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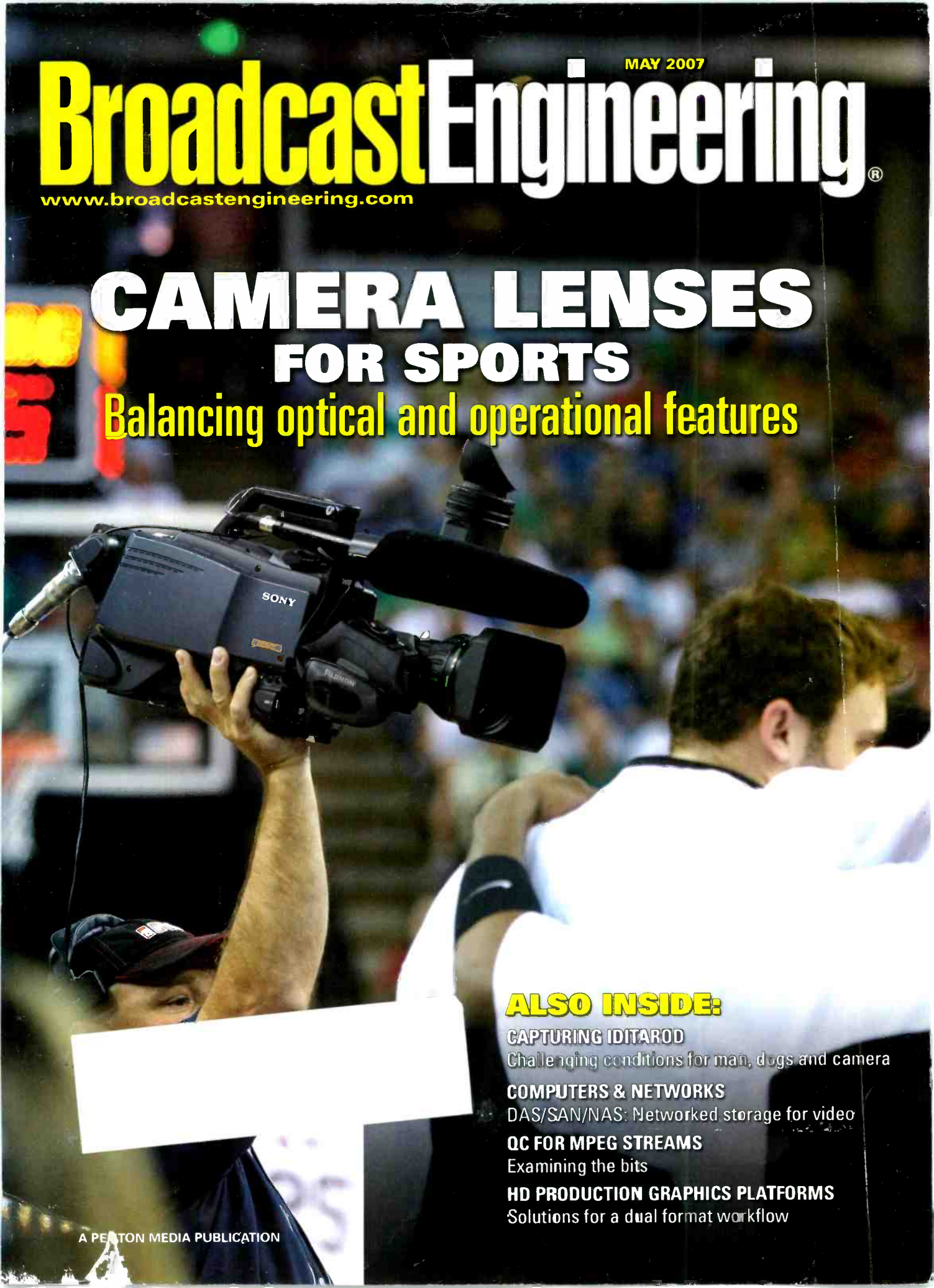

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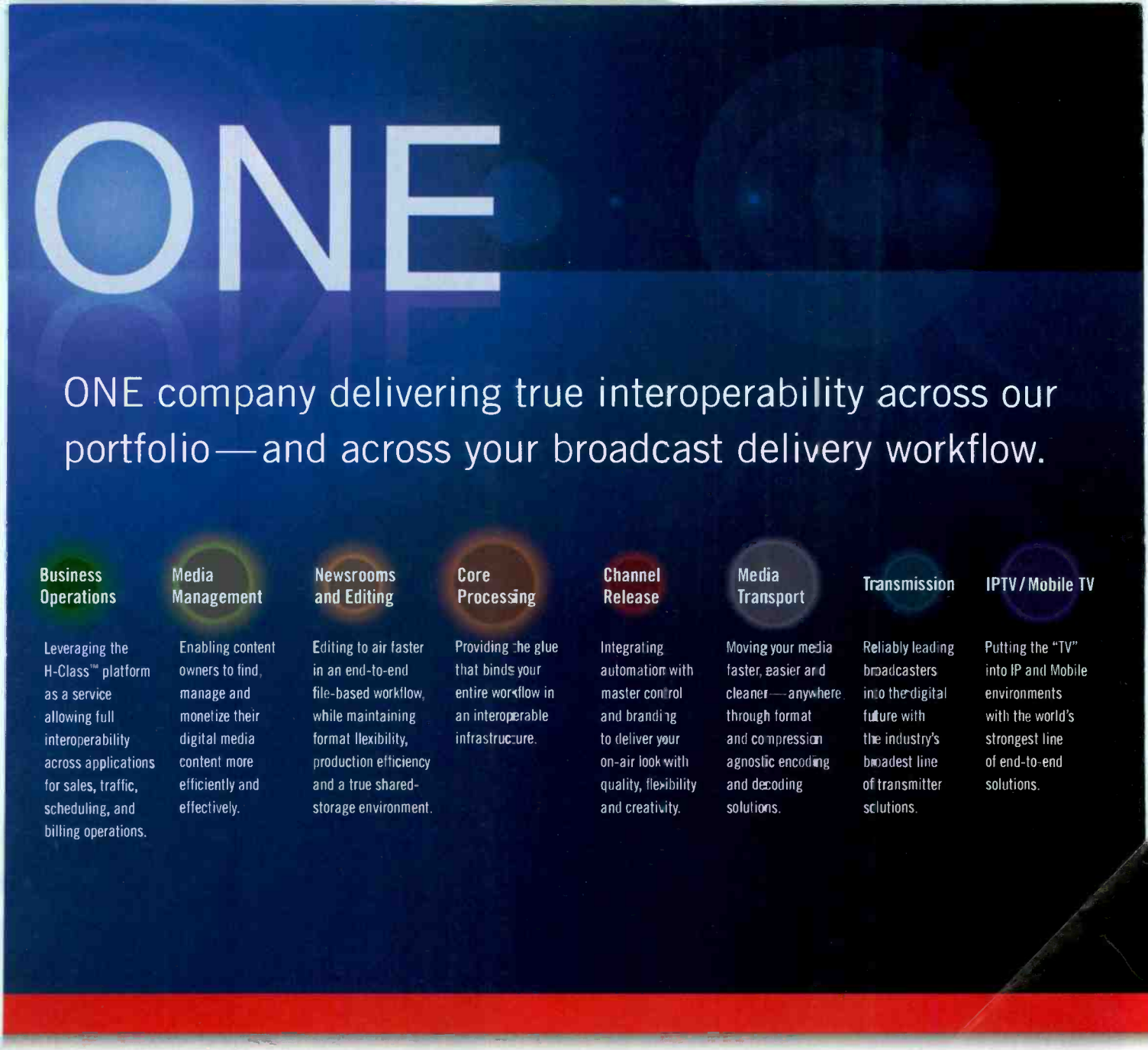

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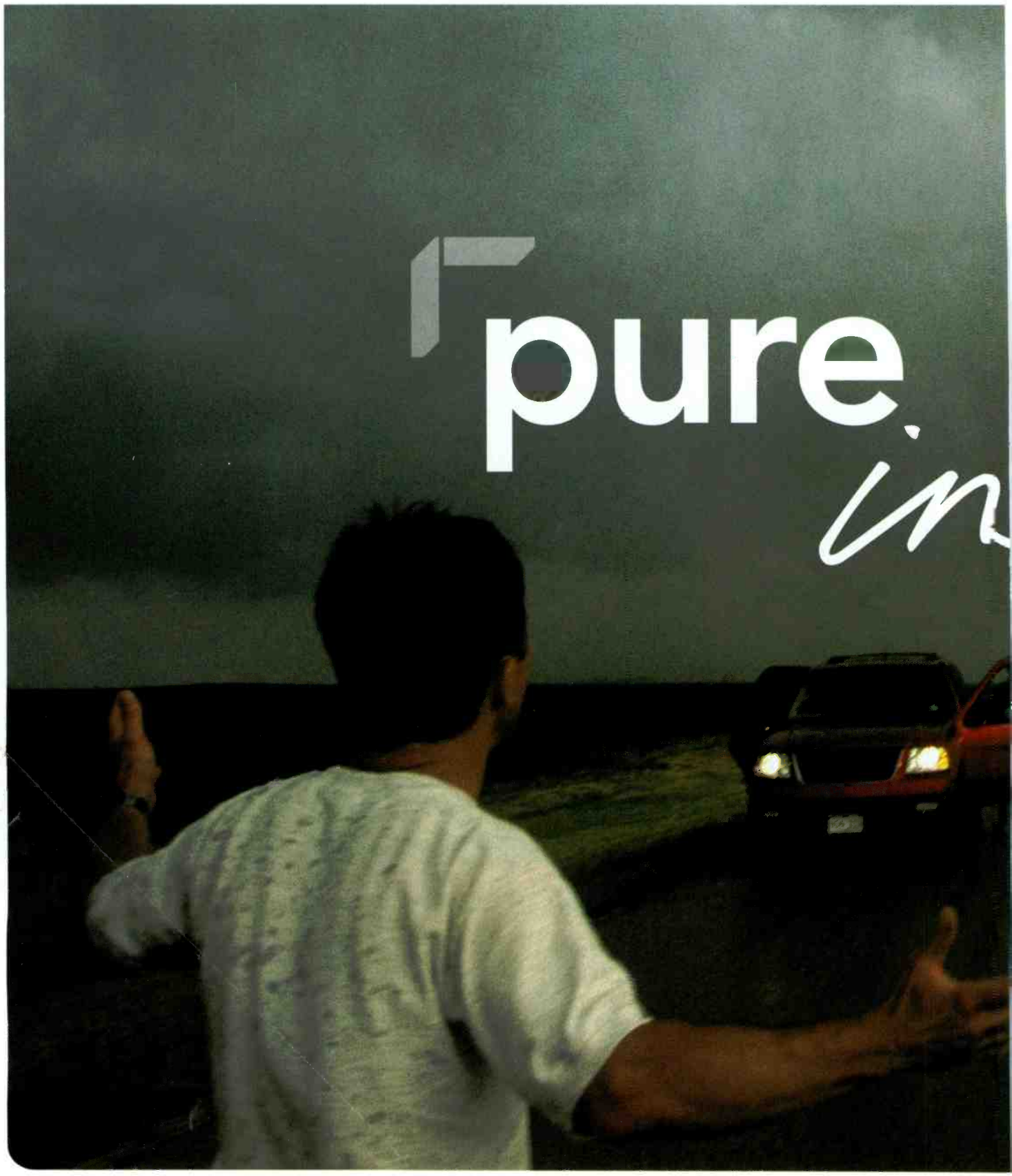

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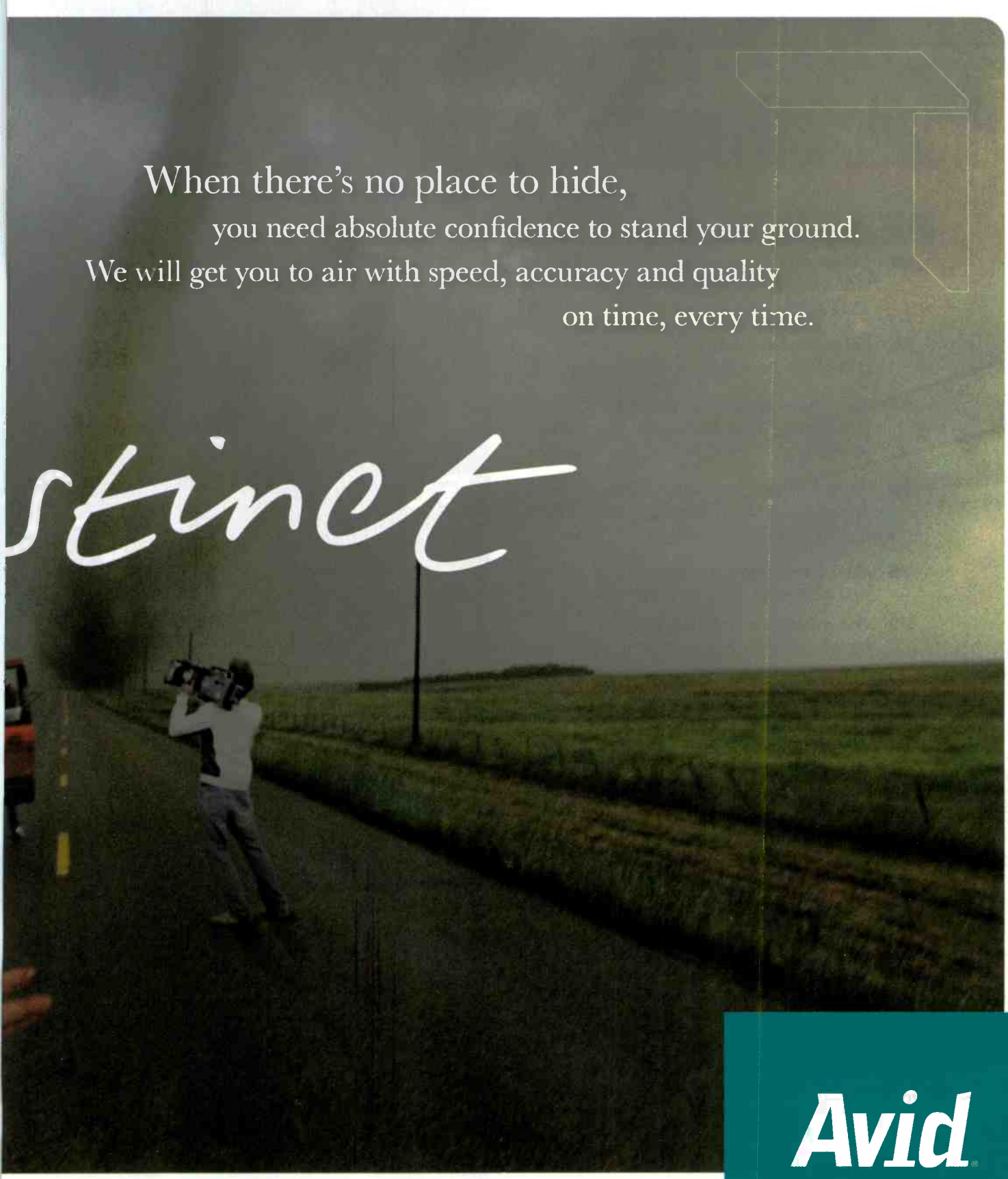
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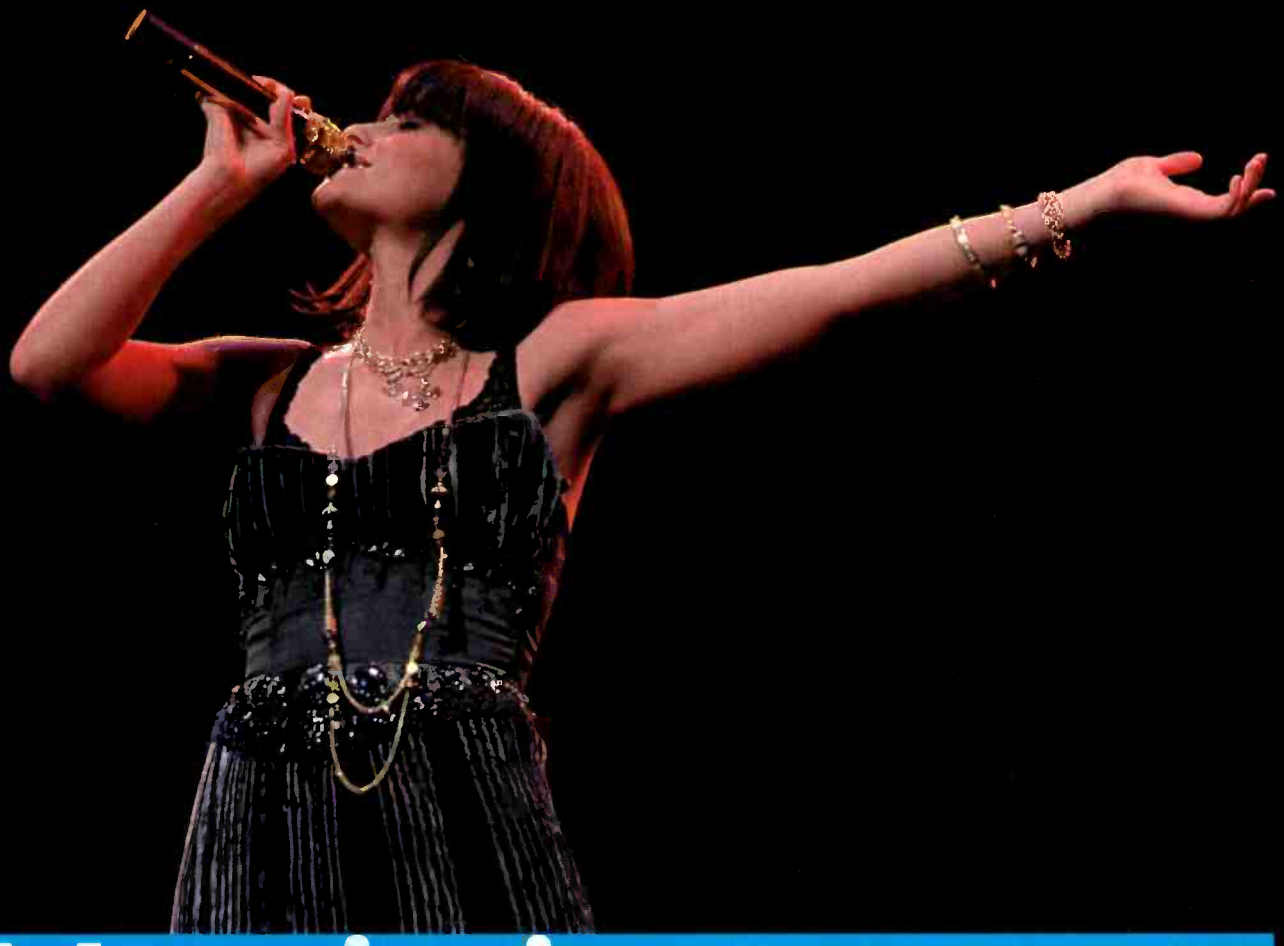
National Mobile Television of Torrance, CA, covers a Vanderbilt NCAA basketball game. Photo courtesy of National Mobile Television and Fujinon.

