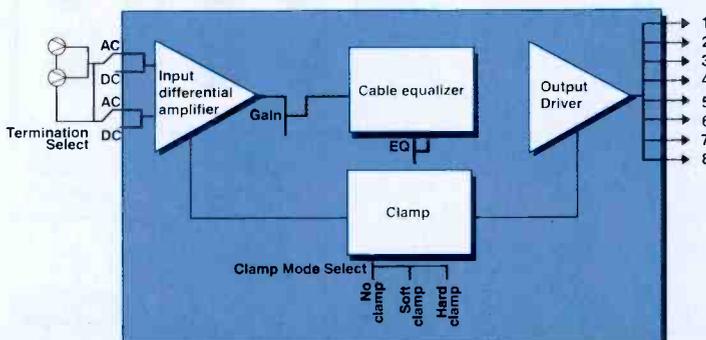


VPD-6830
Back Connector

VCA6800+ — Composite Video Equalizing and Clamping Distribution Amplifier

The VCA6800+ is an analog video clamping and equalizing distribution amplifier. This distribution amplifier is capable of hard and soft clamping to the composite NTSC and PAL video signal.

- AC and DC input coupling selectable
- Looping and internal terminating selectable with double-slot back module, internal terminating with single-slot back module
- ± 3 dB gain adjustable range, >50 MHz bandwidth
- Continuous cable equalizing up to 984 ft (300 m) Belden 8281 cable, or equivalent
- Back porch clamp with selectable soft, hard and non-clamp modes
- Optional gain/EQ control



VCA6800+
Double-Slot
Back Connector



VCA6800+
Single-Slot
Back Connector



VDA6800+ — Composite Video Distribution Amplifier

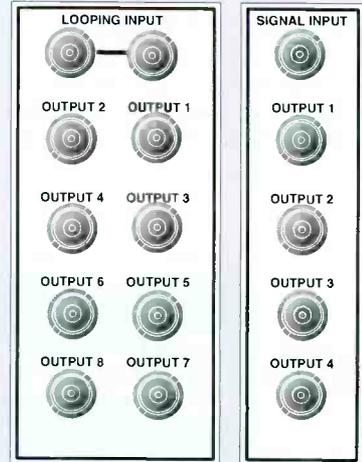
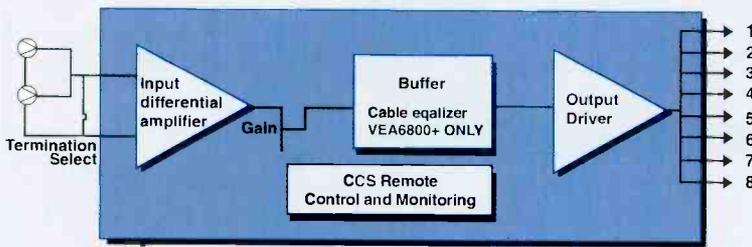
VEA6800+ — Composite Video Equalizing Distribution Amplifier

The VDA6800+ is a high-performance, high-reliability, cost-efficient general purpose analog video distribution amplifier. The VEA6800+ adds input video equalization.

- DC input coupling
- Looping and internal terminating selectable with double-slot back module, internal terminating with single-slot back module
- $\pm 3\text{dB}$ gain adjustable range, $> 50\text{ MHz}$ bandwidth

VEA6800+ Adds:

- Continuous Cable Equalizing up to 984 ft (300 m) Belden 8281 cable, or equivalent



VDA6800+ and VEA6800+ Double-Slot Back Connector

VDA6800+ and VEA6800+ Single-Slot Back Connector

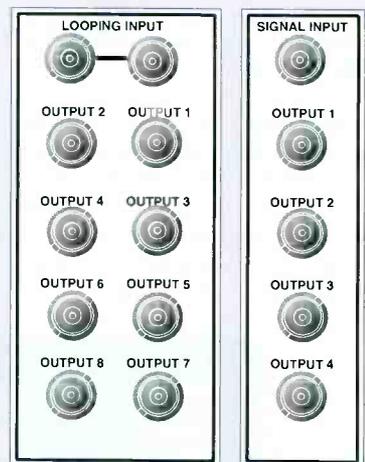
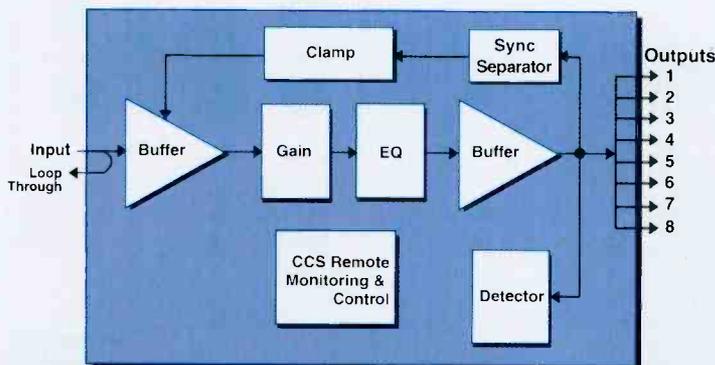


6800+™ DISTRIBUTION

VRG6800+ — Composite Video Remote Gain Distribution Amplifier

The VRG6800+ is an analog video remote gain and EQ distribution amplifier.

- Remote gain, EQ and clamping timing adjustability
- Looping and internal terminating selectable with double-slot back module, internal terminating with single-slot back module
- Back porch clamp with selectable soft, hard and non-clamp modes



VRG6800+ Double-Slot Back Connector

VRG6800+ Single-Slot Back Connector

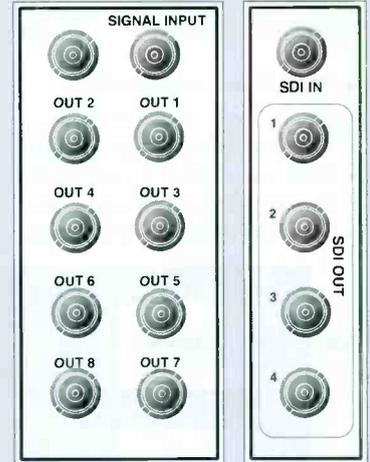
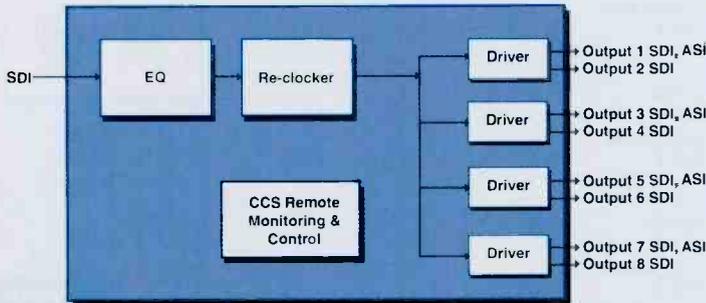


6800+™ DISTRIBUTION

VSE6800+ — SDI Video Equalizing and Reclocking Distribution Amplifier

The VSE6800+ is a serial digital video DA with cable equalizing and reclocking.

- High video performance and low cost
- Handles 143, 177, 270, 360 and 540Mb Mb/s SDI signals; and ASI signal (4 outputs only)
- Input signal presence detect
- Automatic cable equalization
- Alarm output
- Automatic/manual reclock rate select at 143/177/270/360/540 Mb/s
- Reclocking status report
- Automatic/manual bypass



VSE6800+
Double-Slot
Back Connector

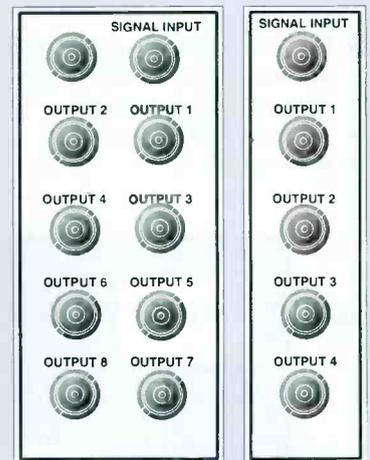
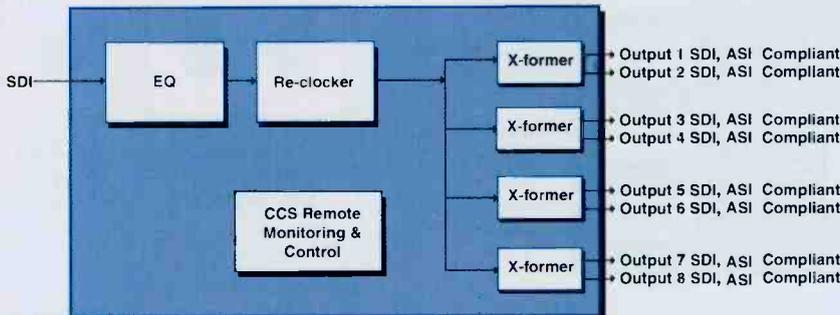
VSE6800+
Single-Slot
Back Connector



VSI6800+ — SDI/ASI Equalizing Reclocking Distribution Amplifier

The VSI6800+ is a serial video distribution amplifier that meets the requirements of SMPTE259ABC and DVB-ASI.

- Transformer coupling at the input and output
- Identical polarity between the input and outputs
- Automatic cable equalization
- Automatic reclocking at 143, 177, 270 (SDI and ASI), and 360 Mb/s
- Automatic bypass if the signal is not able to be reclocked
- Enforce bypass



VSI6800+
Double-Slot
Back Connector

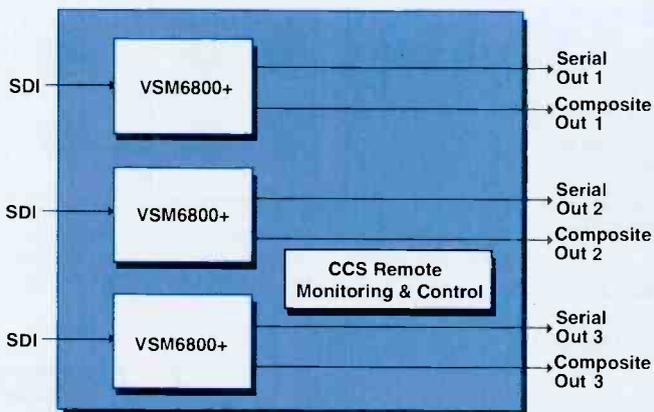
VSI6800+
Single-Slot
Back Connector



VTM6800+ — SDI Triple Monitoring Distribution Amplifier

The VTM6800+ triple serial monitoring DA combines the functions of three equalizing, re-clocking serial DAs and three composite video encoders on a single module.

- **SAVE SPACE AND MONEY!**
- Vertical blanking (pass/delete)
- Set-up on/off option (per channel) NTSC only
- Local Gain control for each channel
- Zero SCH and proper picture position
- Burst and chroma on/off (jumper per channel)



VTM6800+
Double-Slot
Back Connector

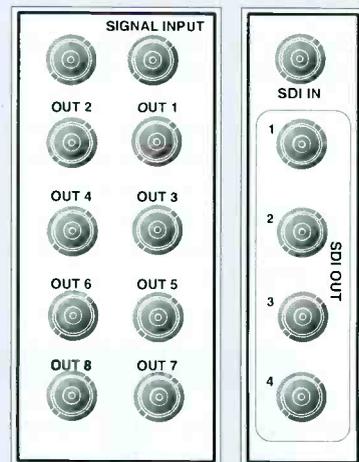
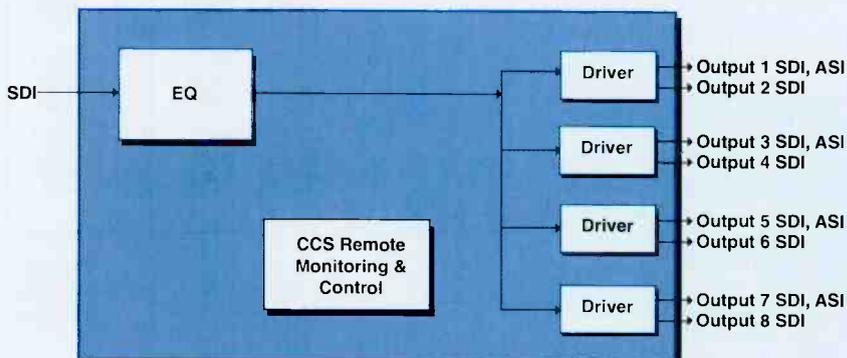


6800+™ DISTRIBUTION

VSD6800+ — SDI Video Equalizing Distribution Amplifier

The VSD6800+ is a serial digital video distribution amplifier with cable equalizing.

- High video performance and low cost
- Distributes any 10-540Mb/s data within the amplitude limitation
- Input signal presence detect
- Automatic cable equalization
- Alarm output



VSD6800+
Double-Slot
Back Connector

VSD6800+
Single-Slot
Back Connector

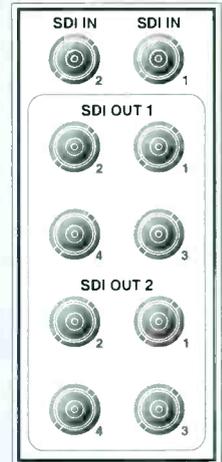
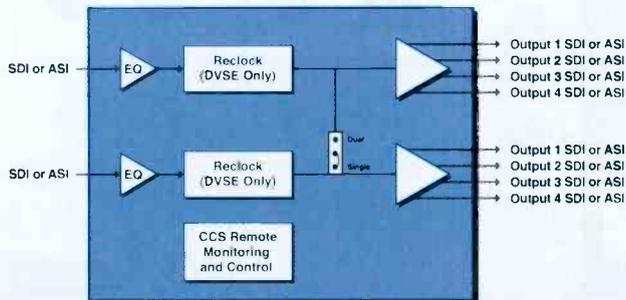


6800+™ DISTRIBUTION

DVSE6800+ — SDI/ASI Video Equalizing and Reclocking Distribution Amplifier DVSD6800+ — SDI/ASI Video Equalizing Distribution Amplifier

The DVSD6800/DVSE6800+ Dual DAs provide 2 channels of SDI/ASI video distribution with cable equalizing (and reclocking on DVSE only). The DVSD/DVSE6800+ Dual DA will provide 4 outputs for each input (2-1x4) as well as a jumper that provides a method allowing for a single-channel DA with 8 outputs (1x8).