SENNHEISER



Nelly Furtado

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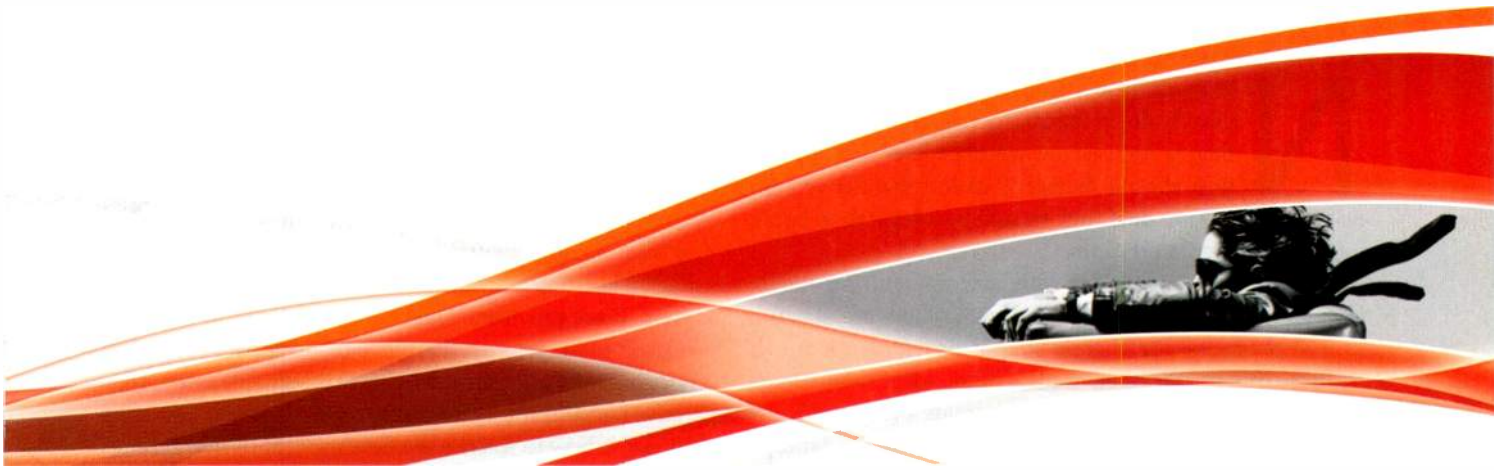

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Choking off innovation

Net neutrality. You've heard the term, but what exactly does it mean to broadcasters? The debate is focused on whether laws and regulation should dictate if data networks remain open to innovation or if they should be relegated to being just dumb broadband pipes.

As the Internet explodes with new demand for video, HD, games and other content, broadcasters are starting to find themselves as eagerly sought providers for much of that content. Weather, traffic, news, local happenings — all video content TV stations generate every day is increasingly desired by viewers from their desktops, laptops and mobile devices.

However, under the banner of net neutrality, the broadband service providers delivering that content are being targeted with additional government regulation. Given the government's record for screwing things up, let's consider what might happen to the Internet's QoS if Congress or federal regulators become involved.

The Internet is composed of three layers: content, applications and service. Broadcasters are involved in each of these three layers. Currently there is competition in each of the layers. Net neutrality would reduce, or possibly even prevent, competition in the service layer.

Net neutrality can loosely be considered as access rights to the Internet, or simply broadband connectivity. Neutrality proponents consider access to the Internet as almost a constitutional guarantee, rather than simply a purchased service. Users could agree that, historically, the Internet's openness has been good for its development. However, today's question is whether regulated broadband — which is what net neutrality really is — will help or hinder the development of a more featured and higher speed connectivity to support new broadcast services.

A basic claim of neutrality proponents is that there are insufficient last-mile providers, and without government intervention, those providers could choke off access to the other two layers of the Internet (i.e. content and applications). The service providers, not surprisingly, see things differently. They perceive harmful effects from new regulations. For them, the challenge is how to finance the development of new services and delivery systems while being prohibited from building vertical monopolies within the Internet's application and content layers. Service providers believe that it's not unreasonable to charge for what's consumed. Their philosophy: If you use more, you should pay more.

From here, it seems the greatest risk from implementing net neutrality is the forced commoditization of our broadband infrastructure. Such regulation will bring connectivity down to the lowest common denominator. Without the ability to experiment with new and different types of services, broadband vendors have no incentive to improve their networks. If regulations require that every pipe carry 10Mb/s and cost $15 a month, no vendor has the financial incentive to develop a 100Mb/s pipe complete with a walled garden of features, videos and information.

Another regulatory issue should be considered. Don't for a minute think that if Congress gets involved, it would stop with just regulating connectivity issues (e.g. the size of pipes). Price and guaranteed access could be next. Supply and demand issues, such as Internet access, cannot be solved with government regulations. Anyone remember the old AT&T? For 20 years, you could have any color phone you wanted as long as it was black. AT&T was heavily regulated.

Net neutrality is not the panacea proponents claim. Rather, it's a roadblock to the development of new services and features. Let broadband suppliers innovate and develop new services. The marketplace — not the government — should decide which of these offerings will survive.

Broadcasters need low-cost, high-speed connectivity into viewers' homes. Unfortunately, net neutrality will choke off the innovation needed to make that happen. BE

Brad Dick
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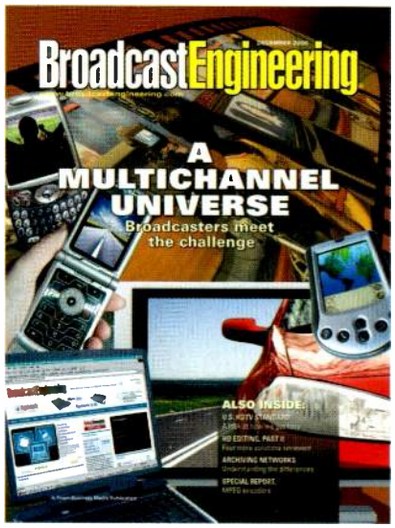

Clarifying Kell factor

John Luff:

In the December 2006 issue of *Broadcast Engineering*, you respond to a letter that raises a question about the relation between the Kell factor and resolution. You state, incorrectly, that there is a difference in how the Kell factor applies to interlaced scan and progressive scan.

I have attached a short article that I wrote in response to a discussion about NTSC resolution that appeared in the Letters to the Editor section of the IEEE "Consumer Electronics Society Newsletter" in 2005. My response was included in Letters to the Editor in the Winter 2006 issue.

Bernard J. Lechner

John Luff responds:

My response in the December 2006 issue may have led one to believe that it is a mathematical relationship, which would be incorrect. I also incorrectly stated that the Kell factor applies to interlace and not progressive images. In fact, it only applies to the *perceived* resolution of a scanned image in the vertical dimension as a percentage of the limiting resolution (the Nyquist limit of half the line rate in the vertical dimension). The value 0.7, which is often quoted for the Kell factor, is heavily affected by such factors as scene content, display performance and type, optical effects, and resolution of the imaging device and display. It is, however, accurate to say that the perceived vertical resolution of a progressive 720p picture is about the same as that of an interlaced 1080i picture. The relationship is affected by many parameters. There is no doubt 1080p shows more vertical resolution than 720p.

Tom Lewis from KSAZ-TV in Phoenix wrote about the same issues. Lewis said, "If I have 18Mb/s to format my DTV stream in, whether 1080i or 720p, I already have plenty of bits to fully encode HD video without added artifacts due to bit starving ... and having a higher data rate ... would not yield any improvement over having just enough bits for complete encoding, regardless of progressive or interlaced content."

However, the writer misses an important point. He states incorrectly that 18Mb is sufficient to encode any HD content. While MPEG-2 improvements have made pictures much better in the last few years, 18Mb is only sufficient for some scene content, and is particularly compromised with complex content in sports. The process of encoding an interlaced picture requires more bits, perhaps because the samples in the vertical direction are not time coherent.

Consider interlaced scanning as interleaving two frames of half the vertical resolution. In the case of 1080i, think of two 540p images offset vertically so that they will perfectly interleave. Interlace was invented as a method of analog compression. It allows systems to broadcast with the apparent resolution of twice the number of actual lines in each temporal sample without doubling the amount of data in the channel. Your eye integrates the two images and does not see flicker between them if the field rate is high enough. The viewer perceives much higher than 540 lines on each full frame (two fields), though the sampled image resolution is lower on coherent samples.

Imagine a picture moving horizontally between fields of the interlaced image. The horizontal offset of the two pictures cannot be properly represented in interlaced systems, having the effect of reducing the apparent vertical resolution and showing artifacts even before the MPEG compression process begins. The constructed interlaced image has samples that, in the vertical direction, are not coherent and therefore contain spurious information that does not encode as well as natural images, hence a loss of encoding efficiency.

In "The MPEG Handbook," (Focal Press 2001), John Watkinson states, "Interlaced signals are harder for MPEG to compress. The confusion of temporal and spatial information makes accurate motion estimation more difficult, and this reflects in a higher bit rate being required for a given quality. In short, how can a motion estimator accurately measure motion from one field to another when the differences between the fields can equally be due to motion, vertical detail or vertical aliasing?"

It should be noted that the total number of active pixels to be encoded per second is about 11 percent lower with 720p60 than 1080i30. This is not a plea for all broadcasters to use 720p60, but rather shows that 1080p or 720p would provide better natural images and compress better (in film or video content) than interlace images. The EBU caused quite a stir in 2005 when it published a paper, stating, "On emission standards, the EBU favours the use of progressively-scanned formats, such as 720p/50 or 1080p/50, rather than interlaced formats such as 1080i/25." (To read the paper, visit *www.ebu.ch/en/technical/trev/trev_301-editorial.html.*)

In the opinion of some experts, 1080p50/60 compresses essentially as well as 1080i25/30. At IBC2006, David Wood of the EBU said, "We know that 1080p/50 is virtually as efficient a broadcast format as 1080i/25."

I am interested in your thoughts. Please write to me at John.Luff@penton.com. BE

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Unconditional access

Consumers' DRM protests may have finally reached a few ears in the entertainment industry.

BY CRAIG BIRKMAIER

The control of intellectual property lies at the heart of the shift from an industrial-based to an information-based global society. Right now, a handful of content conglomerates are trying to use the transition to digital distribution to greatly expand their control over how we consume and share the content they produce.

To do this, they have used their influence to turn the original constitutional intent to proliferate ideas into a means to protect their oligopoly control over the distribution of entertainment content. Several recent developments, however, suggest that the pendulum may be swinging back to favor consumers rather than the content conglomerates.

Those who wrote the U.S. Constitution understood the need to protect intellectual property. However, they also understood that moving ideas into the public commons quickly would benefit the entire country. The first copyright protections granted by Congress were limited in scope, only protecting the work of American citizens who requested the government issue a copyright for their work. The duration for such protections was 14 years. If the authors or creators were still living after that, they could request a 14-year extension.

Copyright law remained essentially unchanged for a century, until the invention of the player piano, the first means of mechanical reproduction of a copyrighted musical composition. The scope of copyright law expanded to cover musical compositions and their reproduction. The duration of copyright protections was also extended.

Over the past 46 years, the duration of copyrights was extended 11 times. Today, the term of a copyright is the life of the author plus 70 years. It is no longer necessary to register works for copyright protection. My words in this column, for example, are automatically granted copyright protection for 70 years after I die.

Who knew that the 21st century global economy would be driven in large part by the value of ideas, rather than the value of the products of the industrial revolution?

The spirit and intent of our forefathers to quickly proliferate ideas into the public commons has been subverted. One could argue that these actions are appropriate for the times we live in. After all, who knew that the 21st century global economy would be driven in large part by the value of ideas, rather than the value of the products of the industrial revolution?

A kidnapped market

All of this would be less irritating, were it not for one fact. Among the special interests most active and influential in the battle to grant increasing rights for intellectual property are industries that used the 20th century radio and TV broadcasting technologies to create a new public commons for their creative efforts. Where would the music industry be today without the remarkable power of advertiser-supported radio to promote its artists? The 45rpm single, LP, audiocassettes and CD somehow managed to produce increasing revenues for the music industry without content protection technologies.

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

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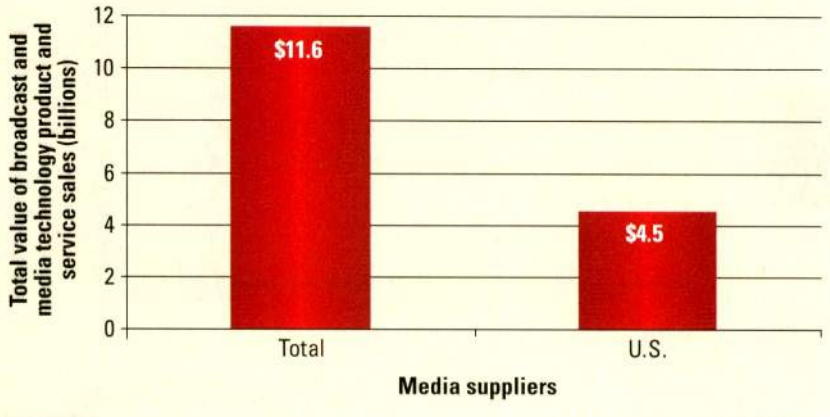

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Before embracing VCR technology as a way to create the highly profitable home theater market, the Motion Picture Association of America (MPAA) viewed the VCR as a major threat. To protect itself, the industry turned to Macrovision for a lightweight copy protection system for prerecorded videocassettes. It implemented a much stronger copy protection scheme, the Content Scrambling System, with the introduction of the DVD.

With the ability to share digital media files via Internet connection, the content conglomerates claimed that the ability of consumers to make illegal copies of their content would kill the industry. This largely unsupportable claim was used to lobby for greater levels of control over the distribution of digital content, culminating in the passage of the Digital Millennium Copyright Act.

Broadcasters quickly joined in, claiming that the ability to make digital copies of HDTV content threatened the television and motion picture industries. They successfully lobbied the FCC to implement the broadcast flag, which would put a few bits in the headers of unencrypted DTV broadcasts that all downstream devices would detect. Once detected, the downstream devices would limit the scope of how that content could be viewed and copied.

A federal appeals court overturned the broadcast flag regulations, stating that the FCC has no authority to control downstream devices such as personal computers and digital networks. The pressure is still on Congress to pass legislation that would enable the FCC to implement a broadcast flag for both DTV and digital radio broadcasts.

Buying control

The consumer electronics and computer industries have been both friend and foe of the content industry. And some, such as Sony Picture Studios, are connected at the hip.