- 2 inputs, 4 outputs per input
- Auto/manual reclock on DVSE only (19.4/143/177/270/360/540 Mb/s)
- Manual (force) reclock bypass option
- Alarm output
- For use in both the FR6802+X(F) and FR6802+DM(F) frames
- Input signal presence detection
- Automatic cable equalization
- Handles MPEG and ASI distribution on all outputs (SMPTE310 - 19.4 Mb/s to 270Mb/s)
- Loss of input switch — guarantees input to all outputs if one of the two inputs is lost



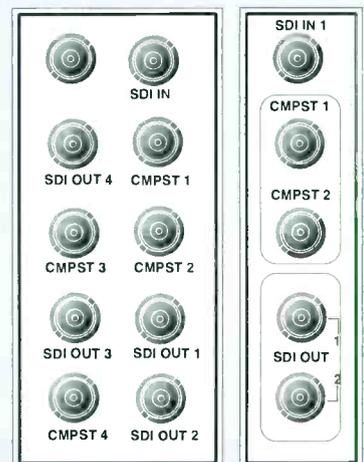
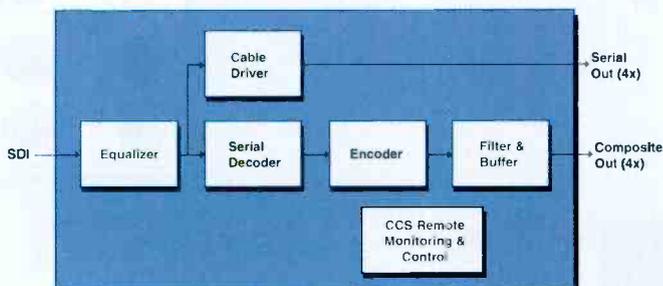
DVSE6800+ and DVSD6800+ Double-Slot Back Connector



VSM6800+ — SDI Monitoring Distribution Amplifier

The VSM6800+ serial monitoring DA combines the functions of an equalizing, re-clocking serial DA and a composite video encoder on a single card.

- Vertical blanking (pass/blank) – Line 10 to 22 (NTSC); Line 10 to 23 (PAL)
- V-Blanking chroma, plus chroma on/off
- Mono burst on/off



VSM6800+ Double-Slot Back Connector

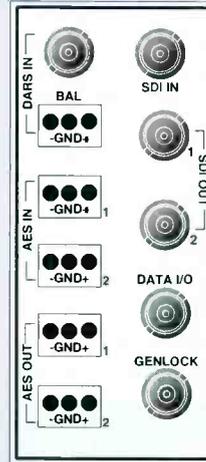
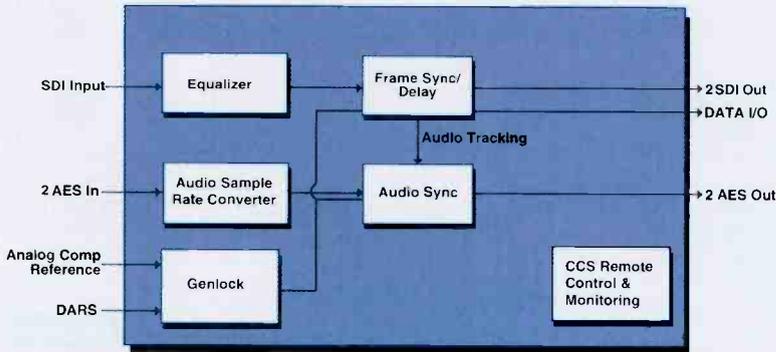
VSM6800+ Single-Slot Back Connector



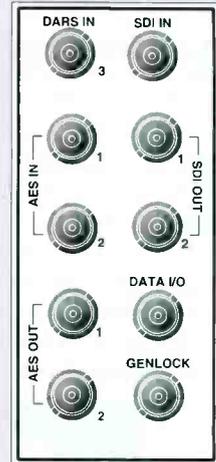
AVS6800+B2, C2 — SDI/AES Synchronizer/Processor

The AVS6800+ B2/C2 are single modules that combine SDI frame synchronizer and an audio delay synchronizer functions.

- Video Proc Amp
- Frequency jitter removal
- Delay or synchronize modes
- Audio adjustment proc amp
- Audio synchronizer tracks video frame sync
- Fixed delay of up to 1.3 seconds
- AES input and output ports provide full 24-bit capability, as well as compressed (Dolby® E) pass-through capability



AVS6800+B2
Back Connector

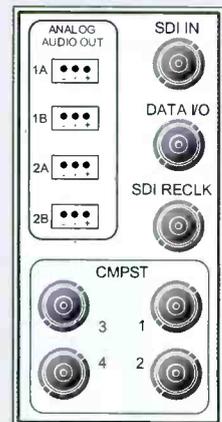
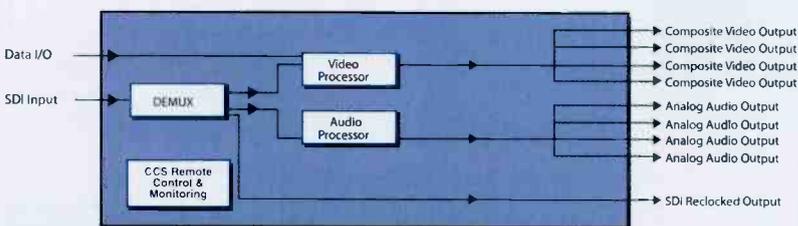


AVS6800+C2
Back Connector



VAM6800+A4 — Digital-to-Analog Video and Audio Monitoring

- SD-SDI input SMPTE 259M-C 270Mbps
- Data inputs (external sync for video and audio)
- 4 composite analog video outputs
- SD-SDI re-clocked output SMPTE 259M-C 270Mbps
- 2 stereo pairs (4 mono channels) for VAM6800+A4 option
- Jumper-selectable audio level (0 dBFS) for each channel
- Support for up to 24-bit audio de-embedding
- Composite encoder converts a SDI into a composite analog signal; supports NTSC, PAL-B and PAL-M output video formats



VAM6800+A4
Back Module



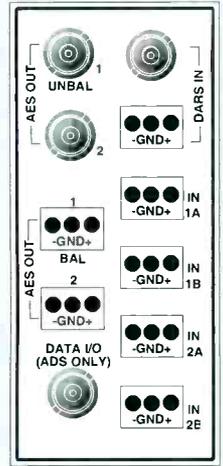
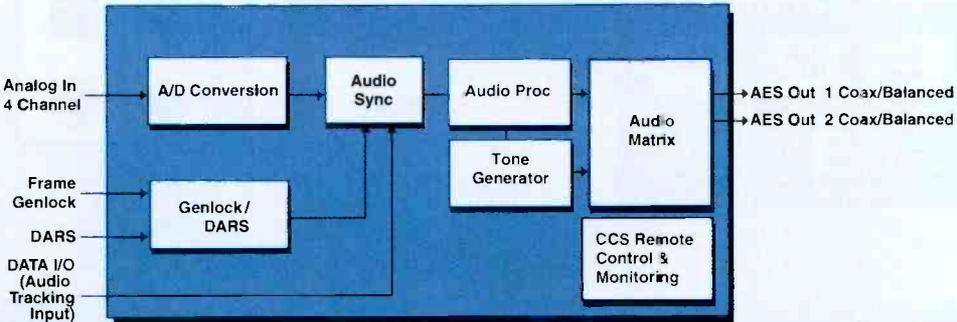
6800+™ SIMPLICITY

6800+™ SIMPLICITY

ADS6800+A4BC — Audio Delay Synchronizer with A to D Conversion

The ADS6800+ A4BC are audio delay synchronizers with on-board analog-to-digital conversion capabilities. To be used in conjunction with the 6800+ DES, ENS and VFS modules.

- Internal audio processing amplifier
- Fixed delay of up to 1.3 seconds
- 32/48/96Khz sampling
- Selectable 16/20/24-bit analog-to-digital conversion
- Channel ID tone generators (750 Hz, 1.5 kHz, 3 kHz, and 6 kHz)
- Selectable delay adjustment for each channel

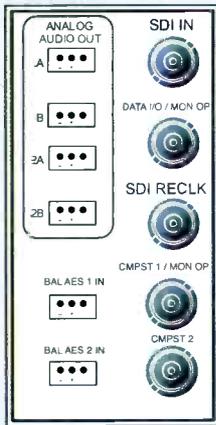
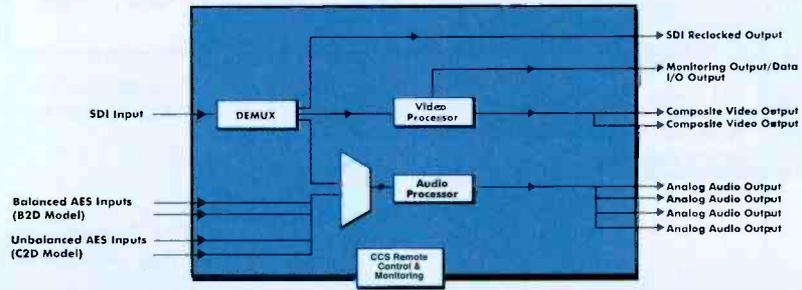


ADS6800 Back Connector

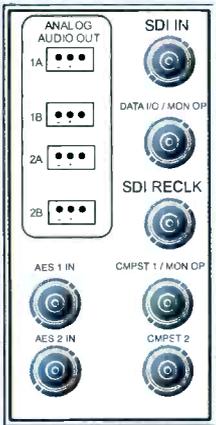


EAS6800+B2A4D,C2A4D — Broadcast-quality Digital-to-Analog, Video and Audio Monitoring

- Video processing with controls for: black level, luminance gain, chrominance gain, chrominance phase, and SCH offset
- Frame synchronization to reference video input
- Line synchronization within a 3-line window of input video
- Audio processing amplifier with controls for gain, invert, mute, and channel multiplexing (including summing for mono channel production)
- Jumper-selectable audio level (0 dBFS) for each channel
- Balanced (+B2 model) or unbalanced (+C2 model) AES inputs
- 16-, 20- or 24-bit audio processing (selectable word length in channel pairs)
- Audio test tone generator
- Programmable audio delays (up to 1.32s per input channel)
- Composite encoder converts a SDI into a composite analog signal; supports NTSC, PAL-B and PAL-M output video formats



EAS6800+B2 Back Module



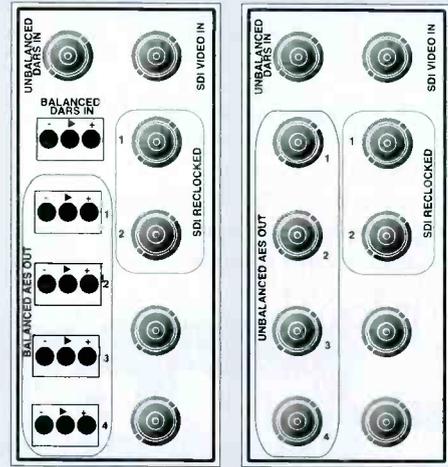
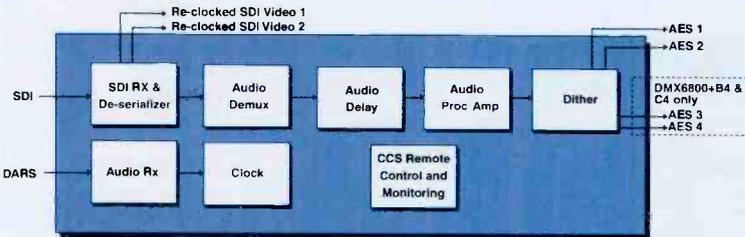
EAS6800+C2 Back Module



DMX6800+B2, B4, C2, C4 — AES Audio Demultiplexers

The DMX6800+ B2/B4/C2/C4 AES digital audio demultiplexers support up to four balanced or unbalanced AES audio outputs.

- Internal audio processing amplifier
- 16-bit, 20-bit, or 24-bit audio processing
- C-bit, U-bit and V-bit transparency
- Adjustable audio delay of up to 1.3 seconds



DMX6800+B2
and B4
Back Connector

DMX6800+C2
and C4
Back Connector

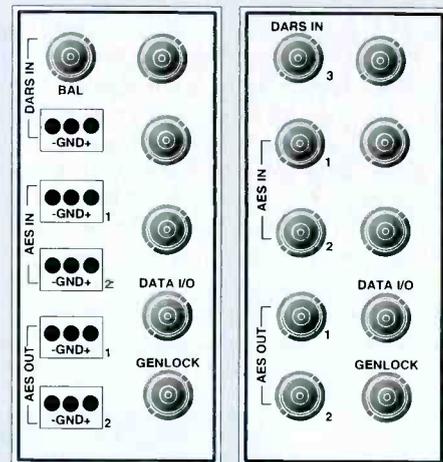
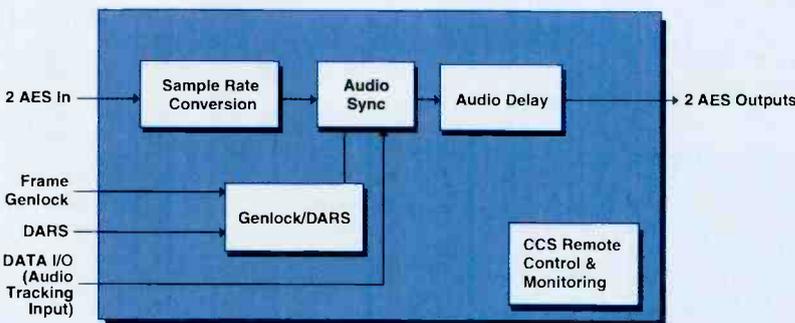


6800+™ AUDIO

ADS6800+B2, C2 — AES Audio Delay Synchronizer

The ADS6800+ B2/C2 are the audio delay synchronizers used in conjunction with the 6800+ DES, ENS and VFS modules.

- Two 24-bit digital audio inputs
- Audio adjustment proc amp for levels and mute
- Framestore tracking and system delay operation
- Fixed delay of up to 1.3 seconds



ADS6800+B2
Back Connector

ADS6800+C2
Back Connector

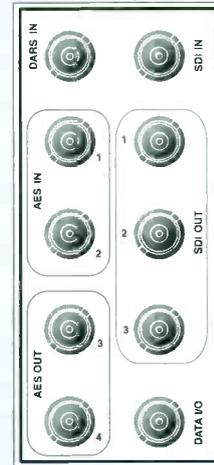
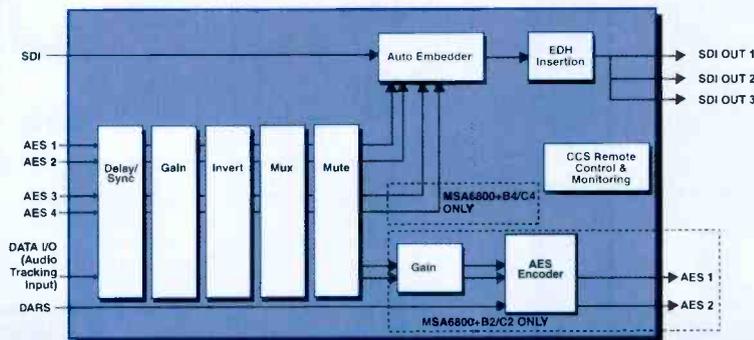


6800+™ AUDIO

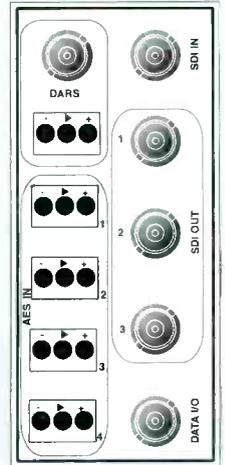
MSA6800+B2, B4, C2, C4 — AES Multiplexers with Synchronizer & Delay

The MSA6800+ AES digital audio multiplexers with audio sync and delay combine the function of embedding up to two audio groups onto a serial digital video stream with video synchronization and delay capabilities, all in one module.

- Embedder input can be selected from any audio input
- Input audio sample rates from 32 kHz to 108 kHz
- 24-bit audio processing with adjustable fade rate, gain, invert and mute, independent per channel
- Adjustable audio delay up to 1.3 seconds
- Black video generator at loss of video input
- Adjustable embedding group and mode



MSA6800+C2
Back Connector.
Balanced (+B2) version
also available



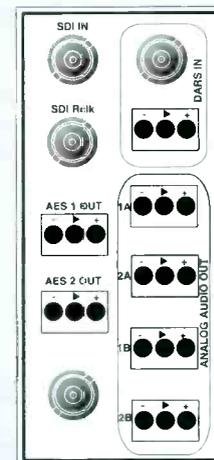
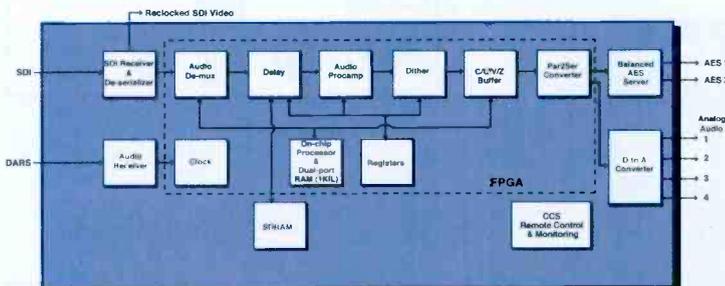
MSA6800+B4
Back Connector.
Unbalanced (+C4)
version also available



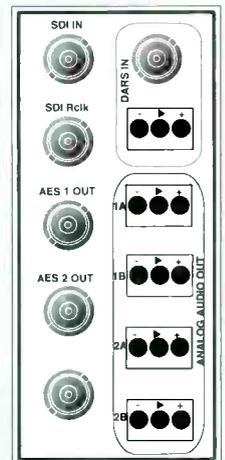
DMX6800+A4B2, A4C2 — Analog /AES Audio Demultiplexers

The DMX6800+ A2B/A2C/A4B2/A4C2 analog and AES audio demultiplexers provide audio de-embedding from an SDI input with up to two-channel AES and up to four-channel analog output.

- Selectable 16-, 20- and 24-bit resolution during audio processing
- Adjustable audio delay up to 1.3 seconds
- Selectable on/off mute function for audio errors
- Adjustable gain, invert, channel swapping
- Left/Right channel swapping
- Audio group selection
- Add "Z" at end of part number for 600ohm output impedance option



DMX6800+A4B2, A2B
Back Connector



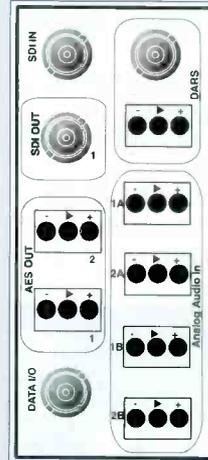
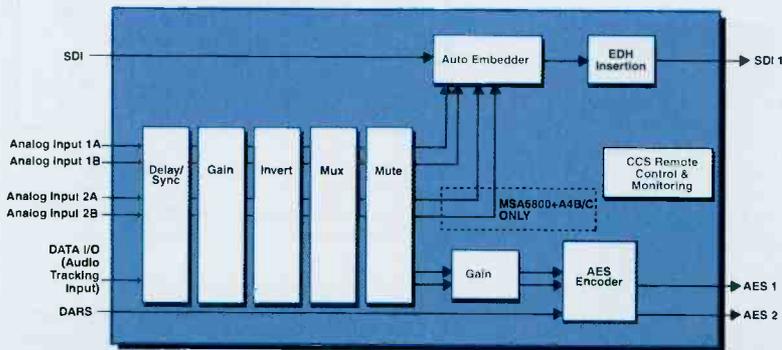
DMX6800+A4C2, A2C
Back Connector



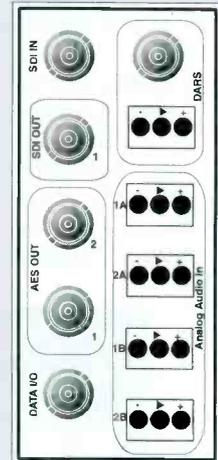
MSA6800+A4B2, A4C2 — Analog Audio Multiplexers with Synchronizer, Delay & AES Outputs

The MSA6800+ analog audio multiplexers with sync and delay combine the function of embedding one audio group onto a serial digital video stream with video synchronization, delay capabilities and AES outputs all in one module.

- Selectable 16-, 20- and 24-bit resolution during audio processing
- Accepts 32kHz and 48kHz audio
- Adjustable audio delay up to 1.3 seconds
- Customer-selectable on/off mute function with adjustable mute duration
- Adjustable gain, invert, channel swapping
- Audio group selection, insertion/pass-through/delete
- Audio and time code selectable delay



MSA6800+A2B2
and A4B2
Back Connector



MSA6800+A2C2
and A4C2
Back Connector

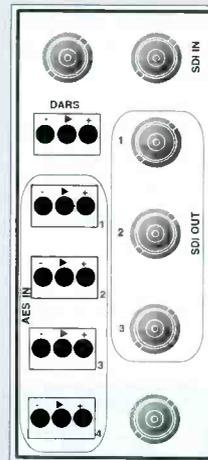
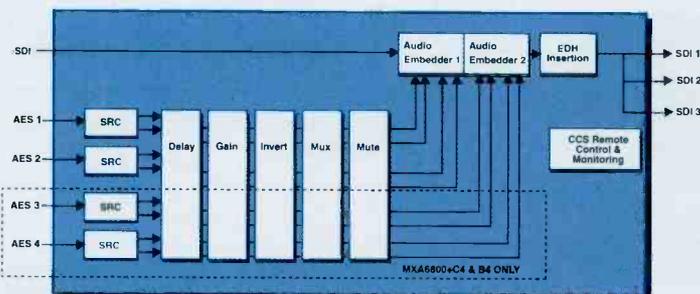


6800+™ AUDIO

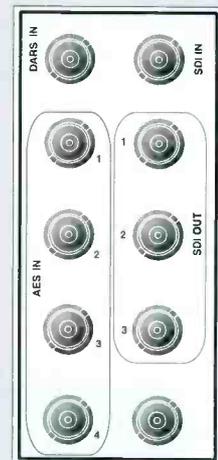
MXA6800+B2, B4, C2, C4 — AES Digital Audio Multiplexers

The MXA6800+ B2/B4/C2/C4 AES audio multiplexers embed up to two audio groups onto a serial digital video stream.

- Embedder input can be selected from any audio input
- Input audio sample rates from 32 kHz to 108 kHz
- 24-bit audio processing with adjustable fade rate, gain, invert and mute, independent per channel
- Adjustable audio delay up to 1.3 seconds
- Black video generated on loss of video input
- Adjustable embedding group and mode
- Choice of unbalanced or balanced AES inputs



MXA6800+B2
and B4
Back Connectors



MXA6800+C2
and C4
Back Connectors

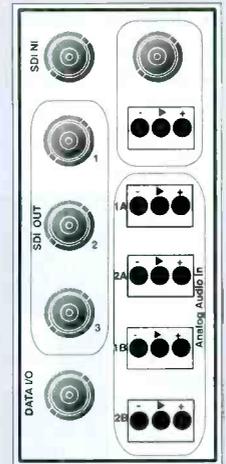
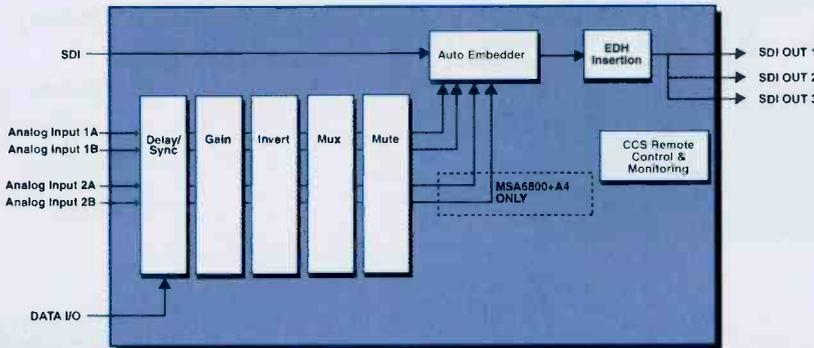


6800+™ AUDIO

MSA6800+A4 — Analog Audio Multiplexers with Synchronizer and Delay

The MSA6800+A2/A4 analog audio multiplexers with sync and delay combine the function of embedding one audio group onto a serial digital video stream with video synchronization and delay capabilities, all in one module.

- MUX-enabling embedder input can be selected from any audio input
- 24-bit audio processing with adjustable fade rate, gain, invert and mute
- Adjustable audio delay up to 1.3 seconds
- Black video generator at loss of video input
- Adjustable embedding group and mode



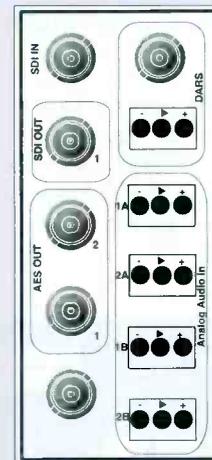
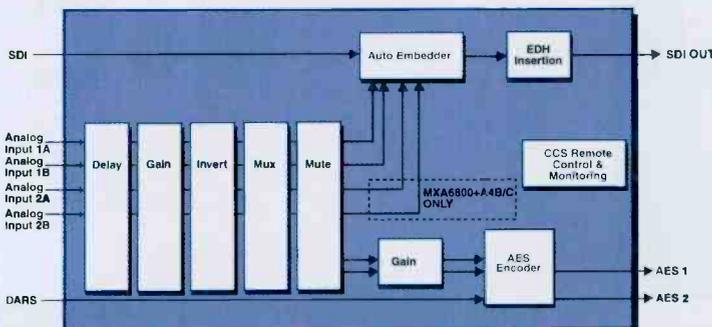
MSA6800+A2 and A4
Double-Slot
Back Connector



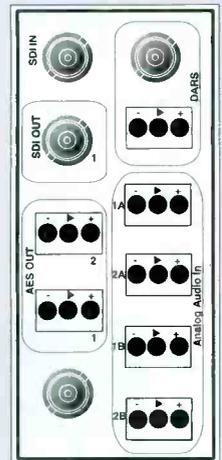
MXA6800+A4B2, A4C2 — Analog /AES Audio Multiplexers

The MXA6800+ A4B2/A2B2/A4C2/A2C2 audio multiplexers provide audio embedding up to four-channel analog to a serial digital interface (SDI) output, and up to two-channel AES with outputs.