Content is the driving force behind the sale of many consumer electronics products, including radios, TVs, VCRs and DVD players. The development of recordable media, reel-to-reel audio recorders, audiocassettes, VCRs, CDs and DVDs enabled consumers to make copies of entertainment content. The MPAA tried to kill the VCR, but lost the battle in the U.S. Courts, establishing precedents for consumer fair use rights, which were later solidified by congressional legislation.

Before embracing VCR technology as a way to create the highly profitable home theater market, the MPAA viewed the VCR as a major threat.

The incorporation of CD-ROM drives into personal computers turned the PC into an entertainment appliance with the ability to duplicate audio CDs. And the networking of PCs via Internet connection made it possible to share music and video files, setting the stage for the current battles to curtail illegal file sharing and to require PCs to enforce content protection measures.

The music industry was dragged reluctantly into the online music distribution business, in large part through the success of Apple's iPod and iTunes music store. The store has sold more than 2 billion songs, and the service has expanded to include television shows that can be viewed on a PC, an iPod and now on the big screen via Apple TV.

In order to get the media conglomerates to agree to online distribution, Apple implemented a DRM system called FairPlay. It encrypts the downloaded content and gives the user the right to play the content

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on a limited number of PCs, iPods and Apple TVs.

The system has been strongly criticized because it tightly couples the content to Apple iPod music players. Competing systems cannot play these tracks. This led several European countries and now the European Union to investigate Apple's business practices, suggesting that the company should allow competitors to use FairPlay.

In February, Apple's Steve Jobs published the essay "Thoughts on Music." In it, Jobs calls for the elimination of DRM protection for music, noting that the music industry does not protect the songs it releases on CDs. (See "Web links" on page 18.)

On April 2, Jobs met with one of the big music companies, EMI, in London to announce that the EMI online music library would be available DRM-free this month. EMI conducted consumer research studies that found that nine out of 10 consumers would pay more to purchase music without DRM restrictions, especially if the tracks were of higher quality.

Apple will charge $1.29 for a DRM-free track, 30 cents more than the cost of a DRM-protected track. Another change is that the DRM-free tracks will be encoded using the open Advanced Audio Coding (AAC) standard at 256Kb/s. The DRM-protected tracks are encoded at 128Kb/s. The higher quality DRM-free tracks will play on all existing iPods and competing music players that support AAC. For sales of complete albums, there will be no premium for the DRM-free tracks.

Jobs announced that more than half of the 5 million songs available from the iTunes store will be available DRM-free by the end of the year. This suggests that at least one of the other major music companies will offer DRM-free music in the near future.

When asked if Apple expects to offer DRM-free movies and television shows, Jobs responded, "We are offering nothing really new here since people can buy music without DRM on a compact disc. Video is different from music because the movie industry does not currently distribute 90 percent of its content without digital rights management."

It's a step in the right direction — one that will be closely observed in the coming months, with the potential to reverse the trend toward ever more onerous content restrictions.

One final rant

The entertainment industry cannot exist without widespread sharing of its experiences. This is how they influence the culture and create a market for their products. Many artists already know this. Giving away their music helps sell their music too. More importantly, it creates the demand to fill venues where they perform and make most of their money.

Why do movies with [insert the name of your favorite Hollywood star here] enhance the box office draw? Could it have something to do with culture? Could it be that the endless promotion that occurs over radio and TV, in magazines and on the Internet creates a market for the work of that artist?

Sharing an entertainment experience is not the same thing as piracy. We put locks on doors and cars because there are people out there who want to steal from us, not from the companies that built our homes or cars.

Content pirates are not stealing from you and me. They are competing with the content owners in the marketplace where we buy entertainment. They are capitalizing on the fact that this content is overpriced, limiting the legitimate market for its sale.

There is only one reason to protect entertainment content: to artificially prop up the price and the legacy distribution models that are being disintermediated. Ironically, due to pressure from the music industry to increase its prices for the music sold through the iTunes store, Apple has challenged the possibility of a DRM-controlled digital world.

Sharing an entertainment experience is not ... piracy. We put locks on doors and cars because there are people out there who want to steal from us, not from the companies that built our homes or cars.

This is the vision of the world that I reject. Someday, the ability to proliferate cheap content to the masses in a matter of days will replace the current broken models. When the content conglomerates finally figure this out, they will make more money than ever. BE

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

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

Web links

- "CPR redefined," *Broadcast Engineering*, April 2006 *http://broadcastengineering.com/mag/broadcasting_cpr_redefined/index.html*
- Free Culture *www.free-culture.cc*
- "Thoughts on Music," Steve Jobs' DRM essay *www.apple.com/hotnews/thoughtsonmusic*

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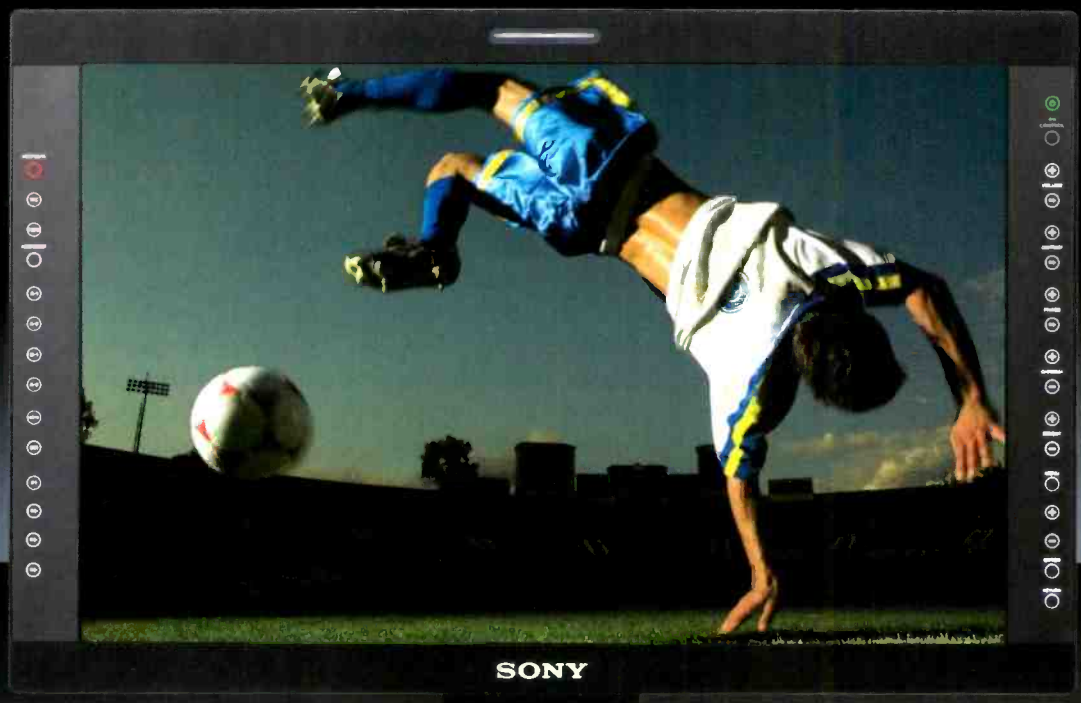

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Spectrum friction

Broadcasters fear that wireless use of white space could interfere with analog TV signals.

BY HARRY C. MARTIN

Wireless use of vacant TV white space is on the horizon. The principal remaining issues include whether portable devices will be authorized in white space and exactly when the roll-out will begin.

Background

The idea of white-space use (of the vacant spectrum that shows up as white areas on a map of channel usage) first emerged in the mid-1980s, when the FCC allocated the remaining spectrum under 1000MHz. In those purely analog TV days, the need to separate stations on the same and adjacent channels, and the complex spacing requirements for UHF stations, resulted in every market having dozens of empty channels. Signals in the TV band propagate well, so wireless companies eyed the white-space channels with increasing fervor as frequency congestion worsened through the 1990s.

In late 2002, the FCC issued a notice of inquiry on the feasibility of letting unlicensed devices similar to Wi-Fi operate in the white-space spectrum. A notice of proposed rulemaking followed in May 2004. Even then, the concept was still just a rough outline, but it focused on allowing both fixed systems, for delivering broadband to homes and businesses, and portable devices, such as laptops and PDAs.

Broadcasters opposed the inquiry because they were concerned that wireless devices would interfere with TV reception. In response, the rulemaking offered three alternate means to keep wireless devices away from the channels being used for TV in a given area. First, the device could determine its location and consult a database to find out what frequencies are safe to use there. Second, a central transmitter could send out a control signal that notifies devices of the locally safe frequencies. Third, each unlicensed device could monitor for TV signals and automatically avoid the channels on which it found any.

Broadcasters were not happy with any of these proposals. Analog television is highly sensitive to interference — even from weak signals — and none of the proposed methods kept wireless devices far enough away from TV sets on the same channel.

IEEE weighs in

The IEEE proposed that base stations, operated by service providers, be professionally installed, taking into account locally used TV channels. Subscribers could buy and install their own equipment, but a subscriber station could not operate until it first picked up a base station signal, which carries a list of locally suitable channels. Moreover, all of the devices on the system would continuously monitor for TV activity on all channels, share this information and mutually lock out frequencies that were detected and confirmed as TV activity.

Responding to Congress

In response to pressure from Congress, in 2006, the FCC adopted rules that authorize wireless operations in TV white spaces effective Feb. 18, 2009, after the DTV transition. Today, the FCC only permits fixed use, in accordance with the IEEE recommendation.

Signals in the TV band propagate well, so wireless companies eyed the white-space channels with increasing fervor as frequency congestion worsened through the 1990s.

The commission also prohibited low-power devices from operating on TV Channel 37 (to protect the radio astronomy services) and Channels 52-69 (to protect the wireless and public safety services authorized to operate on these channels).

Many details remain open. To further complicate matters, there are four bills pending in Congress that would require the FCC to authorize both fixed and portable devices. BE

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

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

Dateline

June 1 is the deadline for TV stations in Michigan and Ohio to file their 2007 biennial ownership reports.

TV, Class A and LPTV stations that produce their own programming in the following states must place their annual EEO reports in their public files by June 1: Arizona, the District of Columbia, Idaho, Maryland, Michigan, Nevada, New Mexico, Ohio, Utah, Virginia, West Virginia and Wyoming.

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STB rules

NTIA's coupons will breathe a second life into analog TVs, but don't expect much more than conversion.

BY ALDO CUGNINI

As is widely known by now, the federal government has released details of the congressionally mandated coupon program for subsidizing digital-to-analog converter boxes. These soon-to-be-available set-top boxes will enable analog TV owners to continue receiving free OTA programming.

The coupon program specification defines the attributes of converter boxes eligible to receive a federally funded rebate. So, it makes sense to look more closely at what these boxes will — and won't — do. In the end, the program will affect how tens of millions of viewers receive and watch TV programs. Simple economics make it reasonable to expect that the majority of boxes sold will adhere to this specification.

Our lawmakers at work

As part of the Digital Television Transition and Public Safety Act of 2005, Congress empowered the National Telecommunications and Information Administration (NTIA) to define and manage the coupon program. The DTV act defines a digital-to-analog converter as "a stand-alone device that does not contain features or functions except those necessary to enable a consumer to convert any digital channel broadcast in the digital television service into a format that the consumer can display on television receivers designed to receive and display signals only in the analog television service, but may also include a remote control device." The key phrase here is "functions except those necessary," which left some interpretation to NTIA.

What these boxes will — and won't — do ... will affect how tens of millions of viewers receive and watch your programs.

Last July, the administration released a Notice of Proposed Rule-making and invited comments from the public. NTIA received more than 100 responses from the consumer electronics and broadcast industries, trade associations, public interest groups and private individuals, as well as from several members of Congress and congressional committees. NTIA then formulated its position and forwarded it in late January to the White House Office of Management and Budget for approval. The office then permitted the NTIA to release the specification in March.

The coupon program deals with three broad areas: eligibility of boxes for coupons, distribution of the coupons and coupon redemption requirements. The actual process of coupon distribution is being handled through a separate vendor process, which will address the logistical details of coupon availability, distribution, expiration and redemption, as well as box identification. This article will discuss the technical aspects of eligible converter boxes.

Box requirements

Analog TV viewers rely on various aspects of the medium for its ease of use. Channel selection, picture adjustment and antenna adjustment on portable sets are performed without a second thought. Many stakeholders urged for technical requirements for digital converters so that the user would have a similar experience when installing and using the STBs.

FRAME GRAB *A look at tomorrow's technology*

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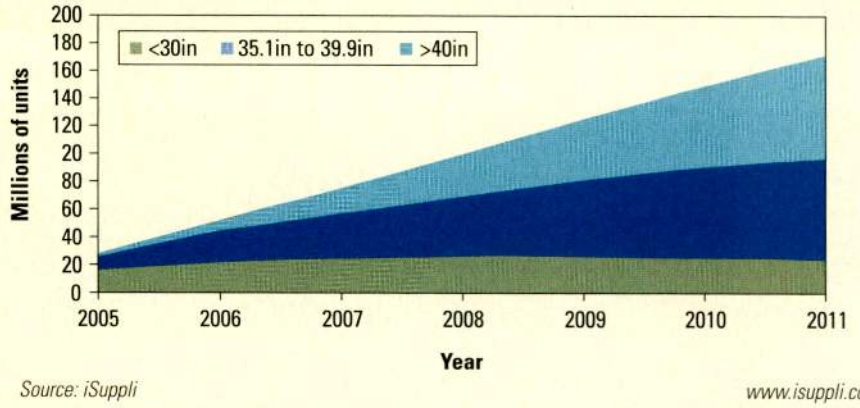
In 2007, consumers will purchase 75.2 million LCD sets



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In the end, Congress mandated that coupon redemption would be limited to boxes meeting a specific set of technical requirements. It was ruled that manufacturers could self-certify compliance with these requirements, but must also supply units to NTIA (and FCC, if needed) for compliance verification.

detected for a certain time. Eligible boxes can optionally conform to the more stringent EnergyStar requirements of 8W when active and 1W when passive.

While a few respondents to the proposed rulemaking requested the inclusion of a software update feature, this was left as optional, presumably

Capture description		
Antenna type • Log-periodic • Dipole • Double bow-tie	**Antenna direction optimization** • Optimal • Random	**Capture parameters** • AGC on/off • A/D precision • Others

Site description			
Antenna location • In-home • Outdoor, up to 30ft	**Neighborhood** • Rural • Industrial park • Suburban • Others	**Site location** • Distance from transmitter • Latitude and longitude of the site location	**Miscellaneous** • Channel name • Date of capture • Weather conditions • On-site temperature • Construction type • Others

Channel description	
Upper and lower adjacent channel • DTV • NTSC • None	**Channel dominant characteristics** • Multiple echoes • Dynamic or static channel • In-band interference • Band-edge distortion • Pilot distortion • Others

Table 1. The ATSC field ensembles cover a wide variety of DTV field reception situations.

The boxes must convert all ATSC formats to NTSC. The boxes should be designed "for ease of installation and operation," though there is no absolute metric with which to measure this, other than the provision for a remote control.

The boxes must provide an antenna input and an RF output for display on channel 3 or 4. Baseband audio and video outputs must also be supplied. The boxes must consume no more than 2W when passive (no video or audio display), with an automatic power-down feature (defeatable) when operator input has not been

because of the cost and the relative immaturity of the technology. BTSC stereo inclusion at the RF output would also be at the discretion of the manufacturer. Support for closed captions and parental controls (i.e. the V-Chip) are required for coupon eligibility.

Two additional optional functions that can be added while retaining coupon eligibility include electronic programming guides (EPGs) and support for smart antennas. While the use of an EPG has become ubiquitous for cable and satellite subscribers, such a function does not exist for analog television. Thus, although there is value in providing a means with which to easily navigate the new DTV space, the inclusion of an elaborate EPG was not considered essential for all users. At the very least, coupon eligibility will require the ability to display channel number and simple program information for the channel being viewed.

There was also considerable support for the need for a smart antenna for viewers with problematic reception conditions. By electronically automating the aiming of the antenna and using an optimum reception pattern for each DTV station, the user's manual interaction with an antenna is essentially eliminated. Support for a smart antenna is achieved through the use of the CEA-909 Antenna Control Interface standard.

The boxes must also meet or exceed the guidelines specified in "ATSC Recommended Practice A/74: Receiver Performance Guidelines," which is intended to assure reliable reception. Specifically addressing the RF front-end of a DTV receiver, A/74 outlines minimally acceptable performance levels for sensitivity, selectivity, interference rejection and multipath management. Performance is also specified for specific input levels, phase noise immunity, interference rejection and burst noise immunity. The multipath requirements are given as a template of echo delays for specific desired-to-undesired ratios, as well as the recommendation that receivers appropriately process signals simulated by several field-captured ensembles available from MSTV.

Several groups — most notably CEA, MSTV and NAB — advocated receiver requirements slightly beyond that of ATSC A/74, with stricter requirements in such areas as RF dynamic range and taboo channel rejection. Overwhelming cross-industry support resulted in the inclusion of these extended requirements. In addition, the requirements also describe the minimum number of multipath

field ensembles that must be tolerated by an eligible converter.