- Selectable 16-, 20- or 24-bit resolution audio processing
- Accepts 32kHz & 48kHz audio
- Adjustable audio delay up to 1.3 seconds
- Customer-selectable on/off mute function with adjustable mute duration
- Adjustable gain, invert, channel swapping
- Audio group selection, insertion/pass-through/delete
- Audio and time code selectable delay



MXA6800+A4C2
and A2C2
Back Connector

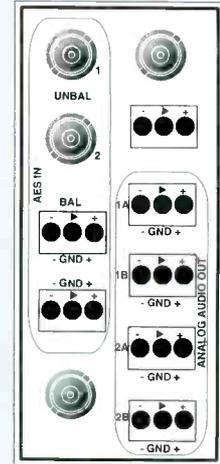
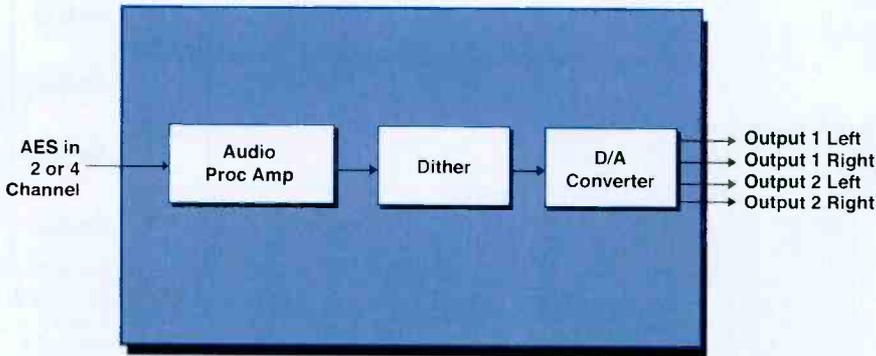


MXA6800+A4B2
and A2B2
Back Connector



DAC6800+BCA4 — AES to Analog Audio Converters

- High-quality, 24-bit D to A conversion
- 2-channel and 4-channel versions
- Provides 110 ohm balanced (AES3-1992) and 75 ohm coaxial (SMPTE-276) AES inputs
- Add "Z" to end of part number for 600ohm output impedance option



DAC6800+BCA2
and BCA4
Back Connector

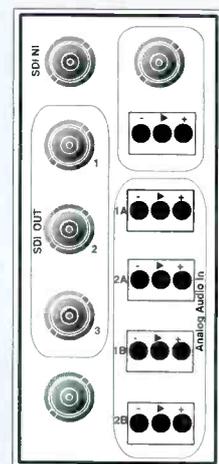
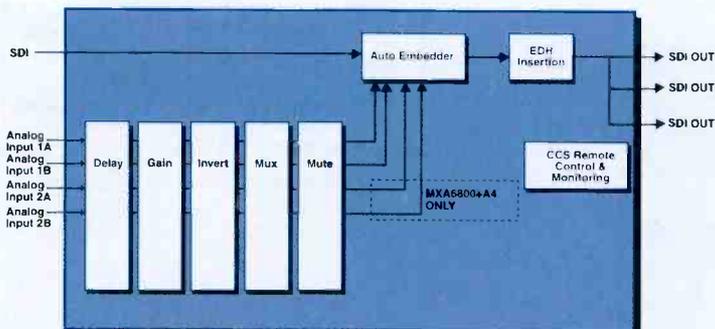


6800+™ AUDIO

MXA6800+A4 — Analog Audio Multiplexers

The MXA6800+ A2/A4 analog audio multiplexers embed up to two audio groups onto a serial digital video stream.

- MUX-enabling embedder input can be selected from any audio input
- 24-bit audio processing with adjustable fade rate, gain, invert and mute
- Black video generated on loss of video input
- Adjustable audio delay up to 1.3 seconds
- Adjustable embedding group and mode



MXA6800+A2
and A4
Back Connectors

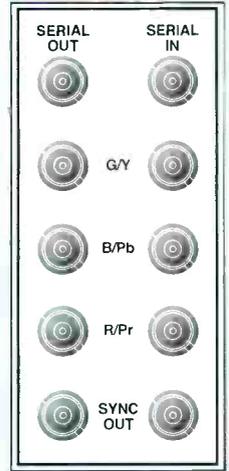
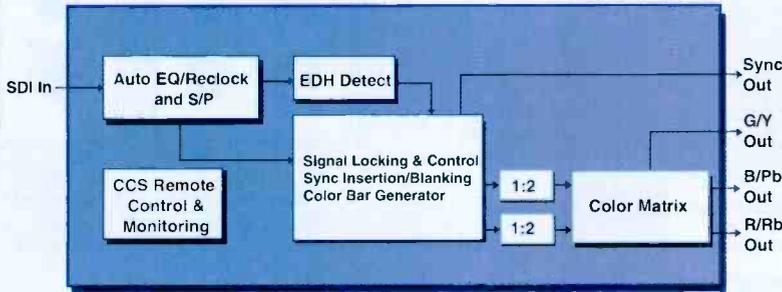


6800+™ AUDIO

DAV6800+ — SDI to Analog Component Video Converter

The DAV6800+ is an SDI to analog component video converter.

- 4X over-sampling
- High-end 10-bit conversion and signal path
- Selective Vertical Blanking
- Built-in color bars as alignment aid
- Digital gain offset calibration



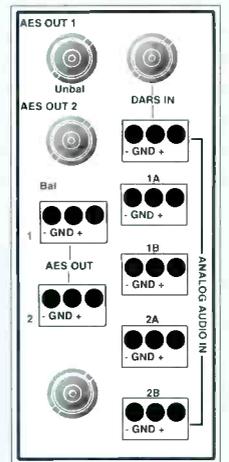
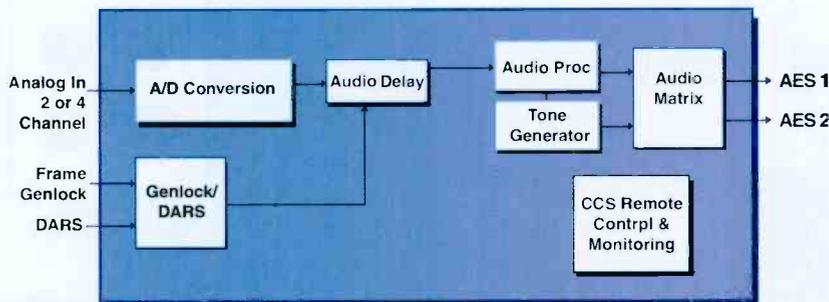
DAV6800+
Back Connector



ADC6800+A4BC — Audio Analog to AES Converters

The ADC6800+ A2/A4BC are two-channel or four-channel analog audio to AES audio converters with delay.

- Internal audio processing amplifier
- Fixed delay operation of up to 1.3 seconds
- 32/48/96kHz sampling
- Selectable 16/20/24-bit analog-to-digital conversion
- Channel ID tone generators (750 Hz, 1.5 kHz, 3 kHz, and 6 kHz)
- Selectable delay adjustment for each channel



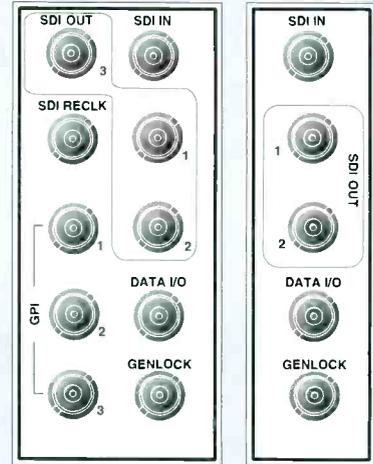
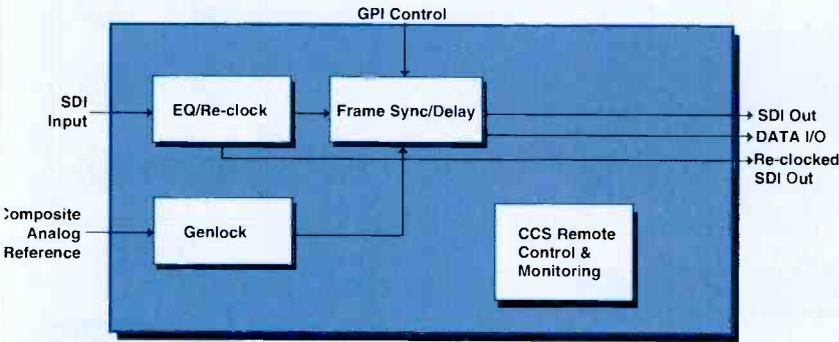
ADC6800+A2BC
and A4BC
Back Connector



VFS6800+ — SDI Frame Synchronizer / Processor

The VFS6800+ is a full-featured 10-bit serial 4:2:2 video frame synchronizer.

- Video Proc Amp
- Jitter removal
- Passes all ancillary data including embedded audio, VBI (HANC and VANC)
- Infinite Phasing relative to reference (both V and H)
- 1 Frame Delay buffer
- Delay or Synchronize Modes



VFS6800+
Double-Slot
Back Connector

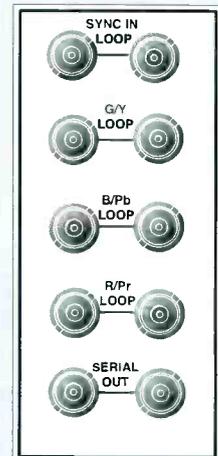
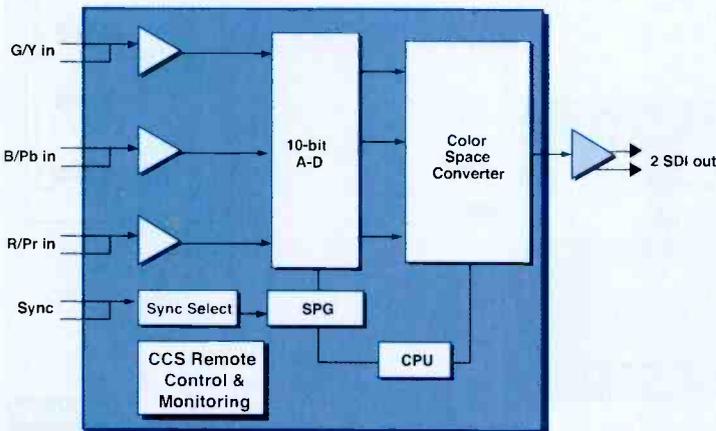
VFS6800+
Single-Slot
Back
Connector



6800+™ VIDEO

ADV6800+ — Analog Component Video to SDI Converter

- 525/625 line operation
- 10-bit converter and 12-bit signal path
- Looping inputs supporting SMPTE/EBU component and RGB, Betacam and MII, and NTSC RGB
- SMPTE 259M outputs (2)
- Sync on G/Y or external Sync/Video (looping input)
- Built-in color bars as alignment aid
- EDH Insertion on output
- Card edge and remote communications



ADV6800+
Back Connector

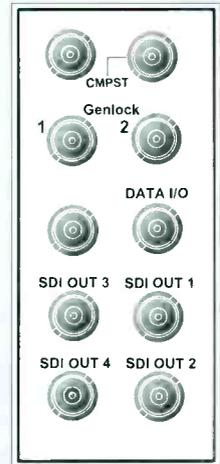
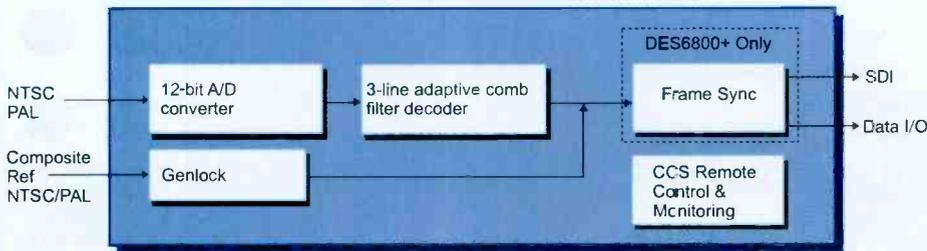


6800+™ VIDEO

DEC6800+ — Composite Video Decoder DES6800+ — Composite Video Decoder / Synchronizer

The DEC6800+ and DES6800+ are compact, high-precision 12-bit decoders that convert NTSC or PAL composite video signals into superior-quality component (4:2:2) digital video.

- 2-D Adaptive comb filtering using Leitch Phase Quadrature Modulation (PQM) algorithm
- Full line-by-line VBI handling and processing
- Black level adjustment
- DES6800+ additionally provides frame synchronization and TBC capabilities



DEC6800+ and DES6800+ Back Connector



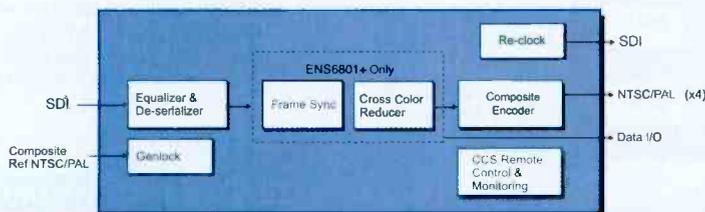
ENC6801+ — SDI Video Encoder ENS6801+ — SDI Video Encoder / Synchronizer

The ENC6801+ and ENS6801+ are high-precision 12-bit digital encoders that convert 4:2:2 digital video into NTSC or PAL composite video.

- NTSC, PAL-M/B with settings shadowed/restored
- 12-bit digital processing, output over-sampled at 54MHz
- Jitter removal; EDH detection
- VB Field/Line/Mode control
- User controls: Luma, chroma, black levels; chroma phase; SCH offset
- Line synchronization within a 3-line window of input video

ENS6801+ Adds:

- Frame sync or delay modes
- Bypassable cross color reduction with 1-line delay
- Fine phase adjustments
- Audio tracking for compatible module (ADS/MSA800+), uses one Reclock out
- Black, Pass or Freeze if loss of input
- Test signal generator



ENC6801+ and ENS6801+ Back Connector

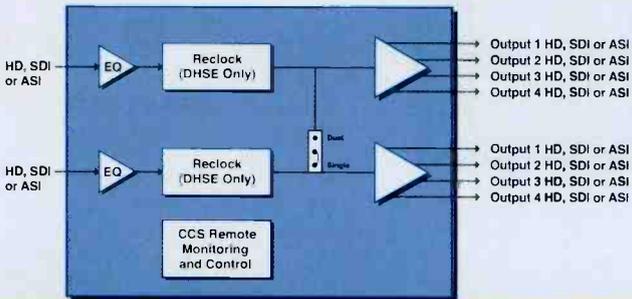


DHSE6800+ — Dual HDTV, ASI, SDI Reclocking Distribution Amplifier

DHSD6800+ — Dual HDTV, ASI, SDI Distribution Amplifier

The DHSE6800+ and DHSD6800+ dual DAs provide 2 channels of HD/SD-SDI video distribution with cable equalizing (and reclocking on DHSE only). The DHSD/DHSE6800+ Dual DA will provide 4 outputs for each input (2-1x4) as well as a jumper that provides a method allowing for a single-channel DA with 8 outputs (1x8).

- 2 inputs, 4 outputs per input
- 1 input to 8 output selection capability
- Automatic cable equalization
- Auto/manual reclock on DHSE only (143/177/270/360/540 and 1.5 Gb/s)
- Manual (force) reclock bypass option
- Input signal presence detection
- Alarm output
- For use in FR6802+X(F)
- Unique LOS (loss of signal) switch provides guaranteed signal output protection and backup



DHSE6800+ and DHSD6800+ Double-Slot Back Connector



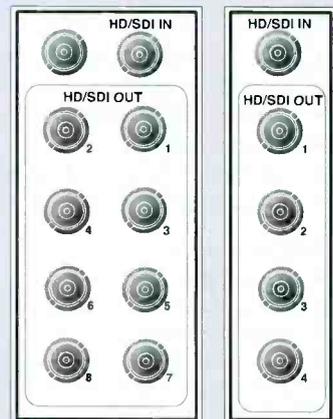
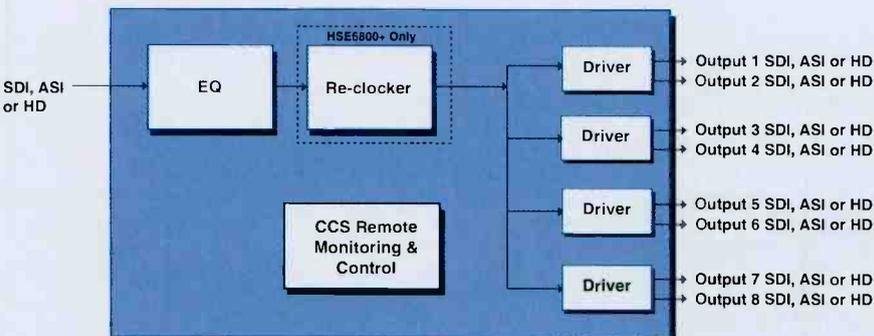
6800+™ HDTV DISTRIBUTION

HSD6800+ — HDTV, ASI, SDI Distribution Amplifier

HSE6800+ — HDTV, ASI, SDI Reclocking Distribution Amplifier

HSD6800+ and HSE6800+ are SD/HD/ASI serial digital video distribution amplifiers with cable equalization.

- Input signal presence detection
- Automatic cable equalization
- Automatic/manual reclock rate setting at 143, 177, 270, 360 and 540 Mb/s; and 1.485 Gb/s (HSE6800+ only)
- Reclocking status report and Automatic/enforced bypass (HSE6800+ only)
- For use in FR6802+X/XF frame.



HSD6800+ and HSE6800+ Double-Slot Back Connector

HSD6800+ and HSE6800+ Single-Slot Back Connector



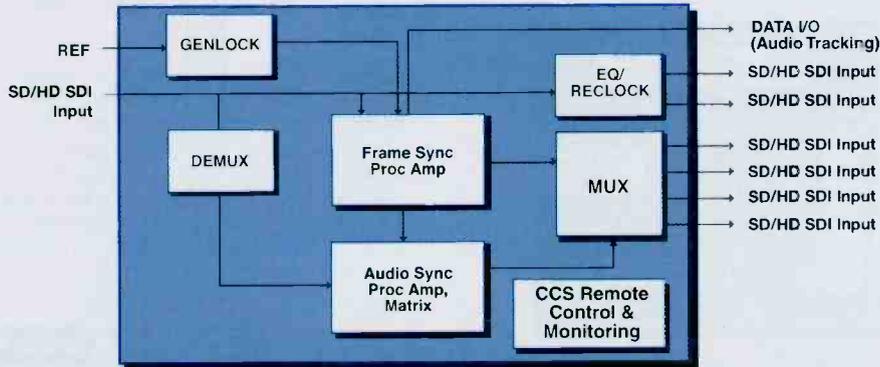
6800+™ HDTV DISTRIBUTION

HSFS6800+ — HDTV Audio / Video Frame Synchronizer & Processor Amp

The HSFS6800+ combines embedded audio and HD-SDI video processing functions on a single module.

PRELIMINARY
See Page 44 for current VFS-3901H-1

- Cleanly handles hot switch on input
- Up to 7 frames less 2 lines of video delay
- Loss of video modes: Pass, Black, Freeze
- HD video processing amplifier with controls for luminance gain, luminance offset and chrominance gain
- Internal audio processing amplifier
- Gain, swap, invert, delay, mix (sum) of embedded audio signals
- Data mode for passing compressed audio – APTX, Dolby® E, AC-3
- 16-, 20- or 24-bit audio processing
- Handling of embedded data and audio when a hot switch occurs (de-embed, re-sample, buffer, re-embed)

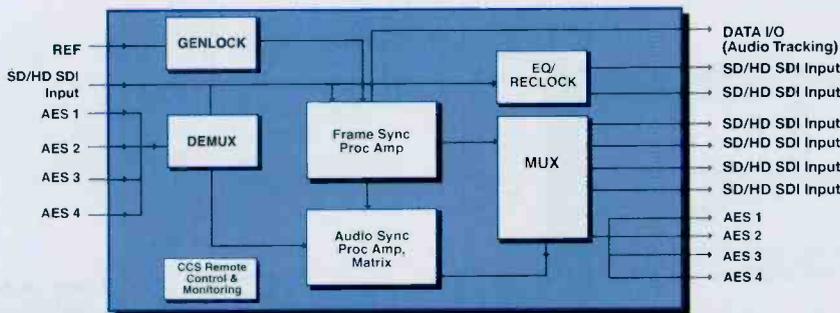


HSFSA6800+ — HDTV Audio / Video Frame Synchronizer & Processor Amp

The HSFSA6800+ combines embedded and discrete audio and HD-SDI video processing functions on a single module.

PRELIMINARY

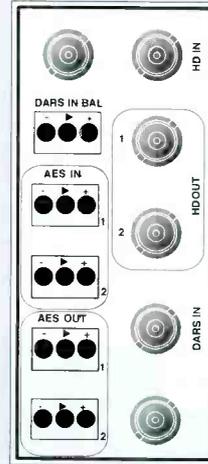
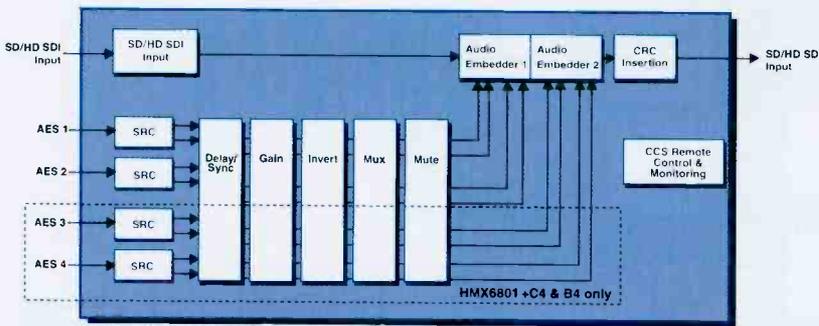
- Cleanly handles hot switch on input
- Up to 7 frames less 2 lines of video delay
- Loss of video modes: Pass, Black, Freeze
- HD video processing amplifier with controls for luminance gain, luminance offset and chrominance gain
- Internal audio processing amplifier
- Gain, swap, invert, delay, mix (sum) of embedded audio signals
- Data mode for passing compressed audio – APTX, Dolby® E, AC-3
- 16-, 20- or 24-bit audio processing
- Handling of embedded data and audio when a hot switch occurs (de-embed, re-sample, buffer, re-embed)
- Discrete AES audio I/O



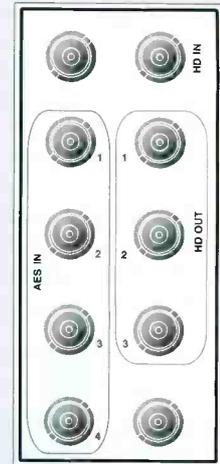
HMX6801+B2, C2, B4, C4 — HDTV AES Audio Multiplexers

The HMX6801+ AES multiplexers embed two to four AES audio signals into a single 1.485Gb/s HD video signal.

- Automatic detection of all SMPTE 292M HD-SDI standards
- Select any mix of audio channel(s) to embed into up to 4 groups, including channel sum or audio tones
- 16-bit, 20-bit, or 24-bit audio processing
- Audio proc for delay, gain, invert, mute, channel multiplexing and dithering
- Programmable audio delay from 0 to 1320 msec
- Disable sample rate conversion to handle compressed data such as Dolby® E
- Four internal audio test tones



HMX6801+B2
Back Connector.
Unbalanced (+C2)
version also available



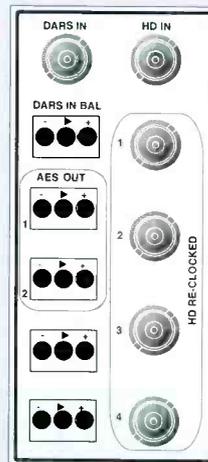
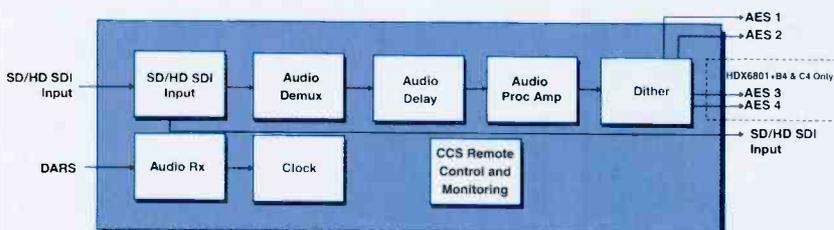
HMX6801+C4
Back Connector.
Balanced (+B4)
version also available



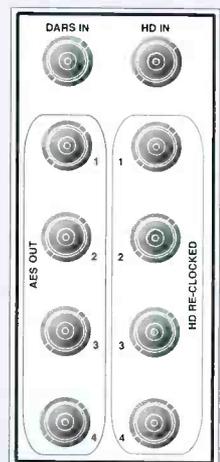
HDX6801+B2, C2, B4, C4 — HDTV AES Audio Demultiplexers

The HDX6801+ audio demultiplexers de-embed two to four AES audio signals from a single 1.485Gb/s HD video signal.

- Automatic detection of all SMPTE 292M HD-SDI standards
- 24-bit AES audio de-embedding
- User assignment of any audio group/channel mix for output, including tones
- Audio proc for delay, gain, invert, mute, channel multiplexing and dithering
- 16-bit, 20-bit, or 24-bit audio processing per channel pairs
- Programmable audio delay from 0 to 1320 msec
- Passes compressed audio such as Dolby® E (by channel pair)
- Four internal test tones: 750Hz, 1.5Hz, 3kHz, 6kHz (all at-20dBFS)



HDX6801+B2
Back Connector.
Unbalanced (+C2)
version also available



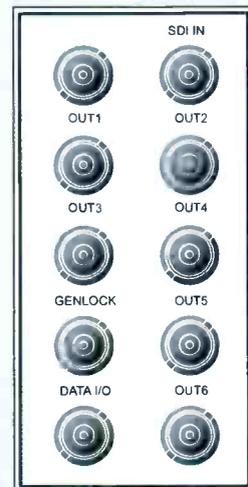
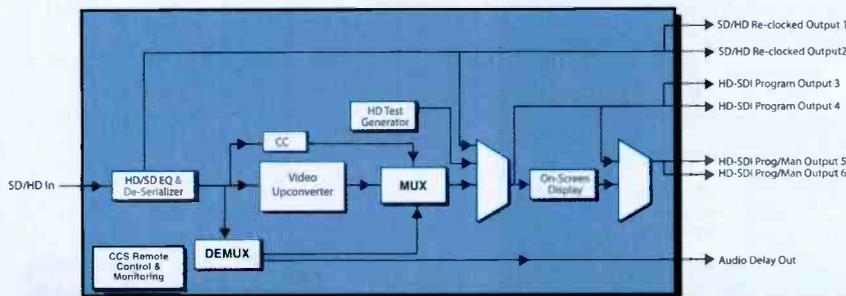
HDX6801+C4
Back Connector.
Balanced (+B4)
version also available



XHD6800+U1 Utility-quality Upconverter

The XHD6800+U1 provides 10-bit digital up-conversion of SDI video for use in utility applications in HDTV environments.

- Up-conversion using high-performance 2D de-interlacer/scalar
- 10-bit video de-interlacing with edge interpolation
- Embedded audio processing (de-multiplex from SD-SDI, delay/sync, sample rate conversion, re-multiplex into HD-SDI)
- Auto-sensing or user-selectable 525/625 input with 2 relocked SDI outputs
- 4 up-converted HDTV outputs, 1080i, 720p
- Aspect ratios: 16:9 anamorphic; 16:9 middle cut; 14:9; 4:3; Pixel True (1 to 1 mapping)
- Onscreen display of parameters and controls for setup and configuration
- HD video test generator
- SDI output with onscreen safe area overlay
- Field upgradeable to broadcast quality upconversion
- Optional closed captioning support, transcodes closed captioning from SD to HD signal formats



XHD6800+U, UC
Back Connector



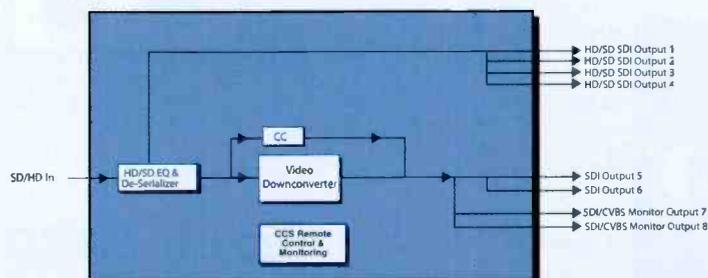
HDC6800+, HDC6800+A — HDTV Utility Downconverter

The HDC6800+ provides 10-bit digital down-conversion with user-selectable choice of outputs for use in utility applications.