Other features, however, are specifically excluded from coupon eligibility, including HD video output and DVR. These features are beyond the intent of the program, which is simply to avoid legacy TV obsolescence and the disenfranchisement of OTA viewers. Digital cable and satellite boxes were similarly excluded from the program.

User requirements

NTIA originally proposed restricting coupon eligibility to those households that exclusively receive OTA television signals (thus excluding cable and satellite service subscribers), but overwhelming response from the industry, the public and lawmakers resulted in the decision that all households would initially be eligible. If the non-contingent wave of 22.25 million coupons is exhausted, a second, contingent wave would then be sponsored, with an additional 11.25 million coupons, limited to households without cable or satellite subscriptions.

The first of these units should be available at retail markets later this year. On this timetable, viewers will have a little more than one year in which to upgrade their homes to digital broadcast. In the meantime, broadcasters should begin to educate viewers on the upcoming transition and coupon program. NAB and other groups have started such a campaign.

From the technical standpoint, it would be a good idea for stations to acquire some of these units to determine how viewers will be accessing their programming. One final note: No manufacturer is required to build converters meeting the above requirements — that is unless they wish their boxes to be eligible for the subsidy! BE

Aldo Cugnini is a consultant in the digital television industry.

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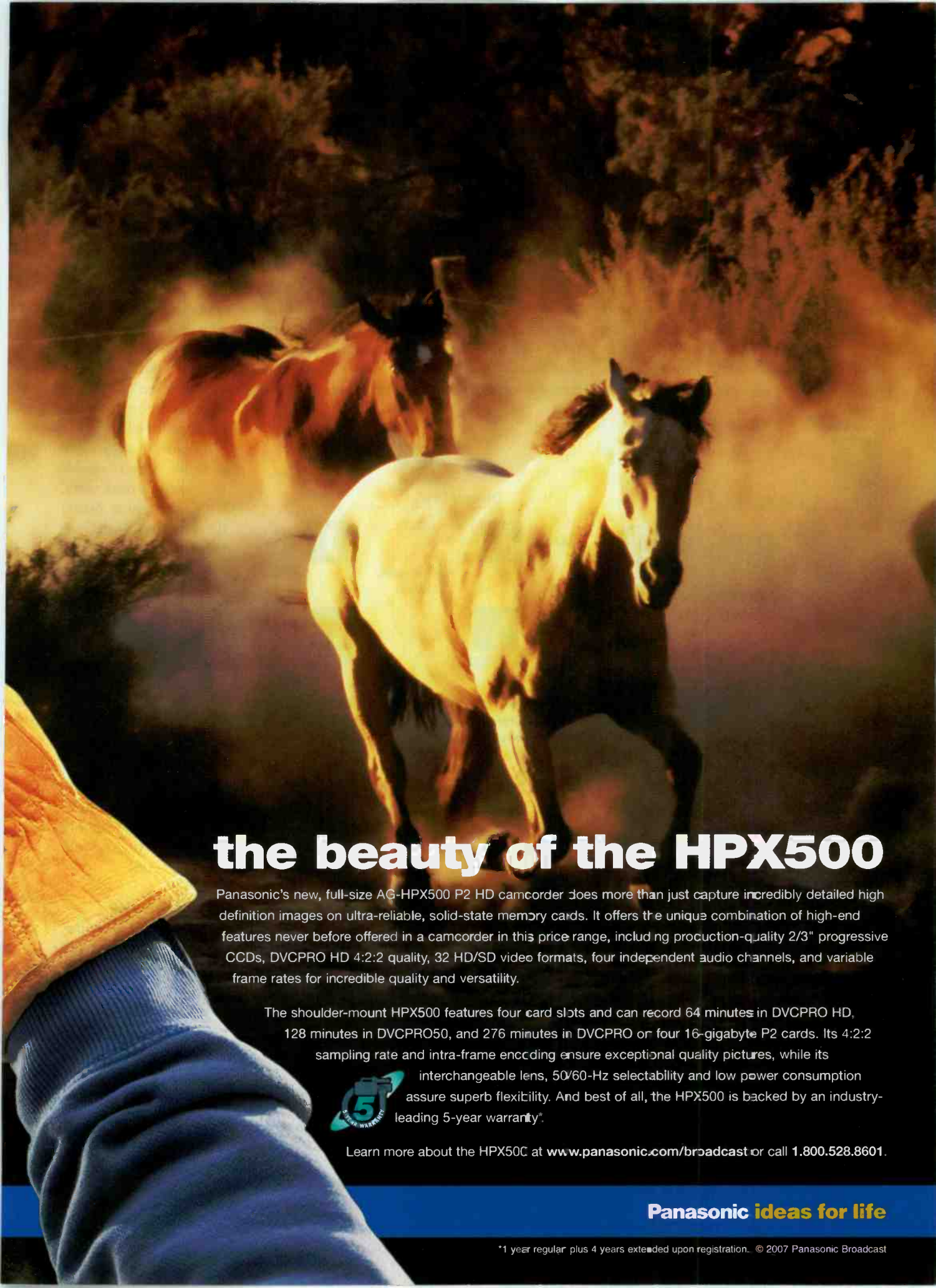

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Video storage

DAS, NAS and SAN offer different workflow benefits.

BY BRAD GILMER

Broadcasters spend a lot of time researching storage these days — and with good reason. The conversion to digital and the ever-increasing number of computer video devices in facilities has prompted many broadcasters to design and operate IT-based facilities. Video is a large data type, so storing even modest amounts of it requires a lot of disk space.

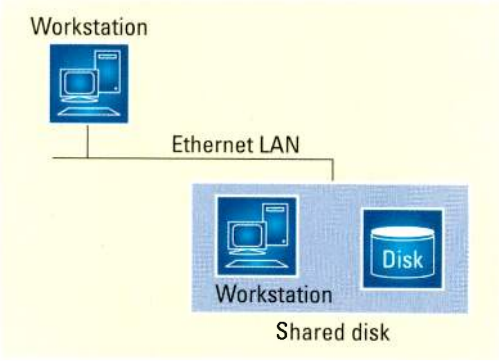

Figure 1. DAS is directly connected to the computer and is usually internal to the device. Files stored on DAS systems can be shared with other users across an Ethernet network without an intermediate server.

There are three main storage solutions: direct attached storage (DAS), storage area networks (SANs) and network attached storage (NAS). (See "Comparing storage" on page 30.)

Direct attached storage

DAS consists of storage directly attached to a server or workstation, perhaps by a SCSI cable or Serial ATA cable. In the simplest case, files stored on one workstation may be shared with other computers on the network using file sharing capabilities built into the workstation OS. (See Figure 1.) The workstation user simply grants others permission to view files stored on the main computer.

DAS is inexpensive to implement. Today's modern computers provide all the necessary components to set up file sharing without purchasing any special hardware or software.

The complexity of DAS file sharing is low. System configuration is minimal, and once it is up and running, very little, if any, maintenance is required. DAS performance, however, can be poor to the point of being unusable, especially if video is involved. Performance can worsen if the workstation user is engaged in a complex task while an external user is trying to access a video file.

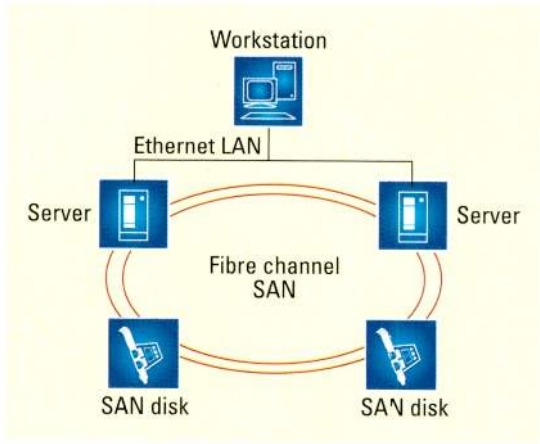

Figure 2. SANs typically employ two networks: a storage network, which may contain two loops, and a data network, usually Ethernet.

Flexibility with a DAS solution is limited. Typically, file sharing is only supported under one OS. File sharing between multiple operating systems causes the DAS configuration to be more complicated.

DAS solutions should never be used for a WAN or remote storage over the Internet. DAS file sharing is not as secure as other solutions, so it is imperative that it only be used with a LAN with a firewall between the LAN and the Internet to prevent local files from becoming visible to others outside the facility.

DAS file sharing is not particularly reliable. If a user needs a file on a workstation and the drive in that workstation fails, then the data will be lost unless steps are taken to mitigate this loss, through nightly backups, for example.

The loss of a drive will probably affect operations, and in most cases, it can take time before the data is restored. Configuring per-user access permissions for DAS can be challenging, especially if more than one computer is sharing files on a network.

Finally, as the name implies, DAS shares files. This means that a remote user accesses the entire file rather than only accessing the portion of the file being worked on.

Broadcasters looking for an inexpensive way to share small amounts of data over a small network should consider DAS, although they should take reliability into account.

Storage area networks

SANs have their roots in DAS. Initially, disks could not be mounted more than a few feet away from the computer they served. As storage requirements grew, it became necessary to externally mount disk arrays. By the time the cables (generally SCSI) were connected to all of the drives, there was little, if any, cable left over to run from the disk

Broadcasters looking for an inexpensive way to share small amounts of data over a small network should consider DAS.

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chassis to the main computer.

The first SANs allowed computer designers to break this constraint by implementing the SCSI protocol over another transport technology, typically Fibre Channel. As a result, drives could be mounted further away from the computer.

Today, SANs provide high-performance, remote-shared storage to multiple users. It does this, in part, by employing a dedicated network to move data. The SAN is not the same network used by client computers to access the Internet or to perform other tasks. (See Figure 2 on page 28.) Only storage traffic flows over the SAN.

Ethernet is not typically used as the transport for these networks for several reasons. Typically Fibre Channel technology links SAN equipment to servers. So even though SAN cables and Ethernet cables may look the same in some installations, the signals and voltages used on the networks are different.

Modern SAN solutions can be expensive. This is in part because they are typically deployed on an enterprise basis. SANs may also be more expensive because the components are more robust and the equipment is more redundant.

A typical SAN installation is more complex than a simple DAS installation, because it is used to meeting more demanding storage requirements. SAN performance is good. The combination of high-performance networking technology, fast disk drives and the use of dedicated processors all contribute to a speedy solution.

Whereas DAS shares files across a network, SANs share blocks of data. Performance on block-based systems can be significantly faster than on file-based systems where one user must wait until the other user is finished to work on the same file.

It is important that SANs run on dedicated hardware. In a DAS file sharing scenario, if the workstation is busy completing a complicated spreadsheet update, any requests for file sharing are delayed. SANs do not have this problem. They are more flexible. While small SAN installations may not be practical, SANs scale well from midsize to large installations.

SANs are reliable because they almost always incorporate RAID. The block-based nature of SANs makes multiuser access quick and efficient. The systems are specifically designed to allow different users to share data. Broadcasters who want to simultaneously share large amounts of video data in a highly reliable way between multiple users should consider SAN.

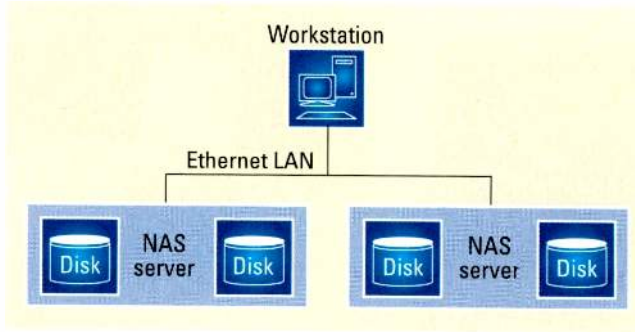

Figure 3. NAS servers attach directly to the Ethernet network used by workstations. The storage on the servers is advertised to the operating systems of the workstations in whatever way those operating systems expect to see remote storage, whether they are Mac, Windows, Linux or some other type of operating system.

Network attached storage

NAS uses the same network for storage data access and other network tasks. The NAS is a dedicated server connected to an Ethernet network. (See Figure 3.) It appears as network drives to a local computer.

The cost of NAS solutions can range from extremely low to very high, depending on the capabilities of the system. In some cases, NAS systems are easy to install.

Manufacturers have spent a lot of time and effort making them interface with just about any computer system. Furthermore, most systems behave like chameleons, making themselves look like native storage to whatever OS is interfacing to them. Inside, the system treats the data in a uniform manner, but at the interface points, the NAS presents the storage data and command interface in a way that the accessing OS understands. These capabilities are even available in low-cost units.

NAS is file-based, so it may suffer a performance hit compared with a SAN's block-based storage system. NAS' performance, however, will be better than DAS' because the server is a dedicated device and does not perform workstation tasks.

NAS solutions can be as unreliable as DAS or as reliable as SAN, depending on the design of the storage media and components. If a single disk is used and that disk fails, a user will lose all of the data. On the other hand, if a user invests in a NAS with RAID disks and multiple controllers, redundancy can be much higher. BE

Comparing storage

	DAS	SAN	NAS
Cost	Low	High	Moderate
Complexity	Low	High	Low to moderate
Performance	Low	High	Moderate
Flexibility	Low	High	Highest
Reliability	Low	Highest	Low to high
Multiuser access	Low	Hig	Moderate
Access typ	File	Block	File

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

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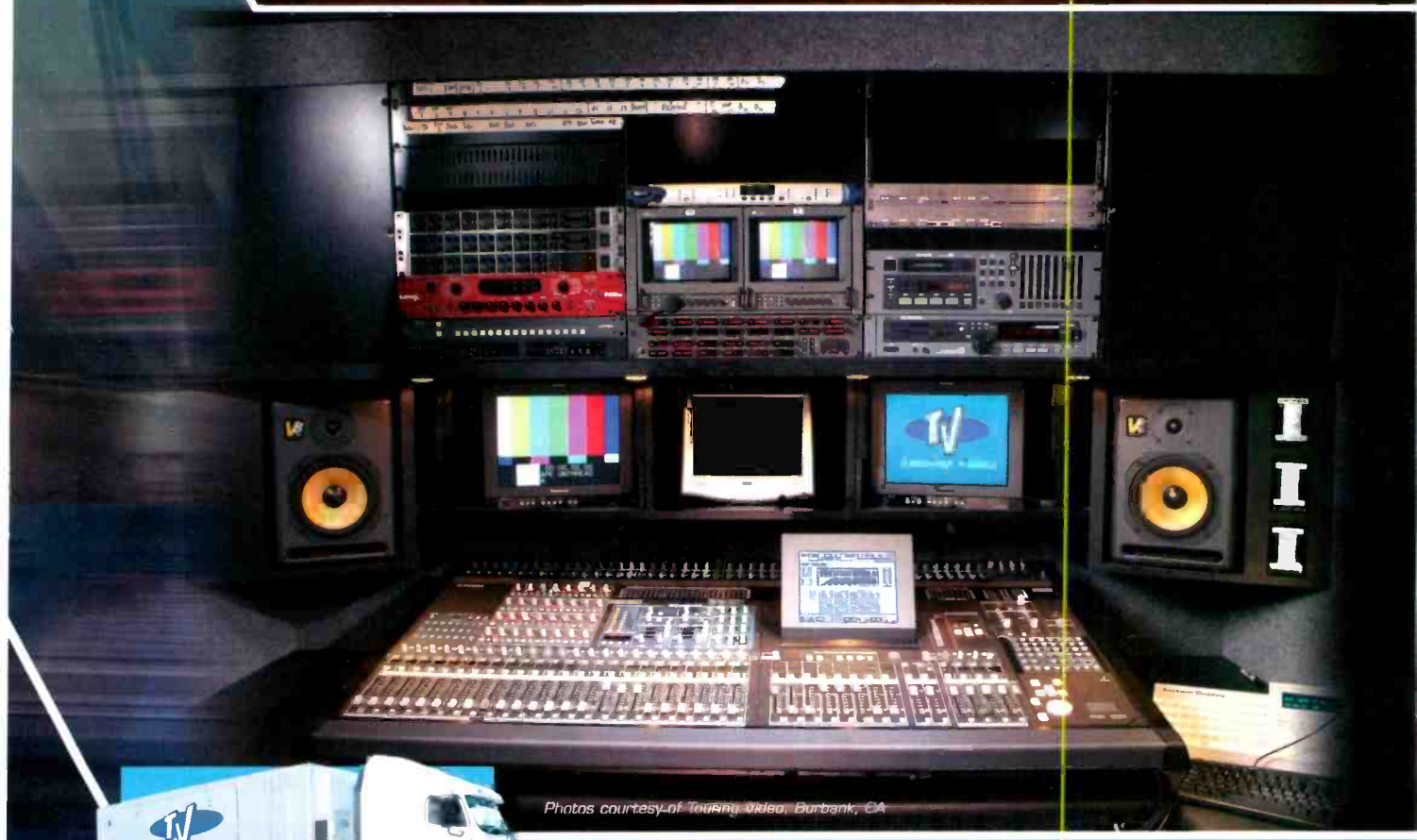

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Moving graphics to HD

High-performance open platforms benefit your graphics application.

BY JIM MARTINOLICH

Full SD/HD capability is now the norm rather than the exception when looking for a production system. The watershed has been reached as the industry rapidly moves to HD in anticipation of the February 2009 cut off date. Luckily, today's new generation of graphic systems are ready to offer powerful and scalable performance at an affordable price owing to the move to high-performance open platforms.

New architecture

These systems rely on the power of the graphics processing unit (GPU), a new name for the graphics chip at the heart of the VGA display board. The performance of these chips constantly improves, driven by the high volume home computer and gaming market. The GPU in a current high-performance computer has twice as many transistors as the CPU, and its performance doubles at least once a year.

Besides the GPU, the adoption of higher speed internal data buses was also critical to the move to HD. The PCI bus standard in most desktops was not fast enough to move full HD RGBA graphics data in real time. The PCI-X standard, on the other hand, is fast enough, and the next-generation PCI Express bus will prove even faster.

Benefits

The benefits of an open platform are clear. First of all, we lose the need for expensive custom hardware that was typical of the last generation of graphics products. This speeds time to market and lowers the cost to the end users.

The next generation ... will make improvements ... at a rate much faster than the television industry has seen in the past.

The other major benefit is that open platforms are bound to grow in performance at a tremendous rate. The next generation of GPU, CPU, storage technology or data bus will make improvements in system performance at a rate much faster than the television industry has seen in the past.

Sports and live events

The biggest demand for HD viewing comes from the sports fans. Considering that these live events were the predominant spot for traditional graphics systems (with a live operator in a non-scripted program), it's no surprise that this group is already heavily invested in creating HD graphics. HD-ready remote production trucks now include HD graphics equipment.

News

Over the last few years, the news industry was busy optimizing its workflows with MOS-enabled devices, solid-state cameras, SAN and NAS storage, asset management systems, metadata, and centralized graphics. Now, broadcasters are ready to migrate to HD news production to keep up with the rest of their programming.

As broadcasters migrate to HD, much of the interesting news content is going in the opposite direction — to DV, camcorders and mobile phone videos — proving content remains king.

Data-driven apps

The tickers and bugs that fill up

The new capabilities in graphics software are transforming broadcast workflows with better HD graphics designed for particular scenarios, such as news and finance.

Open API formats will allow for a smooth transition to HD tickers, bugs and other data-driven graphics.

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the screen during financial, news and sports programming are usually designed and supported by third-party developers. They are still mostly SD, but because they are based on open APIs, these applications should make the transition to HD relatively easily.

HD CG in offline NLE

Almost all offline work is done on NLEs, and the graphics system is generated by a software plug-in. The open PC platforms used by many NLEs have enabled a fast transition to HD, with many powerful and inexpensive systems available. It is important that the graphics plug-in be resolution-independent so that it can operate over a wide range of HD and SD resolutions, and so it can work with many open image file formats.

HD CG in linear editing and finishing

Initially, titling and credit rolls for HD cinema content was one of the biggest markets for HD graphics systems. Upconversion is usually not an option because of the quality requirements. Electronic characters are crisp and clean compared with cinema rolls transferred from film, and they have no weave and judder. However, they may show interlacing artifacts at certain roll speeds. Also, be careful of the tendency to roll credits much faster in video than in cinema, as it creates an unusual and objectionable artifact in 24p.

Master control and branding

With cable and satellite networks providing more than 100 channels, channel branding is important. It has evolved from a simple stationary logo in the lower right to sophisticated animations — sometimes with sound — running under complex automation control. HD programmers want the same capabilities. High quality and resolution are important, so upconversion is usually not an option. One advantage here, though, is that branding bugs are usually small, much less than full screen. This simplifies the design and lowers the networking storage requirements considerably.

Creating content for HD (16:9 vs. 4:3)

Programmers broadcasting in HD and SD simultaneously would rather not create every graphic twice. The biggest problem here is not the resolution, because most graphics applications are resolution-independent and can scale an image up or down easily. The big problem — whether you are upconverting or working in native HD — is the different aspect ratios.

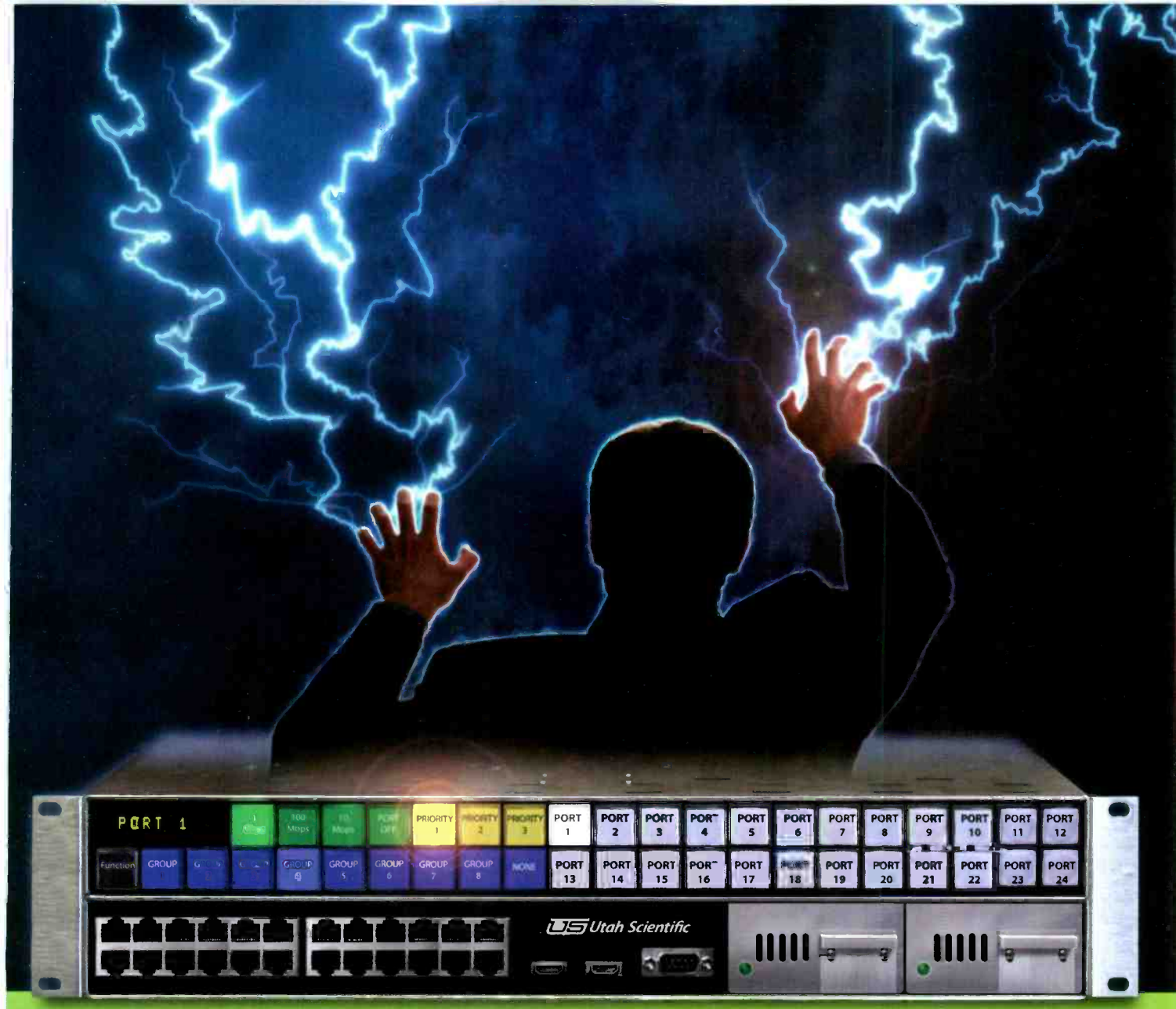
The big problem — whether you are upconverting or working in native HD — is the different aspect ratios.

The most popular solution is to create all the graphics templates in 16:9 with a 4:3 protect. All important information, images and text are kept in a 4:3 area in the center. Backgrounds, lower-third banners and other similar graphic elements can be extended to the end of the 16:9 area. When displaying in 4:3, the graphics system is programmed to crop the side panel area. This matches the technique most commonly used for camera shots that need to be used in both standards.

The graphics market

HD has taken time to evolve, but broadcasters and technology providers are now seeing it as the standard in television. It won't be long before SD is relegated to the realms of history, much like black-and-white television. BE

Jim Martinolich is vice president of mobile products for Chyron.



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SYSTEM DESIGN SHOWCASE

WOSU-TV's video control room is on view as part of the U•TV exhibit at the Center for Science and Industry.

Public Television's TECHNOLOGY EDUCATION

The new WOSU facility at COSI combines education, entertainment and HD broadcasting.

BY TOM HACKETT

In early 2005, WOSU-TV, the Columbus, OH-based PBS member station, came up with an ambitious plan to enhance its broadcast and production capabilities while also helping to educate the community about television production technology. The station signed an agreement with the Center for Science and Industry (COSI), a science center in downtown Columbus, to construct a digital, high-definition media facility within the 320,000sq-ft COSI building.

COSI is one of the most respected science centers in the nation, serving 18 million visitors since 1964. Each year about 500,000 visitors come to COSI to enjoy the exhibits, which strive to make science fun and interesting by engaging visitors with hands-on interactive displays.

If WOSU had wanted the typical model of operation for new television and radio studios, it could have done so anywhere in the community. The chance to partner with COSI and leverage its expertise in using science and technology for educational outreach and hands-on learning, as well as the suitability of the space itself and its location, offered a unique opportunity.

From the main studio, the audio control room is visible through the window at left, and the U•TV exhibit area is visible through large doorway.

WOSU's idea was to construct a fully functioning television production center that would blend with the museum's mission and complement the station's main studio at the Fawcett Center, located on the Ohio State University campus several miles away.

Creating a cutting-edge production facility that would also be the focal point for a variety of public activities meant designing a visually appealing, compelling and accessible space. The additional challenge was doing all this on a PBS budget.

Enter active media

The resulting WOSU@COSI media center covers 12,000sq ft and includes a high-definition production control room, TV studio, HD edit systems with shared content, a combination U•TV exhibit area and studio space, and several media viewing areas.

The center serves as multimedia studios and community space (for civic engagements, forums, performances, events and meetings) and includes a media literacy lab for digital media and technology activities coproduced with COSI. Visitors can watch live productions and participate in a wide variety of workshops and interactive exhibits, bringing the excitement and energy of public television and radio broadcasting to residents of central Ohio.

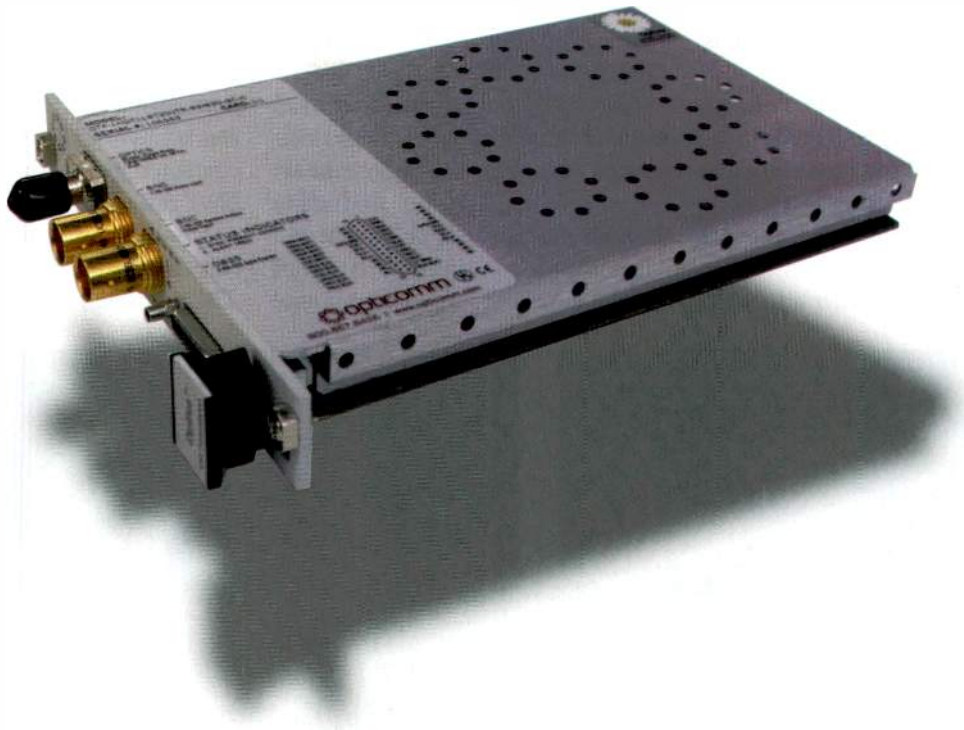
The project has allowed all of station's media resources — AM, FM, TV and Web — to extended deeper into the heart of the downtown area. The project has opened up a variety of possibilities for developing partnerships to expand local programming and educational and outreach opportunities.

WOSU@COSI features complete digital functionality with studios, control rooms and production areas for television, radio and Internet technologies. An especially unique part of the facility is the system's multiplexed connection by a single fiber-optic link to WOSU's Fawcett Center headquarters, enabling simultaneous broadcasts, communications and control from both locations.

Exhibiting design

WOSU hired Communications Engineering (CEI) of Newington, VA, to handle the design, integration and equipment installation for the new center. Most of the new facility occupies space previously used as exhibit areas

The WOSU@COSI studio is separated from the U•TV exhibit area by a movable, six-panel wall with windows. Visitors can also see into the audio control room (not pictured), video control room and the equipment core room above it.



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by COSI. Fortunately, radical changes to the building, such as relocating beams or pillars, were not necessary.

A key component of the new facility is the 2000sq-ft Battelle Studio, which is used for producing TV programming and airing live events. It features four Sony HD cameras, a Stanton Jimmy Jib, Vinten studio pedestals and QTV teleprompters. events. A second, smaller studio is planned for radio, audio and smaller video productions.

The U•TV exhibit, with views of all the main broadcast areas, allows visitors the opportunity to explore the art and science of television production through multilayered video that can be modified by using digital effects and the use of chroma and luminance tures a large video wall comprised of three Barco SXGA 67in multi-input displays, a Sony video switcher and multiformat DVE, a Videotek rasterizer, a Chyron HD/SD single-channel character generator, and an Evertz MVP multidisplay monitoring system and processing equipment. The consoles for the project were provided by TBC Consoles.

The Euphonix Max Air in the audio control room allows for 5.1 surround sound mixing. And the window to the main studio offers a view of the talent for better timed sound adjustments.

Microphones from Shure, Lectrosonics and Electro-Voice are also part of the studio equipment.

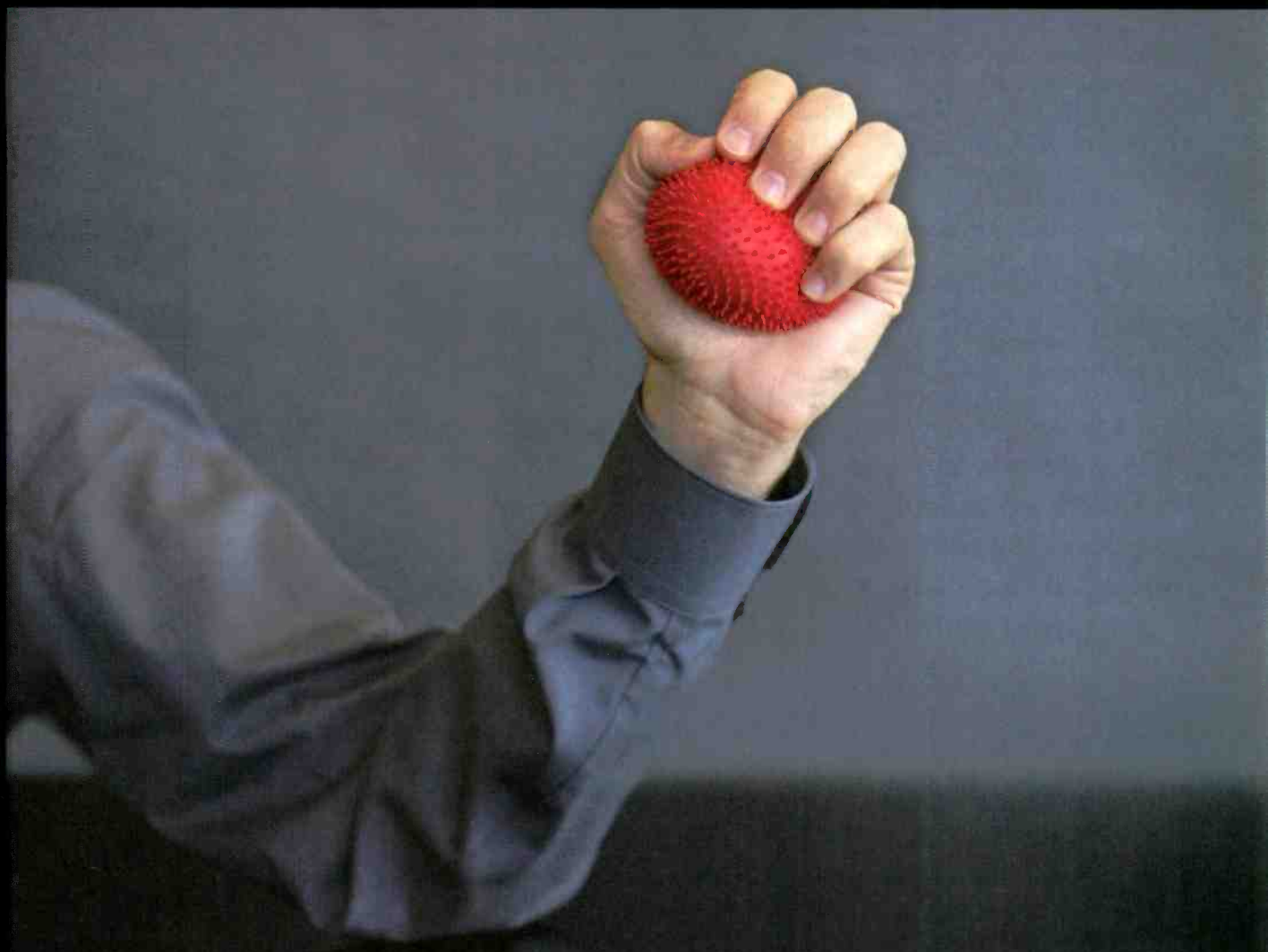
Watch and learn

The studio is separated from the adjacent U•TV exhibit area by a movable, six-panel wall with windows that allow visitors to watch programs as they are produced. The wall can be removed to open the space for special keying. Visitors can bring up various moving backgrounds on a green screen and then step into the scene, which is monitored by overhead displays. A ceiling-mounted Sony projector provides additional entertaining video content for the exhibit area.