- Automatic SD/HD input format detection
- Support HDTV signals for 1080i/59.94, 1080i/50, 720p/59.94, 720p/50
- 4 equalized and re-clocked outputs of the HD or SD input
- 2 SD-SDI Program Outputs
- Preset aspect ratio with 16:9 anamorphic, 16:9 middle cut; 14:9; 4:3; Pixel True (1:1 mapping)
- Variable ARC with five user presets
- Onscreen display of parameters and controls for setup and configuration
- SDI output with onscreen safe area overlay
- Processes closed captioning data in both HD and SD

HDC6800+A Adds:

- Passes two groups of embedded audio from HD-SDI to SD-SDI
- 2 of the outputs can be configured as either 2 additional SD-SDI Program or 2 composite outputs



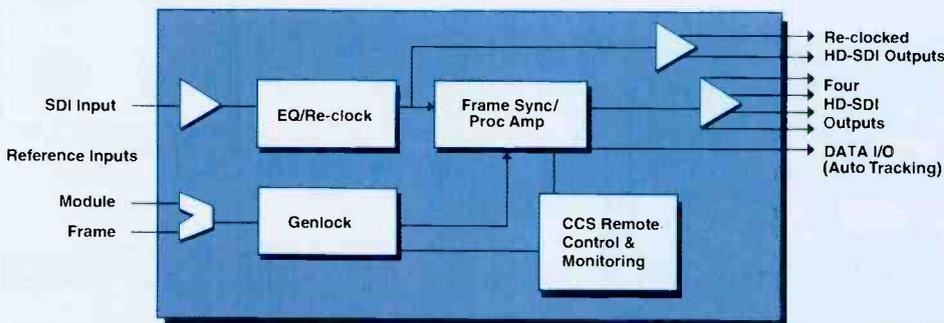
HDC6800+, HDC6800+A
Back Connector



HFS6801+ — HDTV Frame Synchronizer / Processor

The HFS6801+ is an HDTV frame synchronizer.

- Automatic detection of input video standard
- Provides 4 synchronized 1080i/50, 1080i/59.94, or 720p/59.94 outputs
- Add up to 8 frames of delay for 1080i inputs, 16 frames for 720p
- Video proc amplifier for luminance offsets and chrominance gain
- Set pass, black or freeze mode when loss of input video
- In Delay mode passes VANC/HANC data, including compressed data such as Dolby®E
- Data I/O output provides hot switch and I/O delay signals for tracking audio processing
- For use in FR6802+X/XF FR6802+QXF frame



HFS6801+
Back Connector

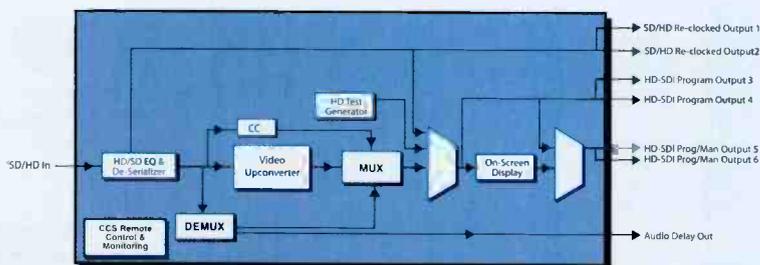


6800+™ HDTV VIDEO

XHD6800+U2 — Broadcast-quality Upconverter

The XHD6800+ provides broadcast-quality 10-bit digital up-conversion of SDI video for high-quality applications in HDTV environments.

- Up-conversion using high-performance 3D de-interlacer/scalar
- 10-bit video de-interlacing with edge interpolation
- 4 up-converted HDTV outputs, 1080i or 720p
- Auto-sensing or user selectable 525/625 input with 2 relocked outputs
- User-configurable picture-resizing Aspect Ratio Conversion (H/V size, H/V position)
- Preset aspect ratio with 16:9 anamorphic, 16:9 middle cut; 14:9, 4:3, Pixel True with five user presets
- Embedded audio processing (de-multiplex from SD-SDI, delay/sync, sample rate conversion, re-multiplex into HD-SDI)
- Onscreen display of parameters and controls for setup and configuration
- SDI output with onscreen safe area overlay
- Optional closed captioning support, transcodes closed captioning from SD to HD signal formats



XHD6800+U, UC
Back Connector

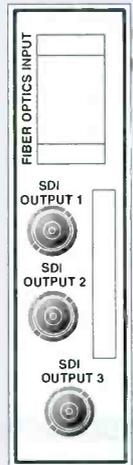
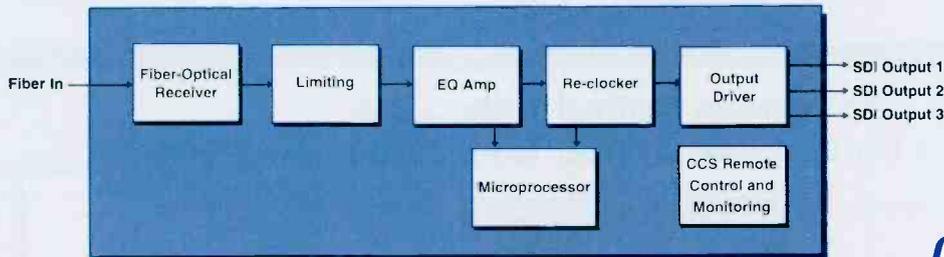


6800+™ HDTV VIDEO

OSS6800+ — Single-mode Optical to SDI Receiver OSM6800+ — Multi-mode Optical to SDI Receiver

The OSS6800+ module is suited to reception over longer "metropolitan" distances. The OSM6800+ is best suited for "enterprise" distances.

- Cost-effective solution for reception of SDI and DVB-ASI signals over fiber
- 1310 to 1550nm wavelength input on SC-, ST- or FC-type fiber connector
- Minimum input power better than -29 dBm (270 Mb/s)
- Automatic optical input signal detection
- Alarming of input signal loss and non-locked data rate
- Automatic or fixed relocking of output at 143, 177, 270, 360 or 540 Mb/s
- Bypass mode for non-relocked data rates



OSS6800+,
OSM6800+
Back Connector



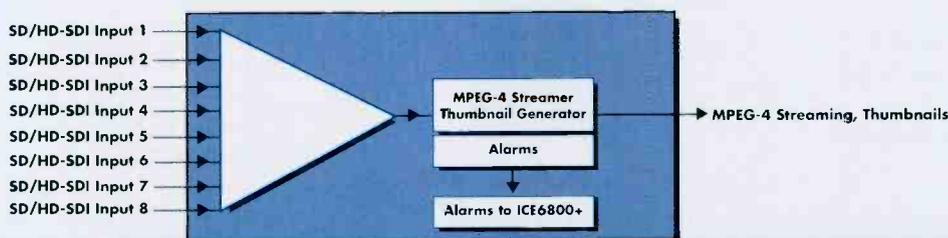
QSEE6800+H, HS - HD/SD Customizable Monitoring

QSEE6800+H: HD/SD Customizable monitoring

QSEE6800+HS: HD/SD Customizable monitoring with MPEG-4 streaming

The QSEE6800+H provides user-customizable alarm criteria and thumbnails for up to 8 separate HD/SD inputs. The QSEE6800+HS includes optional MPEG-4 confidence monitoring streaming.

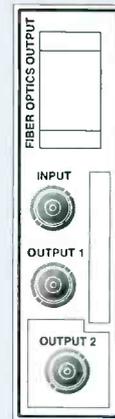
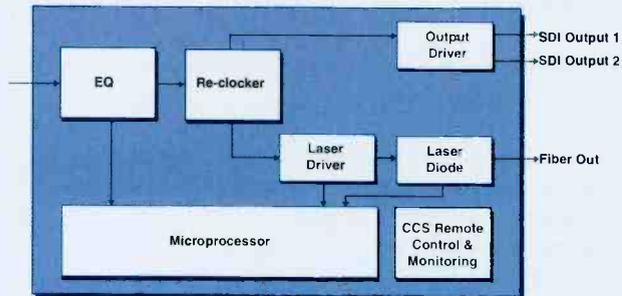
- Monitor up to 8 HD/SD-SDI input signals
- Monitor up to 4 embedded groups of audio per video input signal
- User-customizable alarms
 - Level thresholds
 - Duration thresholds
- Thumbnails generated for each input
 - Audio metering
 - Line-based waveform
 - Line-based vectorscope
- Optional MPEG-4 streaming



SOS6800+xx — SD Single-mode CWDM Optical Transmitter

The SOS6800+xx is a Coarse Wave Division Multiplexer (CWDM) single-mode transmitter.

- Supports single-mode transmission over long "metropolitan" distances
- Supports 16 CWDM optical frequencies
- Optical power 0dBm



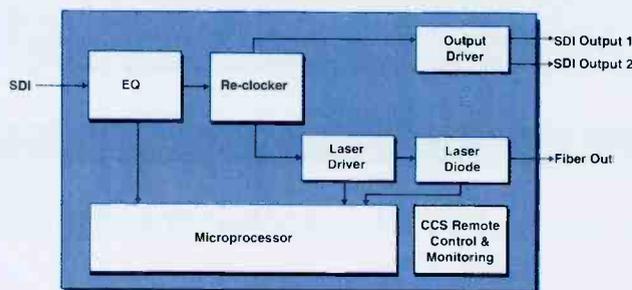
SOS6800+xx
Single-Slot Back Connector

SOS6800+ — SDI to Single-mode Optical Transmitter SOM6800+ — SDI to Multi-mode Optical Transmitter

The SOS6800+ is suited to transmitting over longer "metropolitan" distances.

The SOM6800+ is best suited for "enterprise" distances.

- Cost-effective solution for transmitting SDI and DVB-ASI signals over fiber
- Automatic detection or fixed setup for 143, 177, 270, 360 or 540 Mb/s
- Bypass mode for non-reclocked data rates
- Detection and alarming of equalization and video format
- Automatic cable EQ up to 300 meters for Belden 1694A at 270Mb/s
- 1310nm wavelength output on SC-, ST- or FC-type fiber connector
- Optical power better than -7.5dBm

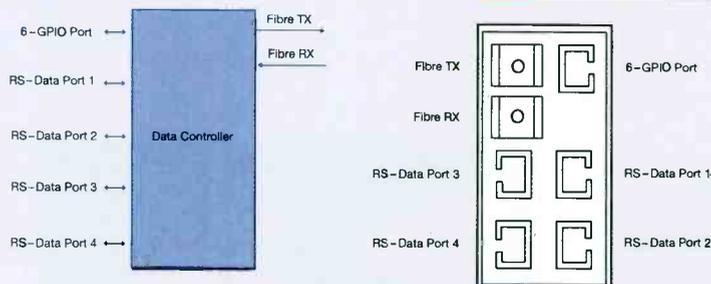


SOS6800+,
SOM6800+
Back Connector

DATA+OP+CxxD, 13D, 15D — Serial Data: GPI Transceiver

The DATA+OP+ provides bi-directional data and contact closures via fibre optics. The DATA+OP+ modules support RS232, RS422, RS485 protocols and 6 contact closures (GPIOs).

- Each data port will have individual parameter settings
- Direction of GPIO will be user definable
- Available in 1310nm, 1550nm and CWDM wavelengths
- Supports multi-mode and single-mode fibre cables



OBS6800+C — Passive CWDM Optical Splitter and Combiner

The OBS6800+C is a single-mode optical splitter/combiner.

- Passive design
- Divides or combines 1310nm band and 1550nm band with low insertion loss and high isolation
- Bidirectional application on one signal mode fiber

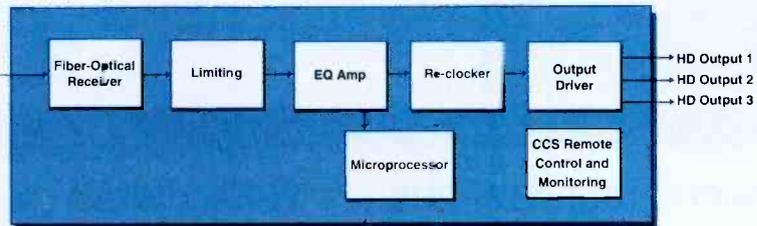


OBS6800+C
Back Module

OHMS6800+ — Multi-mode Optical to HD-SDI Receiver

The OHM6800+ is a multi-mode fiber optic to HD-SDI/SDI/DVB-ASI Receiver.

- 1310nm to 1550nm optical input on choice of SC-, FC- or ST-type fiber connector
- Minimum input power better than: -20 dBm for HD-SDI; -27dBm for SDI/ASI
- Auto-detect and relocking for 143, 177, 270, 360, 540Mb/s or 1.485Gb/s
- Can bypass reclocker when input signal does not lock

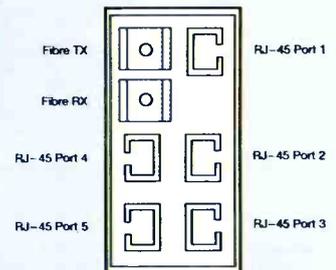
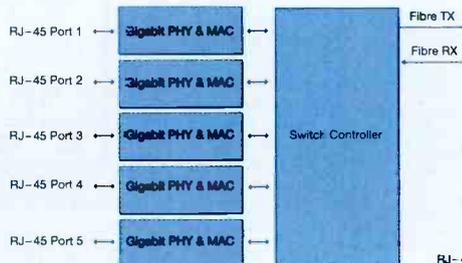


OHMS6800+
Single-Slot Back
Connector

ETH+OP+CxxD, 13D, 15D — 10/100/16 Ethernet Switch – Transceiver

ETH+OP+ is a standalone 10/100/1000Mbps triple speed Ethernet switch with five RJ45 data ports and two fiber interface ports. The module also provides QoS operation by allowing switch traffic to be given different classes of priority or service. Examples include voice traffic for IP phone applications, video traffic for multimedia applications, data traffic for email applications, etc.

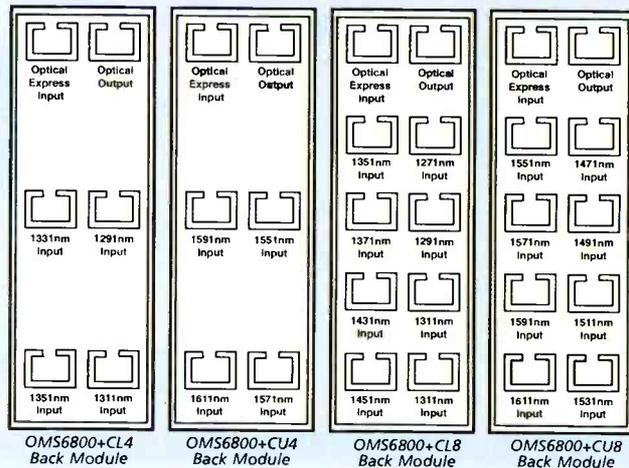
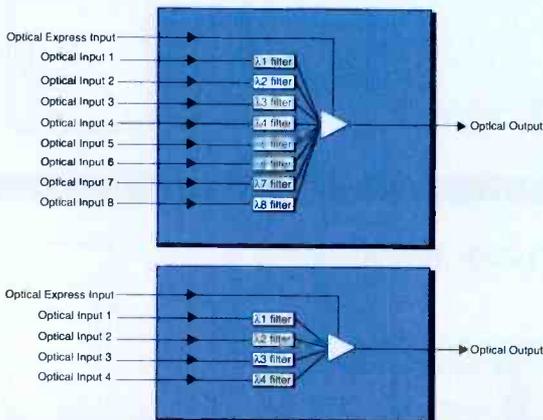
- Triple-speed Gigabit Ethernet connection
- Non-blocking, wire-speed performance
- 8K MAC address. Automatic address learning and aging
- Auto MDI/MDIX support to detect and Correct Crossover cables for all ports
- Single optical wavelength at 1310nm, 1550nm, or up to 16 CWDM wavelengths (ITU-T G.694.2 compliant)
- Dual fiber unidirectional fiber connection
- LED Link activity indication
- Full duplex and half duplex options support



OMS6800+CL4, CU4, CL8, CU8 — Passive CWDM Single mode Optical Multiplexers

The OMS6800+ are passive 4 and 8 channel multiplexers for the CWDM system.

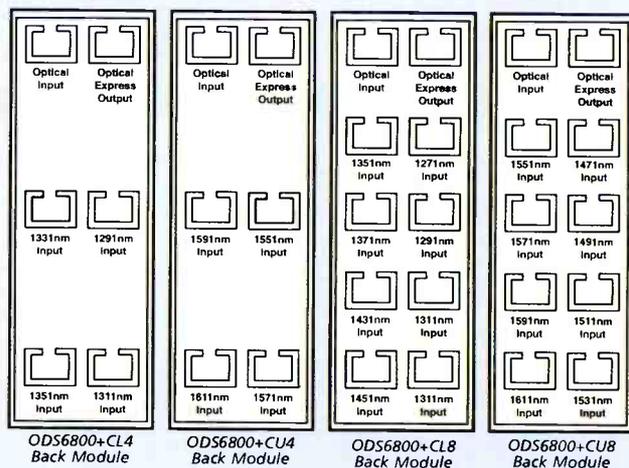
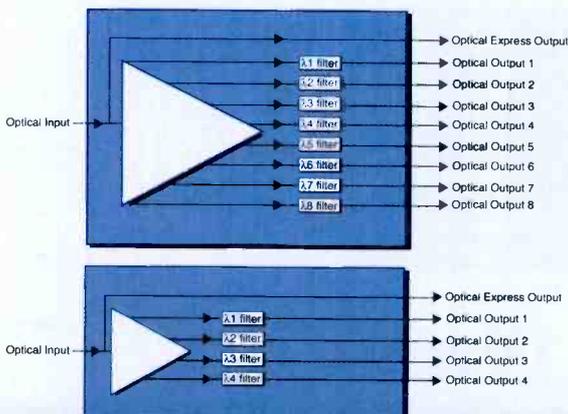
- Passive design
- Provide options for connectors including SC, ST, FC
- CWDM modules comply with ITU-T G.694.2 standards for CWDM wavelengths
- Do not require low "water" peak fiber to utilize all 16 wavelengths and operate over wavelengths between 1271nm and 1611nm



ODS6800+CL4, CU4, CL8, CU8 — Passive CWDM Single mode Optical Demultiplexers

The ODS6800+ are passive 4 and 8 channel demultiplexers for the CWDM system.

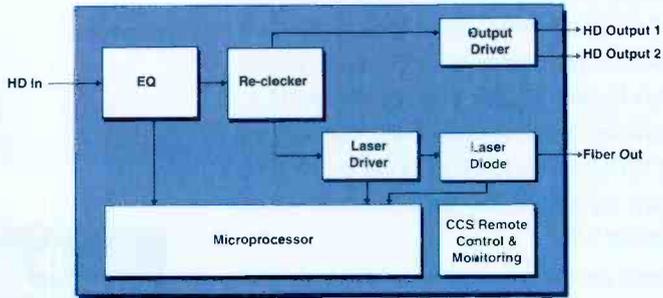
- Passive design
- Provide options for connectors including SC, ST, FC
- CWDM modules comply with ITU-T G.694.2 standards for CWDM wavelengths
- Do not require low "water" peak fiber to utilize all 16 wavelengths and operate over wavelengths between 1271nm and 1611nm



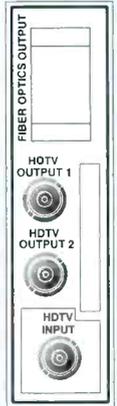
HOS6800+ — HD-SDI to Single-mode Optical Transmitter

The HOS6800+ is an HD-SDI/SDI/DVB-ASI to fiber optic single-mode transmitter.

- Supports single-mode transmission over longer "metropolitan" distances
- Auto-detect and reclocking for 143, 177, 270, 360, 540Mb/s or 1.485Gb/s
- Automatic cable EQ up to 100 meters for 1.485Gb/s, or 300 meters for 270Mb/s with Belden 1694A
- Can bypass reclocker when input signal does not lock
- 1310nm optical output on choice of SC-, FC- or ST-type fiber connector
- Optical power is better than -7.0dBm



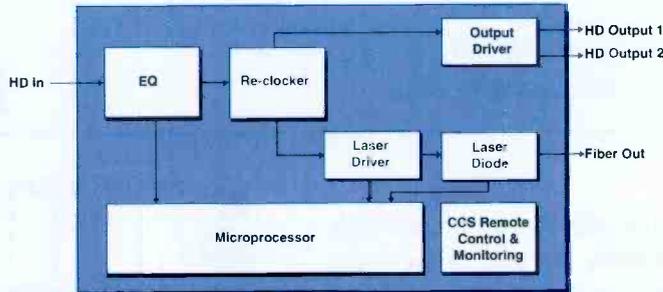
HOS6800+
Single-Slot Back Connector



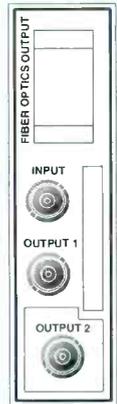
HOS6800+xx — HD, SD, ASI Single-mode CWDM Optical Transmitter

The HOS6800+ is a Coarse Wave Division Multiplexer (CWDM) single-mode transmitter.

- Auto-sensing HD, SD, ASI input
- Supports single-mode transmission over long "metropolitan" distances
- Supports 16 CWDM optical frequencies
- Optical power 0dBm



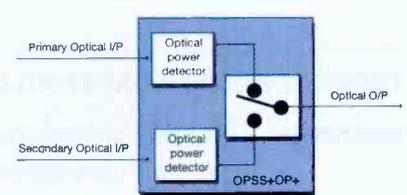
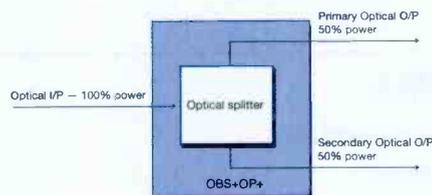
HOS6800+xx
Single-Slot Back Connector



OPSS+OP+D & OBS + OP + 5050D — Optical Protection Switch, Optical Splitter

The OBS+OP+5050D is a passive wideband optical splitter with the power ratio of 50%. The OPSS+OP+D is an active 2 to 1 wideband optical protection switch.

- 1200–1630 nm wavelengths
- Manual or Automatic switchover
- User-definable switching threshold



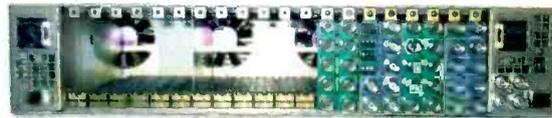
PRELIMINARY



FR6802+QXF

The FR6802+QXF with fan assembly can house any mix of signal types: HDTV, SDI, DVBASI, fiber optic, AES/EBU, (balanced and unbalanced) analog video and analog audio. These frames feature 20 slots that accommodate 1-slot or 2-slot modules with mating back connectors, providing superior density of up to 20 modules in just 2RU. I/O connectors are optimized for each module: BNC, multi-pin, fiber and/or RJ45.

- Q-SEE™ thumbnails compliant
- Fit up to 20 modules in 2RU
- Handle any mix of HDTV, SDI, DVB-ASI, fiber optic, AES/ EBU, analog video and analog audio modules
- Provides open back (mating rear connectors supplied with signal modules)
- Backward compatible with legacy 6800 series modules, and all 6800+ series modules, preserving past investments
- Option for integrated Ethernet resource card
- All 6800+ modules can be housed in this frame



FR6802+QXF full back view



FR6802+X(F)

The FR6802+X(F) is the core 6800+™ frame. Specifically designed for maximum flexibility, the back of the frame accommodates removable back-connectors that are module-function specific.

- ALL 6800+ and ALL 6800™ modules can be housed in this frame
- Houses up to 20 modules, in any combination (both single- and dual-slot modules at the same time)
- Requires back-connectors to be ordered for both 6800™ and 6800+™ modules to be housed in this frame



FR6802+X(F) back view with blank plates



FR6802+X(F) back view with blank plates removed to insert back connectors



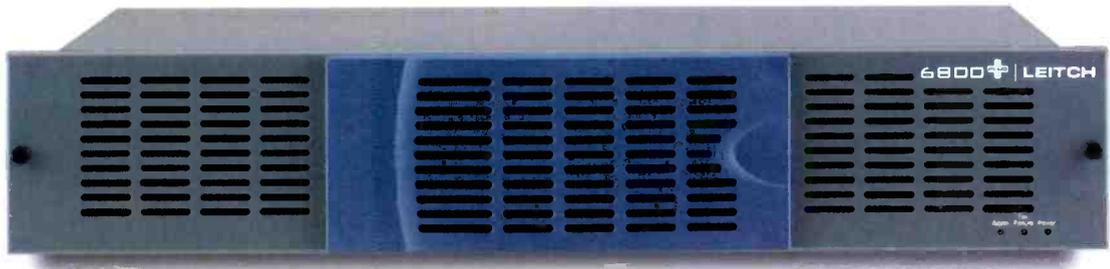
PRODUCT NUMBER ORDERING DETAILS

- xxx6800+D** — D implies that the product is delivered with a "2 slot" back-connector for an FR6802+X(F) or FR6802+QXF frame
- xxx6800+S** — S implies that the product is delivered with a "1 slot" back-connector for an FR6802+X(F) or FR6802+QXF frame

6800+™ FRAMES

6800+™ FRAMES

6800+™ For All Core Processing — The 6800+™ frames house and power 6800™ family modules and enable a new generation of 6800+ style products. These frames allow genlocking, remote control, higher product and power capacity and modular interfaces.



Main Features



General

- Capable of handling HDTV, SDI, analog and AES audio, fiber optics and other (non-BNC) interfaces (in the FR6802+X(F) and FR6802+QXF frames)
- Holds up to 20 single-slot cards (in the FR6802+X(F) frames or FR6802+QXF) or 10 double-slot cards or any combination of the two totaling 20 single slots
- Provides continuity to legacy products, housing 6800 modules
- All modules and PSUs are hot-swappable
- Frame-based looping video reference distribution across frame midplane
- Lightweight for mobile production applications

Power and Thermal Considerations

- Frame can house two (redundant) power supplies: AC, 48V DC, or one of each
- AC power cord is locked in place (no DC cord provided)
- Single power supply unit can support entire frame load
- Able to support any combination of modules in every slot of the frame
- Optional integral fan cooling; front to back primary airflow
- Frames equipped with integral fan cooling; may be rack-mounted on top of one another without restrictions

Control and Monitoring

- QSEE6800+ module enables MPEG-4 video monitoring over IP networks
- Monitoring thumbnails on the FR6802+QXF frame with the Ethernet resource card (on the appropriate modules)
- Each ICE6800+ module enables control and monitoring for up to 9 frames
- Option to connect to Harris CCS™ control through an interface card (ICE6800+) or through the Ethernet resource card (FR6802+QXF frame only)
- Every frame supports serial control and monitoring with free +Pilot Lite application
- Frame status monitoring by a variety of means including GPI contact closure

6800+™ and NEO® provide unmatched product choice for both Core Processing and Advanced Applications, allowing flexible system designs that reduce both upfront capital and ongoing operational costs. Both platforms support networked integrated control and monitoring and are SNMP-friendly for easy integration within larger facility supervision infrastructures.



6800+™—High-quality Core Processing modular platform. 6800+™ is an exceptional value and high-quality processing platform that provides all core processing and distribution functions in analog, SD, HD and optical formats. Products are designed with a “core function per module” concept that ensures straightforward system designs with lower costs and higher performance. Based on the renowned 6800™ platform, 6800+™ has been completely redesigned to offer integrated control and monitoring, confidence monitoring MPEG-4 stream and thumbnails, and SNMP. 6800+™ offers a modern, future-proofed solution for any core processing infrastructure requirements.

NEW! OPTO+™, a full range of fiber optic products in the Harris 6800+ platform, delivers top-quality, easy-to-use fiber solutions in a minimal amount of space. The OPTO+™ line includes auto-sensing HD/SD/ASI transmitters and receivers, along with a complete line of Coarse Wave Division Multiplexer (CWDM) modular products.