The sophisticated video control room, located next to the studio, also has a large window that offers visitors a view from the exhibit area. It fea-

The adjoining audio control room, which looks into the TV studio, includes a Euphonix Max Air digital audio broadcast production console, a 360 Systems DigitCart/E and a Comrex STAC6 multiline on-air call system. The camera shading room next door contains the Sony HDCU900 CCUs, three Telecast SMPTE hybrid elimination devices, two Sony VTRs and a Tektronix SD/HD waveform

SONY



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monitor. The facility was designed to accommodate three nonlinear edit suites with shared content storage.

The recently constructed second floor houses the administrative office and equipment core room, which has a large window that allows a prime view of the U•TV exhibit. From below, visitors can look up to see the racks of equipment that are processing and delivering content.

The equipment core room contains Evertz master sync and time generators, fiber transmission, multiplexing and modular terminal gear; Image Video tally processor and GPI interface; Grass Valley K2 and Turbo-1 video servers, audio, video and data routing switchers and an Encore control system; and a Cisco 144-port gigabit IT switch. A large conference room on the second floor also overlooks the U•TV area, providing an excellent view of the exhibit and studio space.

From below, visitors can look up to see the racks of equipment that are processing and delivering content.

In addition, the system features numerous fiber drop points throughout the entire building. This enables live broadcasts from any exhibit area, in effect making it a 320,000sq-ft HD production studio.

Broadcast exhibit

WOSU has already hosted a steady stream of events at COSI, including a live broadcast of National Public Radio's "Talk of the Nation." And the development of WOSU@COSI fits with an overall Ohio State University strategy to build strong outreach and engagement initiatives. The university's vision is to "set the standard for the creation and dissemination of knowledge and service to its communities, state, nation and the world." BE

Tom Hackett is project manager for CEI.

Design team

WOSU-TV
- Tom Rieland, general manager
- Tom Lahr, chief engineer of television
- David Carwile, director of planning and business initiatives, associate director
- John Prosek, broadcast manager

Communications Engineering (CEI)
- David Giblin, vice president and general manager
- Tom Hackett, project manager
- Victor Silva, installation supervisor

Burt Hill Architects

Technology at work

360 Systems DigiCart/E Ethernet audio recorder
ADC jackfields
Avocent AMX 5010 64 x 64 KVM matrix
Barco OverView displays
Chyron HyperX HD/SD single-channel CG
Cisco Catalyst 4506 144-port gigabit IT switch
Comrex STAC6 multiline on-air call system
Electro-Voice RE92L microphones
Euphonix Max Air digital audio mixing system
Evertz
- 5600 master sync and time generators
- 7700 Series fiber transmission and mux
- 7700 and 500 Series modular terminal gear
- MVP 40 input multi-display processor

Grass Valley
- Concerto switchers
- Encore control system
- K2-HD-22 video server
- Turbo-1 SD/HD pro-AV intelligent disk recorder

Image Video
- 4211 GPI interface
- GSI-3 tally processor

Lectrosonics microphones
QTV
- FDP-17P prompter package
- WinCue teleprompter software

Shure microphones
Sony
- HDC-930 HD cameras
- HDCU900 CCU
- MVE8000A multiformat DVE
- MVS-8000ASF multiformat video switcher
- VPLFX52 projector
- VTRs

Stanton Triangle Jimmy Jib
TBC Consoles consoles
Tektronix WFM700A SD/HD waveform monitor
Telecast SHED SMPTE hybrid elimination devices
Telex/RTS Cronus digital intercom
Videotek VTM-4100 rasterizer
Vinten Osprey Elite studio pedestals

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Engineering The Broadcast Future

Digital splicing

DPI platforms create ad insertion growth and revenue for broadcasters.

BY PETER CHAVE

In any difficult transition, the elements that contribute revenue generally top the list of priorities. This is true for TV advertising as it moves along the inevitable digital transition path. Specifically, the cue tones, contact closures and video switchers long known as the means to airing a local advertisement are now well on their way toward digital splicing.

The reason for the transition is clear. Local cable TV advertising revenues topped $4.68 billion in 2006. Broadcasters collect a fee each time they issue a cue that allows a local ad to override a national ad. Meanwhile, as more cable and broadcast networks are digitally simulcast, and as consumers purchase more digital and HD displays, it is critical that advertisements reach all intended audiences.

This article describes the steps involved in digital program insertion (DPI), or the splicing and delivery of MPEG-compressed video streams. I'll briefly review the existing world of advertising cues and the new, spliced world, focusing specifically on how a digital splicer knows what to do in the few seconds preceding and following a local ad avail.

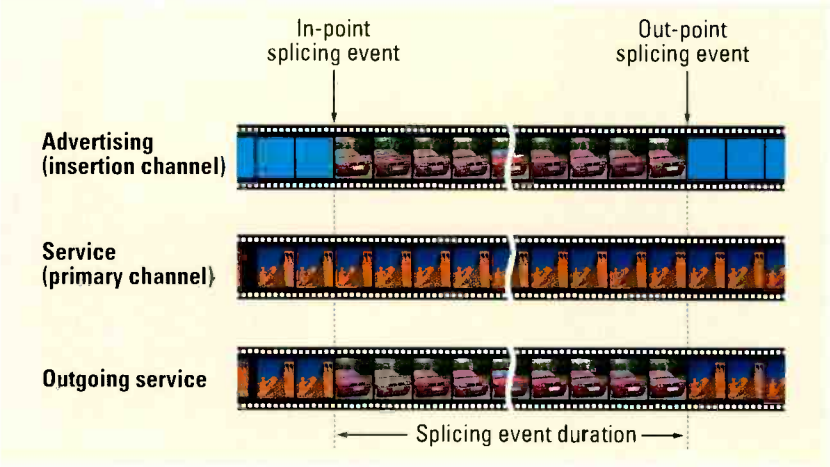


Figure 1. In this splicing event diagram, the ad within the insertion channel is spliced into the primary channel at the indicated in-splice point. The outgoing channel illustrates the primary channel with the alternate ad.

A brief history of ad insertion

Since the beginning of local advertising insertion, broadcasters indicated that an advertising avail was coming by broadcasting a series of in-band dual-tone multifrequency (DTMF) subcarrier audio cue tones. The tones triggered the cutover sequence from a nationally shown ad to a pod of local ads.

DPI is the digital counterpart for analog insertion and cue tones. As a technology suite, it automatically and cleanly places digitized, compressed ads into an MPEG-compressed transport stream.

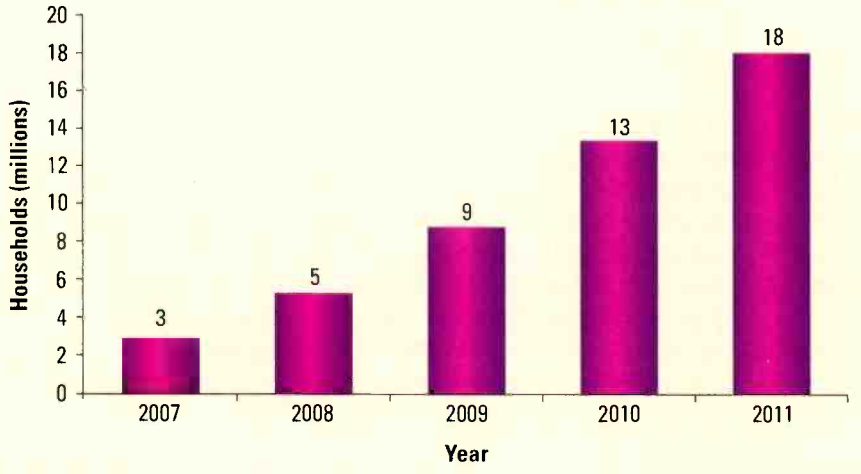
Inserting digital ads into digital programs requires two core technologies: cueing and insertion. Cueing defines a digital cue delivery in-band with the video and audio programming. Insertion consists of two parts: the technology to splice compressed video

FRAME GRAB

A look at the consumer side of DTV

Number of households that subscribe to fiber connections

By 2011, 18 million households will subscribe to fiber



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together and the interface standard between splicers and video asset servers.

The ANSI/SCTE 35 standard defines how local avails are signaled to video splicers, while ANSI/SCTE 30 defines the interface characteristics between video ad servers and splicing gear. An example of this is shown in Figure 1 on page 46. The advertisement within the insertion channel, shown on the top reel, is spliced into the primary channel in the middle reel at the indicated in-splice point. The outgoing channel (shown in the bottom reel) illustrates the primary channel with the alternate advertisement.

Splicing basics and signal flow

In a network playout environment enabled for DPI splicing, several steps occur. Digitized, uncompressed audio and video streams enter a video encoder, either from studio feeds or video storage servers. The encoder receives cue triggers from an automation system driven by the associated ad avail schedule. When a cue trigger is imminent, the encoder injects an ANSI/SCTE 35-based cue message into the outgoing, compressed video stream.

In homes, the impact of DPI happens behind the scenes. Instead of seeing a nationally broadcast Ford F-150 ad, home viewers see an ad by the local Ford dealer.

At the local cable headend, the integrated receiver and decoder (IRD) moves the cue message to the splicer to initiate the sequence of events that will result in a local ad insertion. When the cue message triggering a local avail transits through the IRD to the splicer, it responds by informing the ad server to retrieve the ad spots scheduled for that particular time. Then the ad server initiates the splice. The outgoing video streams the replaced (local) ad into the cable operator's distribution network.

In homes, the impact of DPI happens behind the scenes. For example, instead of seeing a nationally broadcast Ford F-150 ad, home viewers see an ad by the local Ford dealer.

Splicer mechanics

A digital splicer must complete a sequence of actions within a short time frame to achieve a seamless, frame-accurate splice. As with most

things that seem simple on the surface, there's considerable complexity underneath.

The completion of a seamless, frame-accurate splice, for example, isn't a matter of merely switching from one stream to another, as with analog or uncompressed digital video. Compression encoders generally process and buffer MPEG frames along two parallel domains: presentation order and decode order.

A group of pictures (GOP) representing the primary video channel may enter an encoder's buffer in a B-P-B-B-I-B-B-P order, for example, as shown in Figure 2. Only an intra-frame (I-frame) can initiate digital splicing in, for splicing into the primary channel. Splicing out can only be performed on an anchor frame, which is an I-frame or predictive frame (P-frame).

At the onset of a scheduled avail, the splicer begins looking for an out-point splicing event within the primary stream and an in splice point in the insertion stream for an upcoming event. The output buffer provides the cushion of time necessary to apply as-needed transrating during a splice event.

Once the I-frame for the in splice and anchor frame for the out splice have been identified, the GOP in the primary channel closes to allow a clean transition to the insert channel. Then the splice is initiated.

At that moment, the insertion channel is placed into the output stream. When the ad avail finishes and a cue message indicates a return to network source, the splicer engine has to look for an out from the insertion and in back to the network to complete the seamless splice. All of this happens within the broadcast timeline.

Buffering plays a critical role in splicing. Likewise, an important part of a splicer's workload involves vigilantly managing its output buffers to prevent overflows and video buffer verifier (VBV) breaches.

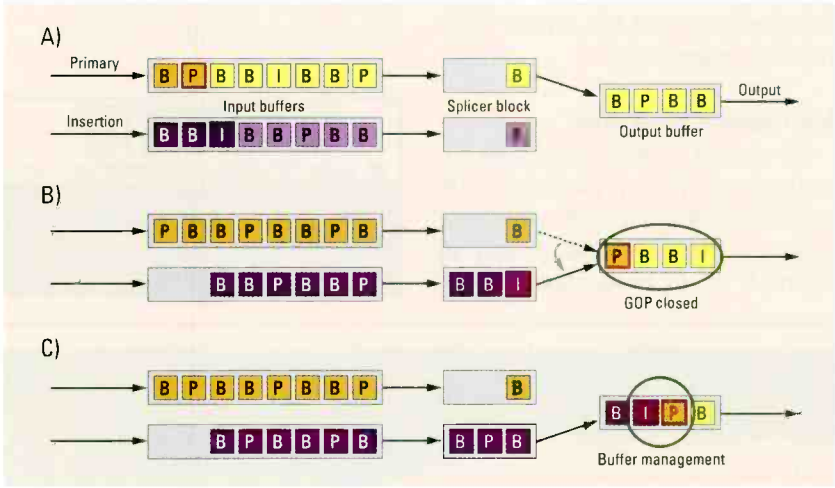


Figure 2. This group of pictures (GOP) show the typical digital-into-digital splice environment.
A) First, the splicer searches for the out-point splice within the primary channel (at intra-frames, labeled "I," or predictive frames, labeled "P") as well as the in-point splice within the insertion channel (at I-frames).
B) Next is the temporal alignment for splice in and out points and the close of the GOP in the primary channel for a seamless splice.
C) The splice is completed, and insert channel frames are placed into the output stream. Buffer management is required on the output buffer to ensure the video buffer verifier model is not violated in the new spliced output stream.

What's next

DPI splicing for ad insertion continues to evolve, most notably in the direction of segmentation, targeting

and addressability. One manifestation, for example, is the personalized or enhanced ad, which involves attaching an additional data stream within the digital advertisement. That data stream carries localized information, such as the address of the local store or a clickable coupon. A set-top box in the home receives and processes this information.

Also on the near-term horizon is the industry-wide shift to advanced video compression engines, such as H.264. The good news is that the increased flexibility of the H.264 encoding standard allows for longer and more complex GOP structures. The challenge that this benefit presents is the subsequent increase in processing complexity required.

Both cases — segmented advertising and advanced compression — require a powerful encoding and splicing platform. And the vendor community is responding.

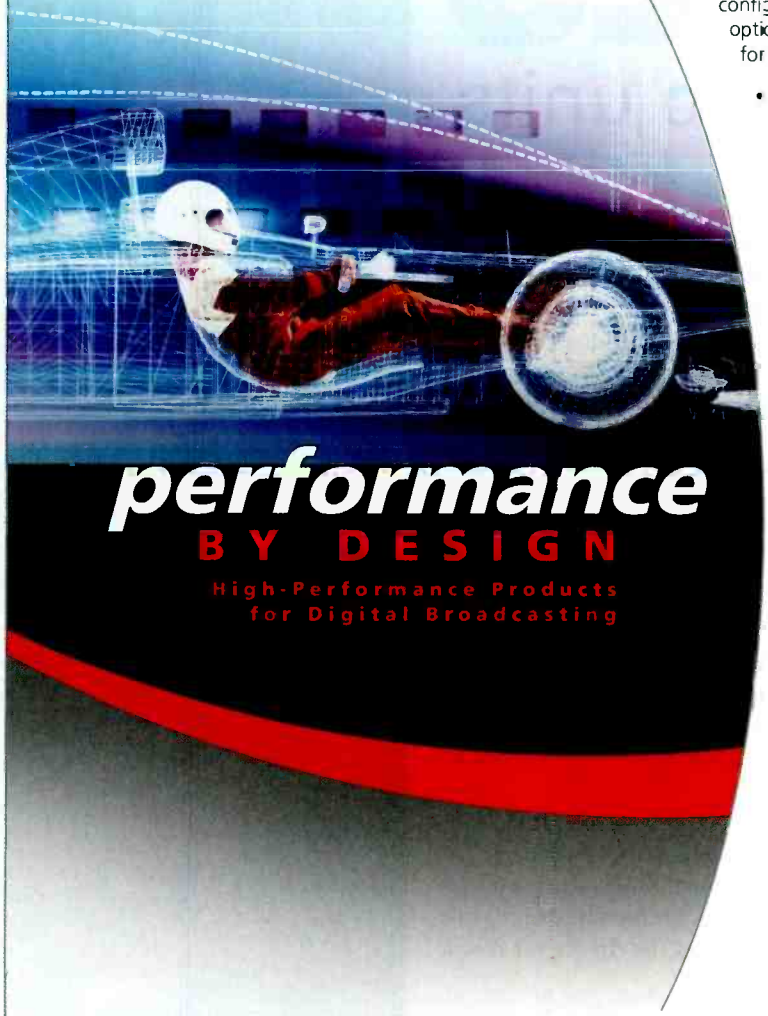
The good news is that the increased flexibility of the H.264 encoding standard allows for longer and more complex GOP structures.