NEO®—Premier Advanced Application modular platform. NEO® hosts a vast array of advanced applications designed to offer high performance, high value and a compact form factor, while simultaneously simplifying integration and operational requirements. NEO® Advanced Applications include the award-winning NEO® VR digital video recorder, the IconLogo™ branding tool, the NEO® SuiteView™ multisource display processor and the MTG-

3901 Master Timing Generator, as well as a comprehensive selection of NEO® Simplicity™ integrated video and audio processing modules. These applications extend the practicality of NEO® beyond traditional modular processing.

NEW! In addition to supporting the open, documented CCS™ Protocol, the NEO® Advanced Application platform offers optional SNMP support, direct to the frame, with support of both SNMP v1 and SNMP v2c. SNMP support is key for facility-wide monitoring applications and offers an industry-standard interface to address interoperability between multiple vendors.

CCS Navigator™ and NUCLEUS™ — Network monitoring and control can be accomplished through both hardware panels and software applications. Both NUCLEUS™ and CCS Navigator™ provide customizable user interfaces to enable users to quickly identify problems and take corrective action. 6800+™ and NEO® products are fully CCS™-compliant and can be remotely monitored and controlled by CCS Navigator™ software over industry-standard Ethernet networks. The NUCLEUS™ Network Control Panel allows the user to navigate to a specific device quickly with the minimum number of keystrokes.



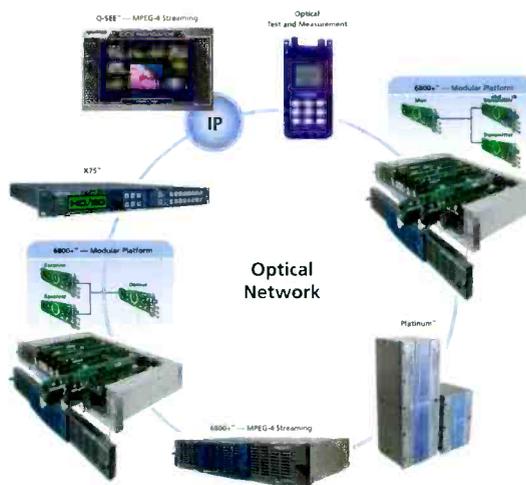
OPTO+^{PLUS}

Fiber Optics

OPTO+™: Extending the reach and flexibility of Harris signal processing

With today's broadcast workflow often spanning multiple locations, the Harris signal processing portfolio meets the unique requirements of geographically distributed signal processing by providing a comprehensive offering of fiber optic products across multiple broadcast transmission functions.

The OPTO+ family of fiber optic products addresses transmission of broadcast-quality signals, as well as a complete set of supporting signal types like data, GPI and Ethernet. OPTO+ solutions include transmission products in the 6800+ platform, Platinum™ routers, the X75 all-in-one signal processing platform and OPTO Test™ and measurement devices.



Network Monitoring and Control

CCS™: Flexible monitoring and control options ensure lowest cost of ownership for Harris signal processing products

No matter what your control and monitoring requirements — from small operations with local control needs to 24x7, geographically dispersed operations requiring remote control over IP and/or over fiber optics networks — Harris signal processing products fit your application and budget.

The Harris Command Control System, CCS™ — a powerful system of software applications, control panels, protocols and gateways — enables monitoring and control of Harris and third-party products within a network. Within the CCS Navigator™ application and with platform-specific enhancements, MPEG-4 enables IP-based signal monitoring, which is key for distributed workflow where operators may not be physically located with the broadcast equipment.

Providing complete customization for customers' specific applications, the NUCLEUS™ control panel offers real-time control and monitoring of a range of CCS™ Protocol-enabled devices, including Harris processing, test and measurement and master control and branding products.

Published SNMP interfaces are also available on devices to allow third-party control system integration. As the de facto industry standard for control system device communication, SNMP over IP networks offers a distributed workflow capability, with the added benefit of multiple vendor interoperability.

Harris provides the lowest cost of ownership by offering the broadcast range of control options — from card-edge device control to IP-based, network control and monitoring — ensuring you get the ideal solution for your environment and needs.

HDTV Glue™

HDTV Glue™: Broadest range of functions for every design requirement and budget

During the industry's last major technology shift—from analog to digital—one manufacturer brought one simple concept to market that significantly eased the transition for broadcasters worldwide. Digital Glue®.

Broadcasters across the industry relied on Digital Glue® to make the transition to digital. From networks and newsrooms to mobile production and post facilities, Digital Glue became a standard fixture, with countless installations in every corner of the world.

Today, with the transition from SD to HD in full motion, Harris is building on the legacy of its Leitch product line to bring the market HDTV Glue™—all the essential infrastructure you need to build a cohesive, cost-effective HD facility.

HDTV Glue™ is the basics. The fundamental building-blocks that every facility needs to pull together complex, next-generation, high-definition systems. No matter what ahead-of-its-time technology you're preparing to install, you can't do it without Glue.

Encoding/decoding, conversion, embedding/de-embedding audio signals, frame and audio sync, video and audio processing—HDTV Glue™ delivers all the basic functionality that makes your operation run. And HDTV Glue™ functionality is available in all our signal processing platforms to ensure you have the right product for your application and budget.

No matter how sweeping the change, some things always stay the same. HDTV Glue™.

HDTV Conversion

Harris HD Conversion Solutions: Most comprehensive range of applications covering video, audio and ancillary metadata

Harris HD conversion applications include up-, down- and cross-conversion; utility- and broadcast-quality products; M-Path multi-path processing; aspect ratio conversion; audio and metadata processing; and various combinations of these functions. Applications can be implemented using the X75™, NEO®, or 6800+™ platforms to fit different budget or system design targets.

To “complete” the HD conversion process, Harris signal processing products process audio and metadata, in addition to video. Multi-channel and surround sound audio requirements tend to accompany HDTV video broadcasting. Sixteen-channel (8 AES) audio processing in Harris signal processing products meet that need. Applications include closed captioning, Dolby® E and corresponding metadata, Active Format Description (AFD), and others.

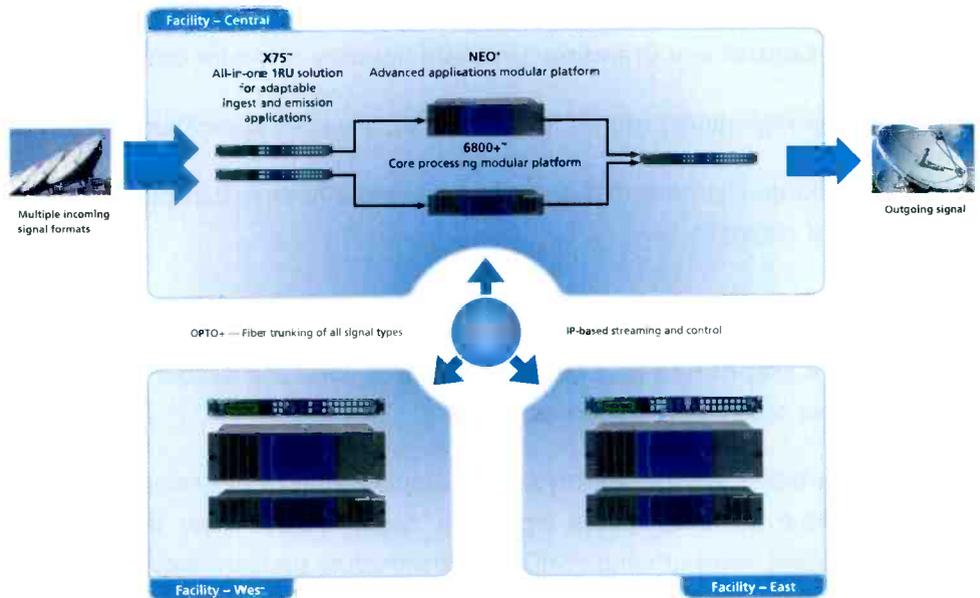
No matter how many signal types and formats you're dealing with, Harris HD conversion solutions ensure that you always provide a superior consumer experience.

SIGNAL PROCESSING SOLUTIONS

SIGNAL PROCESSING SOLUTIONS

Broadcast facilities today are tasked with accommodating and converting a variety of signal types, while still faced with ever-present budget constraints. Video quality is also a critical concern in this changing environment. The need for dense, cost-effective, high-quality signal processing solutions has never been greater.

Harris provides a comprehensive portfolio of advanced signal processing solutions that meet and exceed these industry requirements. Offering the broadest range of products to fit all needs and budgets, Harris provides maximum flexibility at the best price point.



A Platform for Every Need

The Harris signal processing solution provides applications and functions—in modular and standalone platforms—to support every stage of your workflow:

- The X75™ solves the problem of multiple incoming signal formats by auto-detecting inputs and applying processing and HD video and audio conversion functions. At the output or emission stage, the X75™ is utilized again to convert signals to the desired formats for handoff to downstream transmission points.
- The NEO® platform's set of advanced applications enables unique functionality such as multiviewer displays and modular storage.
- The 6800+™ platform's core processing functionality provides the highest value solution with the broadest range of processing modules available.

Key Technology

HDTV Glue™

Broadest range of functions for every design requirement and budget

HD Conversion

Most comprehensive range of applications covering video, audio, and ancillary metadata

Fiber Optics

Extending the reach and flexibility of Harris signal processing

Network Monitoring and Control

Flexible monitoring and control options ensure lowest cost of ownership for Harris signal processing products

This guide was designed with one goal in mind: To make your job easier. Because whatever space you're working in — High Definition, IPTV, Mobile TV — Harris provides a single source to meet all your infrastructure needs as you transition to new digital-media markets.

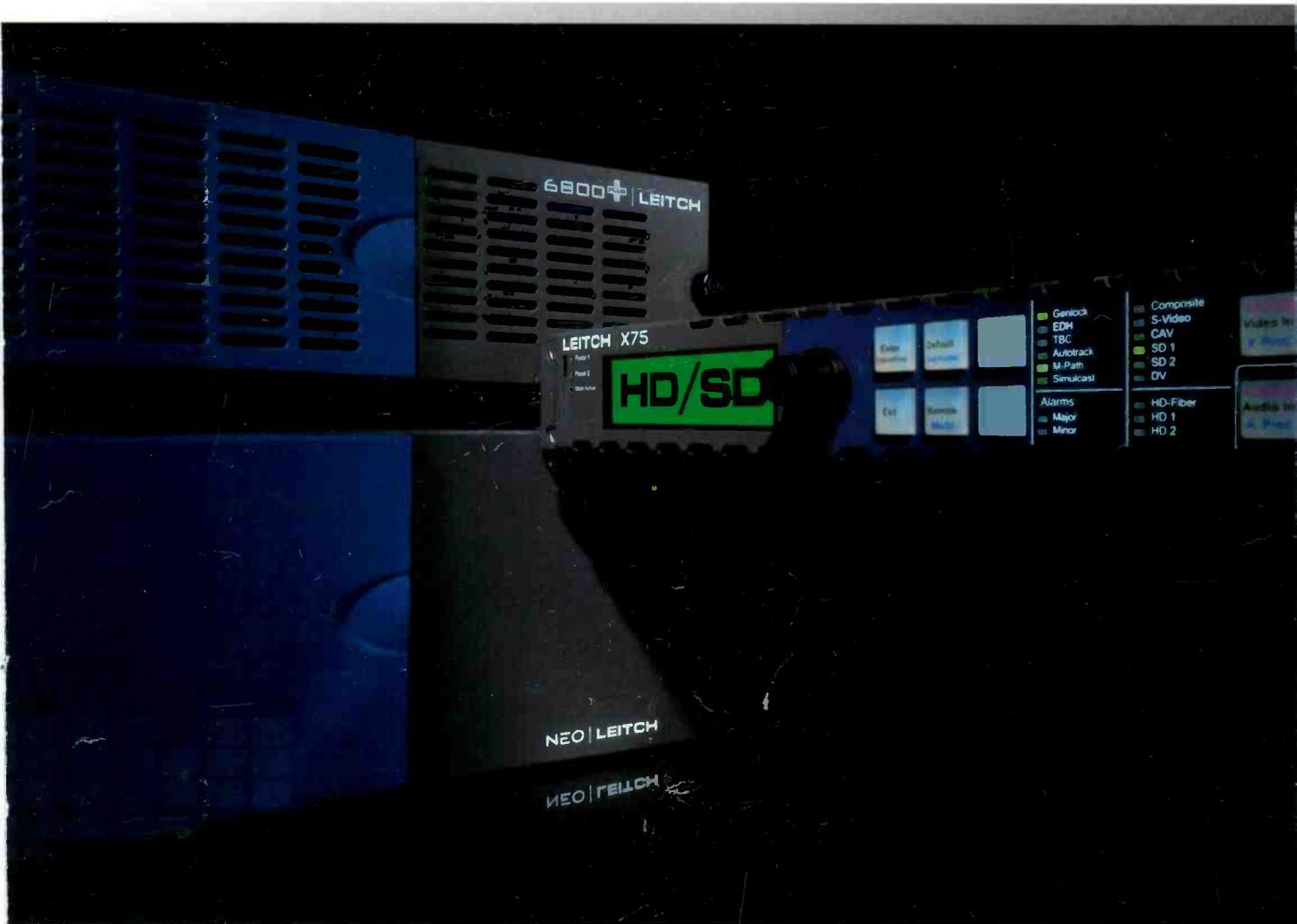
- **Signal Processing:** The widest range of products to meet every need and budget
- **Master Control and Branding:** Unrivaled flexibility in master control and branding solutions
- **Routing:** High-quality routers for any format, any sized application and any budget
- **Networking:** Platforms that cost effectively and efficiently transport media content over a variety of networks
- **Test & Measurement:** The ideal precision instrument for every environment
- **Network Monitoring and Control:** Advanced, local and remote monitoring and control across our broad infrastructure portfolio

Harris now brings you the industry's most complete array of technologies under one roof. Create new revenue streams, reduce operating costs, achieve new levels of productivity—the comprehensive Harris offering of HD/SD infrastructure solutions provides the critical backbone to help you reach your goals.

But don't just take our word for it:



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Signal Processing, Distribution,
Test & Measurement and Networking