Increased revenue

The intent of next-generation encoding and splicing platforms is to enable broadcasters and cable providers to increase splice density by as much as 20 times that achieved by legacy systems. In turn, increased splice density provides the room for revenue growth via new, segmented advertising models.

Again, in the overall digital transition, revenue-generating opportunities, or businesses poised for substantial revenue growth, tend to receive the most attention. DPI for advertising insertion is an early example. Other digital-in-digital splicing models will surely follow, particularly if the fundamentals are in place to enable more flexible splice opportunities. BE

Peter Chave is product manager for Scientific Atlanta, a Cisco company.



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Selecting THE RIGHT LENSES for mobile video units

BY DAVE WADDELL

One of the most critical factors affecting the production of live sports or entertainment shows is the broadcast lens. The image quality, durability, operational features and lens types work together to ensure the success of the telecast and provide a high-quality viewing experience.

Truck companies select lenses carefully because the right complement of lenses will attract new customers and encourage return business. The wrong lenses could cause potential customers to have second thoughts about booking a mobile unit. When choosing lenses for use on a mobile video unit, the main issues to consider are customer service, lens assortment, operational features and performance.

Customer service

The effectiveness of the manufacturer's technical support is arguably the most critical issue to consider when choosing lenses for a mobile unit. Sales representatives from lens manufacturers strive to foster strong, long-lasting relationships with their customers. The true test of the strength of these relationships is when a lens fails.

When a lens doesn't work right, there's no way to fake it. Mobile truck owners immediately call for tech support, and the issue needs to be resolved quickly. When a call to the manufacturer produces immediate results, such as a quick turnaround on service or the issuance of a loaner lens, the manufacturer gains the trust of the mobile truck company, which increases the chance for repeat business.

Lens assortment

Identifying the market and the type of lenses customers expect to use is the second step in selecting the right lenses for a mobile unit. Mobile units are unique because they are severely restricted in terms of total vehicle weight and space, so determining exactly which lenses to have onboard is judicious.

Broadcast lenses are not cheap, and mobile units usually require buying more than just one lens. Typically, a 53ft expando covering network sports requires at least half a dozen lenses. Some events need more than 20 lenses.

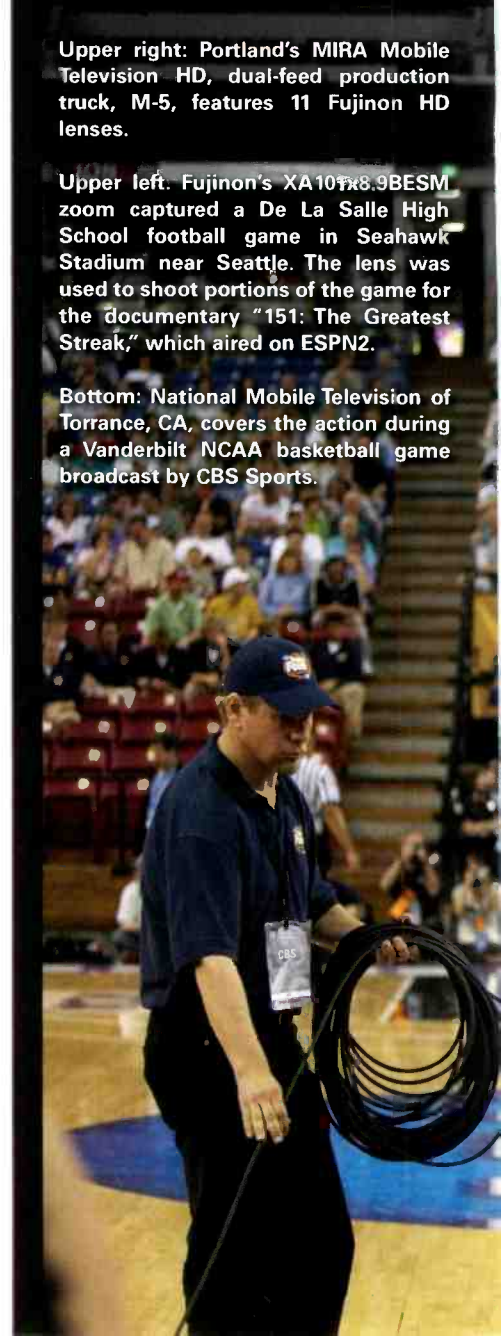
Today's sports networks need to capture all the action in any game, from the Super Bowl to college sports. For the most part, their migration to HDTV production is virtually complete. As a rule, they seek out native HD trucks and require top-quality HD lenses.

Trucks catering to high-profile sports networks typically carry six to eight

Upper right: Portland's MIRA Mobile Television HD, dual-feed production truck, M-5, features 11 Fujinon HD lenses.

Upper left. Fujinon's XA101x8.9BESM zoom captured a De La Salle High School football game in Seahawk Stadium near Seattle. The lens was used to shoot portions of the game for the documentary "151: The Greatest Streak," which aired on ESPN2.

Bottom: National Mobile Television of Torrance, CA, covers the action during a Vanderbilt NCAA basketball game broadcast by CBS Sports.




20:00
35
CBS

big box telephoto lenses. These telephoto field lenses can reach across the playing field to zoom onto a player's face, zero in on the touchdown or close in on spectators on the other side of the stadium.

The lens package typically includes four or five ENG/EFP-style lenses, so versatility is an asset. A 22X is often chosen for stand-up interviews, roving camera shots and shots that are otherwise difficult to capture, such as standing from the inside lanes of the race track to capture cars as they come zooming around the bend. Wide-angle lenses for closeup work, jibs or Steadicams, and smaller, low-cost lenses (18:1 or 20:1 lenses) are all ideal for mobile trucks. These lenses can be aimed at the scoreboard or game clock, affixed to goal posts, put on Cablecam systems or attached to bucket cameras. Remote control is especially important for lenses and cameras in unmanned positions.

Trucks are often designed and built for either sports or entertainment applications. A truck may be built just to serve a specific package of games for one particular sports network, for example "Sunday Night Football" on ESPN. Or a truck could be designed to cover productions such as the Grammies or Academy Awards.

In many cases, truck owners want the flexibility to serve either the sports or entertainment market to keep their trucks booked and on the road year-round. While entertainment and sports shows can employ the same type and sizes of lenses, the mix may differ depending on the production style and shots the director wants. Also, for entertainment productions, lenses may be placed on jibs, cranes and Steadicams to get the right shots.

The GoodyearTire and Rubber Company recently employed the Fujinon A18x7.6ERM ENG SD zoom lens on a Sony XDCAM 510P disk-based camcorder to shoot footage of the Coca-Cola 600 NASCAR event at the Loews Motor Speedway in Charlotte, NC.

Lyon Video uses a Fujinon XA87x9.3ESM HD field lens in one of its mobile units.

These telephoto field lenses can reach across the playing field to zoom onto a player's face, zero in on a touchdown or close in on spectators.

Operational features

On big box lenses, camera operators spend their time peering into the viewfinder. If they can't feel the controls with their hands, having a digital display in the viewfinder that indicates the status of every feature is not only convenient, it's indispensable. This allows the camera operator to see if the lens' image stabilization, focus, 2X extender or other features are on or off, as well as the position of the zoom, focus and other imaging parameters.

For sports, camera operators can find it difficult to keep the image steady, especially when they're zoomed all the way in on a big box lens weighing 50lbs to 60lbs. Scaffolds and camera towers typically shake and sway. Excited spectators jump up and down in the stands, causing movement. Even high winds can affect the image stability. For this reason, it pays to have image stabilization on lenses, especially on the big box 101X, 87X and 88X HD lenses.

Special focusing features are catching on because they enhance the operator's ability to keep a moving subject in focus. For example, if a camera

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operator wants to follow a racecar traveling at 200mph, focus features can zero in on a particular subject and automatically keep it in focus with push-button ease. Zoom and focus features are especially beneficial in HD, where accurate zoom and focus are critical.

If a camera operator wants to follow a racecar traveling at 200mph, focus features can zero in on a particular subject and automatically keep it in focus.

Large lenses incorporate a 2X extender. The 2X extender is a must-have feature for sports. It doubles the focal length of the lens. For example, a 100mm lens with a 2X extender becomes a 200mm lens. The compromise is that the 2X extender also doubles the light loss, so it is not always the correct choice for low-light situations.

It's also beneficial to have an RS-232 (computer output) port on the lens. This enables the lens to interface with external devices. This feature is growing in popularity for use with the Sportvision 1st and Ten marker, which superimposes a bright yellow line to illustrate where the first down line is on the field. The marker enhances viewer enjoyment of football games.

Many sports are also using virtual advertising, which keys images onto the playing field in a way that makes them look like physical signage. These types of features require precise information about the lens position via this port.

Performance

It goes without saying that broadcast lenses for live sports and entertainment shows must have superior precision glass. Images in HD reveal

YES Productions' Mobile Unit II, which had been destroyed by Hurricane Katrina, has been replaced with a new 53ft expando HD trailer outfitted with state-of-the-art equipment, including an assortment of Fujinon field and ENG/EFP HDTV lenses.

much more information than ever before, and any aberration caused by the lens can be distracting. F-stop ramping or the ability of a lens to produce a consistently bright image even at the extreme telephoto end of the zoom range is also important.

National Mobile Television's HD11 53ft expando truck is based out of Los Angeles. The unit features a Fujinon XA101x8.9BESM high-magnification, HD zoom lens.

In addition, lenses must be extremely rugged and roadworthy. Lenses on trucks are often put on cameras, removed, packed into cases, put into the belly of the truck and driven countless miles, with this process repeated on a regular basis.

Lenses must be extremely rugged and roadworthy.

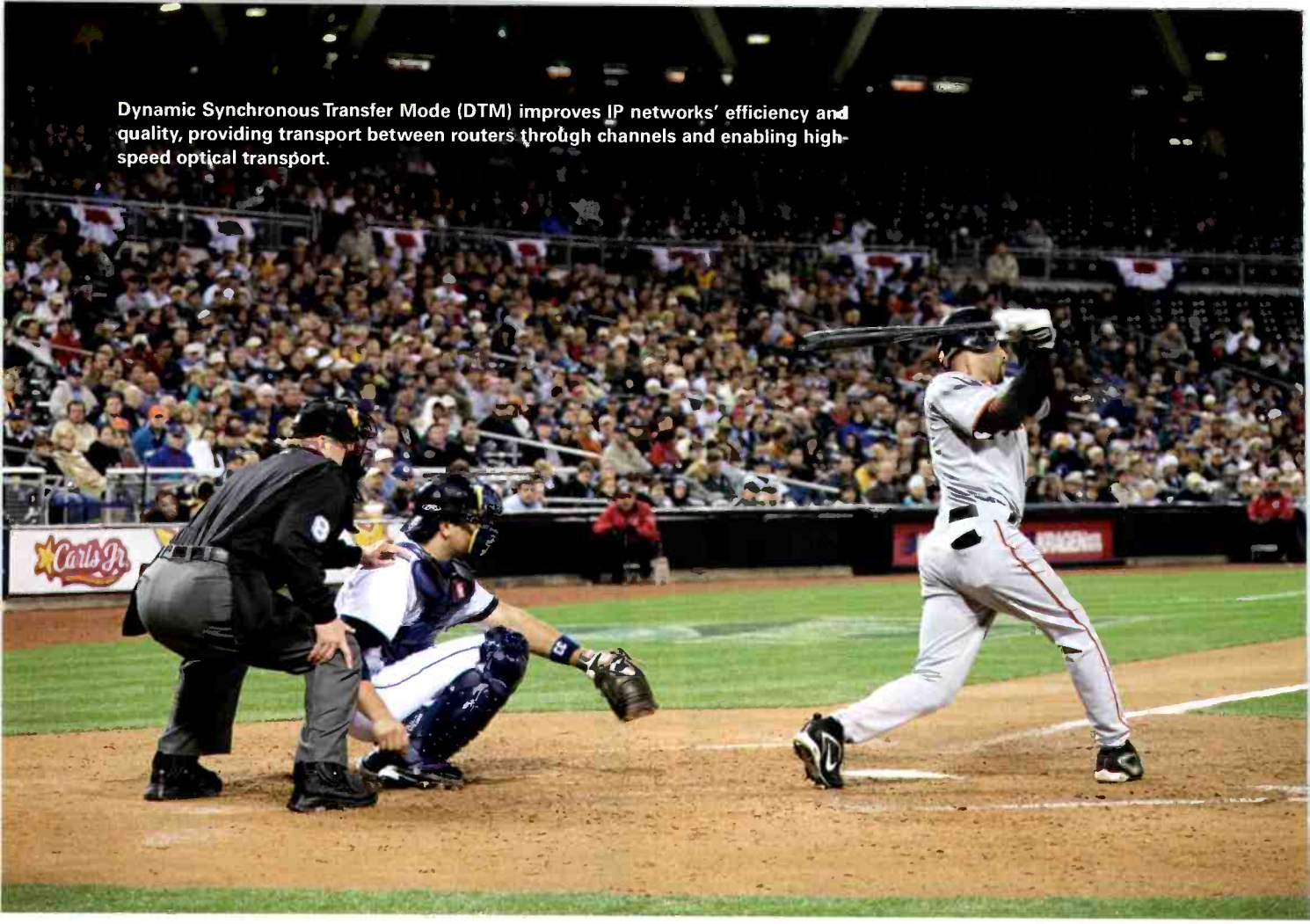
The lenses must be durable enough to withstand extreme temperatures. To reduce maintenance and fogging problems, some lenses feature packages that eliminate moisture and fog while the lens is being focused.

Protecting a lens from moisture and dust requires constant vigilance, but doing so will ensure that the broadcast lens will be operational and maximize profits for 10 years and beyond.

The perfect fit

In the broadcast industry, viewer demand for live coverage of news, sports and entertainment has increased mobile TV productions, and that demand will only continue to increase. To be successful, mobile truck owners need to select the correct lens to deliver high-quality content to broadcasters and viewers. BE

Dave Waddell is the marketing manager for Fujinon, broadcast and communications products division.



Dynamic Synchronous Transfer Mode (DTM) improves IP networks' efficiency and quality, providing transport between routers through channels and enabling high-speed optical transport.

FORGET COMPRESSION

DTM allows for uncompressed HDTV transmission, leaving viewers saying, "It's like I was there."

BY MAHMUD NOORMOHAMED

While sports broadcasting is driving the HD trend in television broadcast technology, it is also highlighting underlying problems with the mass market transport of real-time and HD-quality rich media content. To provide the "it's like I was there" experience promised by HDTV, video must be delivered with the greatest and highest possible quality (e.g. no latency, jitter). The entire entertainment content and delivery value chain faces the ever-increasing consumer demand for uncompromising high quality. Video on demand, interactive gaming and new end-user TV appliances, such as mobile devices, are just some examples of where HDTV-quality expectations are driving the need for an agile, video-centric network infrastructure.

HDTV delivery to a mass market today represents an unprecedented opportunity for innovation since the dawn of the Internet. Equipment vendors are clamoring for technological advances that allow the production and contribution, distribution, and delivery of rich content with quality that meets user expectations.

In the production and contribution world, dedicated media networks connecting remote sites, digital production units and studios provide seamless video delivery in a lossless environment from the field to the studio. Broadcast networks are now beginning to demand a similar QoS capability from telecom providers. This is a must as rapidly improving TV quality has set user expectations

One in six U.S. households have at least one HD-capable TV. That's more than double the figure from two years ago.

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at a level beyond even the smallest compromise. Users are demanding studio quality in the home.

Distribution issues

Content distribution provides an added challenge. Compressing content for bandwidth efficiency ultimately results in degradation. Transporting uncompressed HD content, however, is rare. Telecom operators have raced to install more fiber and hardware solutions, but many networks are still unable to support uncompressed video. As a result, the packet switching fabric is being stressed to the limit. These networks are designed for best-effort services and do not guarantee QoS. HDTV just compounds the problem.

Content delivery begs the question of whether there is enough delivery bandwidth to allow each end user to have the "like I was there" rich media experience of HDTV. Today's network infrastructures do not support the demand for video transfer as they did for data and voice, leaving everyone to compromise on quality. As a result, the promised HDTV experience is hardly a reality and won't be anytime soon. (See Figure 1.)

According to Informa Telecoms & Media, the number of homes worldwide with HD-capable televisions will jump from 48 million at the end of 2006 to 151 million by 2011. Further exemplifying increasing demand, Datamonitor, an online research company, estimates that 63 percent of U.S. households will receive digital TV services and view HD content by 2008.

Sports broadcasters are driving demand for HD content delivery. Research shows that consumer education is also improving. Both developments have led distributors to broaden their HD offerings and cable networks to accelerate their plans to jump into HD. This increase in demand has left network operators scrambling to pull even more fiber and upgrade networks to handle the influx.

The challenge

Many broadcasters are upgrading existing infrastructure so video can be transported over IP networks. IP is a best-effort packetized transmission protocol designed to make transport facilities efficient. The presumption is that if data is grouped into packets, with each packet having sufficient data in its overhead to identify its destination, then the packet will be free to travel across the network in an efficient manner determined by the intelligence of the switching transport network.

While IP has enabled expansion of video, audio and voice services, its packet-based protocol is generally not well suited for video. Content providers, rich media distributors and delivery networks must address a variety of performance issues that are inherent in IP networks and can cause a reduction in quality and service. Frequent issues include:

- IP allows jitter, especially across large networks.

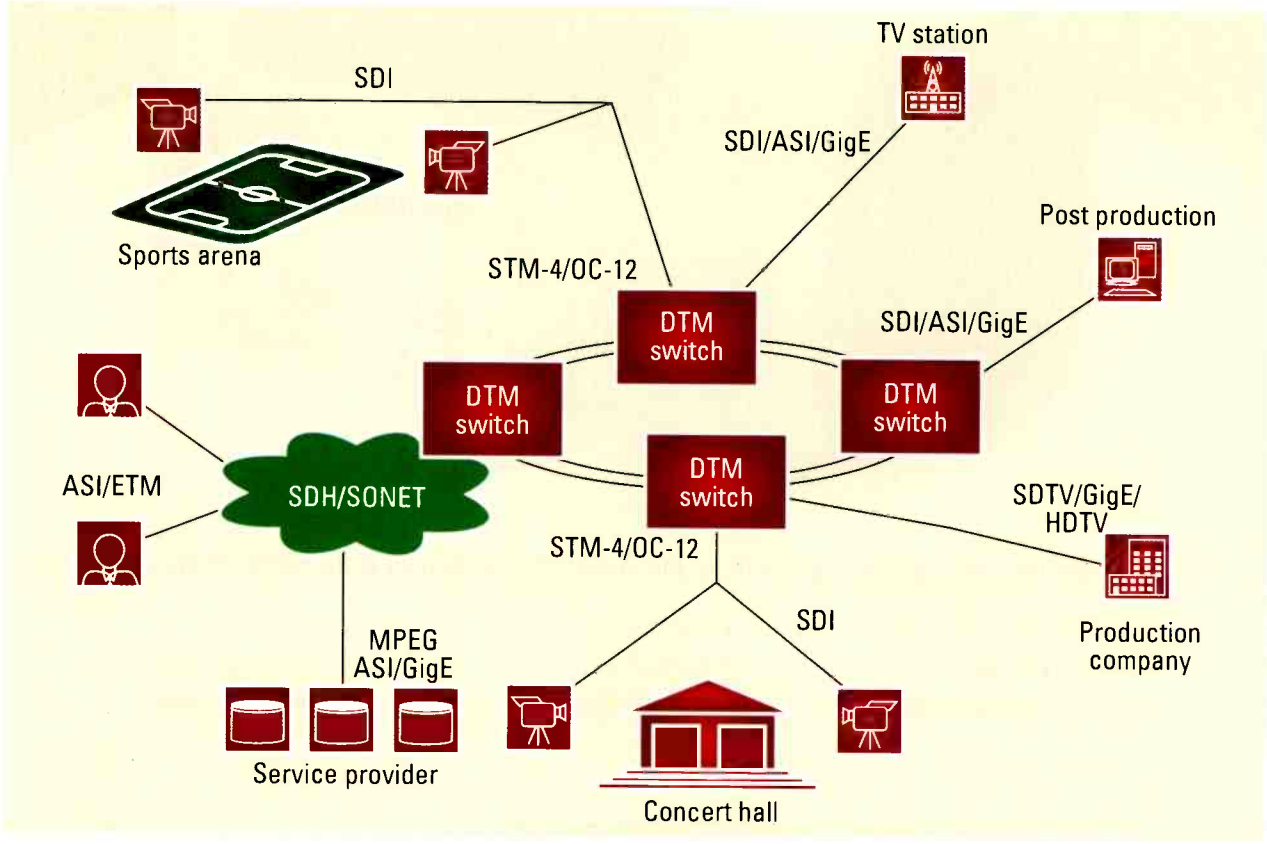

Figure 1. Most current broadcast and media network infrastructures cannot support the demand of video transfers, resulting in reduced quality.

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- Mixed interface planes could create inefficient signal processing.
- Live video needs a synchronous infrastructure.
- Best-effort networks may result in packet collisions or lost packets.
- Multicasting will eat up any available bandwidth.

In the world of video — particularly live video — dropped packets wreak havoc on transmissions. Lost packets during transmission could cause viewers to miss the winning play of the Super Bowl or the buzzer-beating shot during March Madness.

Reserving network switch resources is one way to ensure all video data packets arrive properly and the viewing experience remains intact. Various studies have looked at the connection between the size of an IP network and the quality of video transmission across the network. In order to control video quality across a growing IP network, these studies have found that portions of the network's capacity need to remain empty to prevent packet collision or congestion, which limits the viewing experience.

As the network grows, the relationship between the number of hops and the amount of network bandwidth left empty has a strong, negative correlation. Sending a video signal across one network hop results in the video signal being received with 100 percent quality. No network resources need to be reserved to counteract the adverse effects of packet collision. However, for a video signal traversing 16 hops, almost 90 percent of the network capacity must be reserved in order to maintain quality.

Is it possible to build a viable converged IP network capable of supporting broadcast-quality video? Because live video demands the highest priority in the network, the transmission medium should be one where other traffic will not interfere with or impede the video's transmission across the network infrastructure. As networks experience growing multicast group transport, the growth of the demand should not negatively affect the video quality.

IP, though not optimal for video applications, remains the most prevalent protocol for next-generation converged networking platforms. IP offers tremendous possibilities for network efficiencies. Meanwhile, Ethernet is driving down possible return on investment, which companies must rely on to maintain their position in the market. As a result, if IP is supplemented with

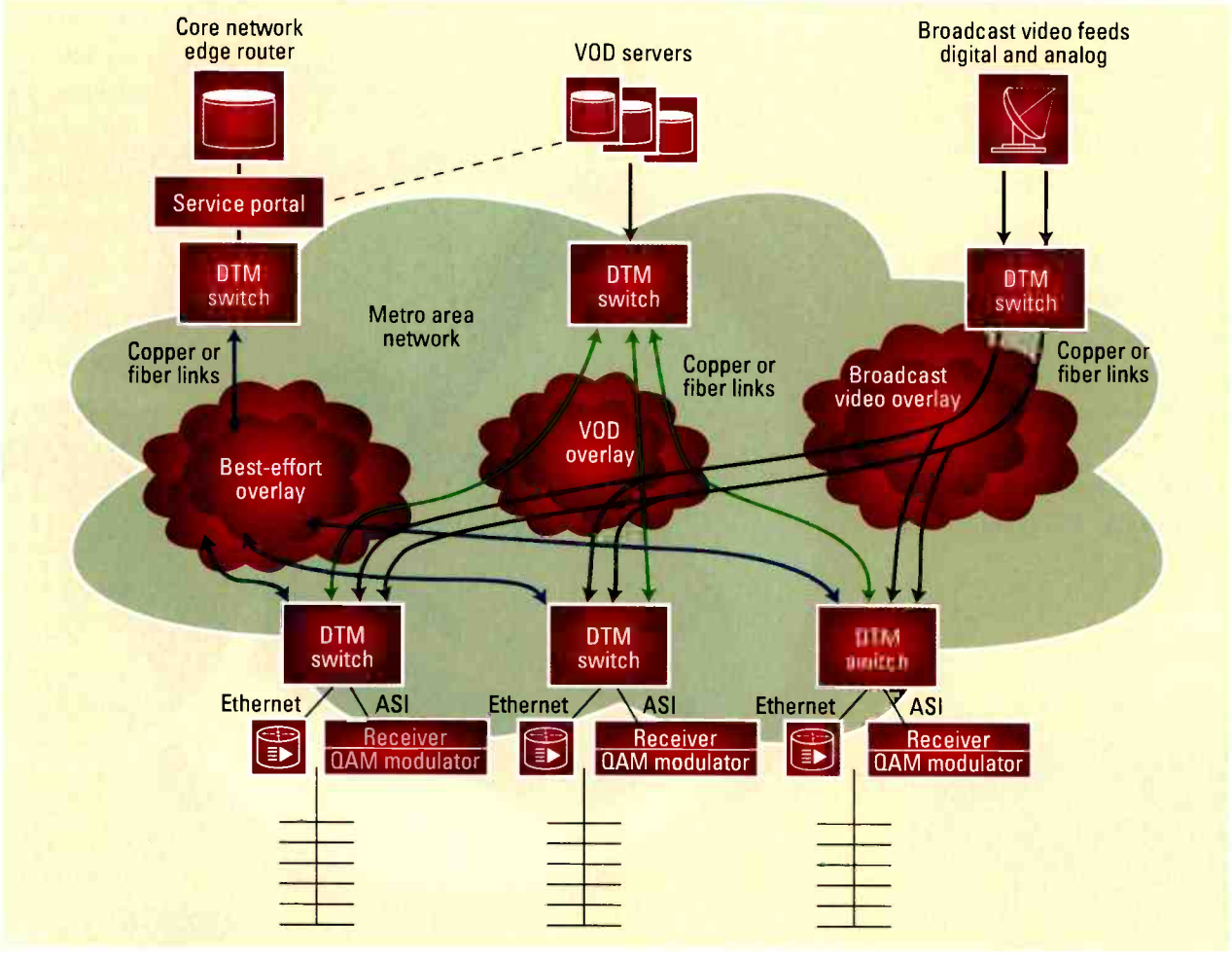

Figure 2. Dynamic Synchronous Transfer Mode (DTM) combines the benefits of circuit and packet switching to allow the transport of large, uncompressed video economically.

next-generation algorithms and technologies, IP may find a fit in the rich media broadcast applications where live video is an important component for a network operator's product suite.

The opportunity

Recognizing that the inefficiencies of IP networks can negatively affect the viewing experience and negate the benefits of HD broadcasting, sports broadcasters are turning to a hybrid technology, Dynamic Synchronous Transfer Mode (DTM). DTM allows broadcasters to produce, distribute and deliver uncompressed HDTV to consumers without jitter, delay or reduced quality. DTM combines the best of circuit switching (required for transporting large, uncompressed video signals) and the best of packet-switching, delivering full-featured and economical HD experience. (See Figure 2.)

Designed to improve some of the shortcomings inherent in IP networks, DTM provides increased efficiency and quality to IP networks. It is a dynamic circuit-switched technology that provides transport between routers through channels and enables high-speed optical transport. With DTM, each channel has dedicated bandwidth and forms a dynamic route between the sender and receiver, passing through the routers along the path. Quality of service levels are established quickly and maintained from origination to delivery. Routers along a channel's path easily pass data from one link to the next because no address information must be checked. To optimize the use of bandwidth, transparent channels can be set up on demand in steps of 512Kb/s up to the full fiber capacity.

While transmission networks have been able to transport video for a number of years, the quality of the video has suffered because network resources were inefficiently used. The poor video quality has slowed the adoption of video-based products offered by network operators. And inefficient network resources did not give network operators the financial incentive to build video-rich networks. However, with advances in DTM, the industry is presented with a viable solution for efficiently delivering high-quality video while using maximum bandwidth.

DTM's ability to maximize bandwidth provides broadcasters with substantial efficiency gains. Because channel size matches the payload, channels can be built and added as needed. And because existing channels are not adversely affected by the addition of new channels, broadcasters are often able to add two HD channels to their existing infrastructures without adverse affects.

The equipment allows HD cameras to plug directly into a fiber-optic network, so content can be transported in an uncompressed format to product facilities or straight to the studio. Additionally, by transporting real-time video streams in the ITU–R BT 601 format, production units can be connected to video-production networks on-demand, providing an opportunity for new revenue-generating services. For example, TV producers could do real-time editing from different locations or set up film banks and sell raw film material to other TV producers.

Imagine a world where real-time HD video is available on demand from virtually any live sporting event to any home. It's a scenario that changes the role of every player along the media chain. This is the promise of the fiber already in the ground, when IP and advanced technologies like DTM come together. With DTM, the promised "it's like I was there" experience of HDTV is a current reality, deliverable to billions of viewers in the short-term here-and-now. BE

Mahmud Noormohamed is vice president of business development for Net Insight.

TRANSITIONING FACILITIES IN THE DTV AGE

BY JOHN LUFF

The NFL on FOX studios in Los Angeles combine detailed, 16:9 design, and programmable robotic and changeable LED color lighting to help set the stage for this highly innovative HD studio. The set was designed by Broadcast Design International.

As we approach the end of analog broadcasting, a scant 22 months away, it is useful to look at what it takes to build a workflow and facility that seamlessly integrates HD into an SD world. Broadcasters are increasingly building news operations around the inevitability of HD local production, with SD slowly becoming the legacy format.

HD represents a totally new medium in addition to the obvious technical differences.

HD represents a totally new medium in addition to the obvious technical differences. It requires careful attention to sound and picture quality, both of which were not as urgent in the past.

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Changes in the studio

HD cameras provide less depth of field given identical focal length, shooting distance and f-stop. This can greatly affect planning a new set and the production process. Items out of focus on an SD set would still be visible on an HD set. In addition to the increase in resolution, this effect puts significant pressure on keeping sets in pristine condition and managing the contrast in the set design to achieve the intended look.

Lighting also contributes significantly to managing the contrast and apparent detail. HD studio cameras have about the same sensitivity as SD cameras, but to achieve depth of field similar to SD shots, it may be necessary to lower the lighting levels.

Even when HD cameras are used to create downconverted images for SD, the sharpness of the SD pictures increases. Don't assume that because the output is eventually SD, the issues, including depth of field differences, no longer exist.

Remember that sharpness and resolution are not the same. Apparent picture sharpness is related to the square of the area under the MTF curve, while resolution is a limiting value for detail that can be seen. (See Figure 1.)

Talent will have to learn new makeup techniques that can stand up to higher resolution. Some traditional makeup approaches used for SD look almost theatrical when shot with HD cameras. Lighting can be important in softening what might be perceived as excess resolution that makes facial features, shall we say, more distinct. This is an important issue to programmers and production professionals, as well as on-air talent, and it cannot be minimized.

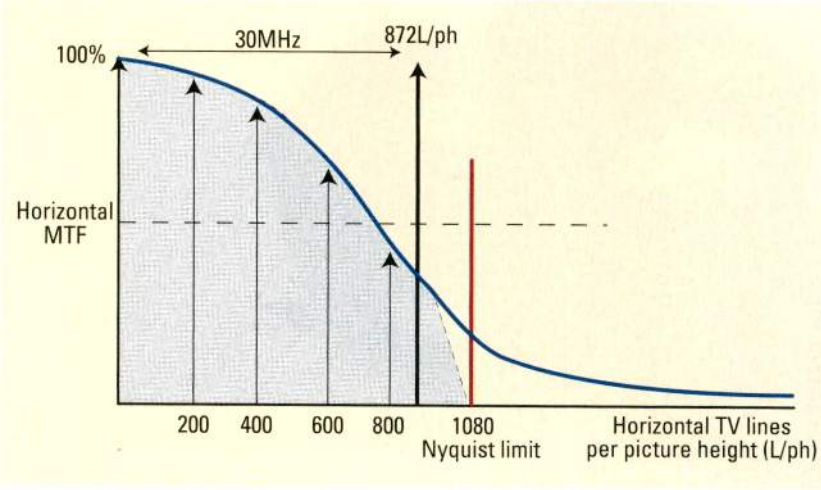


Figure 1. Sharpness is related to the square of the area under the MTF curve. Courtesy Canon USA.

Aspect ratio

In addition to the factors related to the physics of optics and HDTV scanning, there are other critical issues. The most obvious issue is the wide aspect ratio of HD images. Studio sets may need to mimic the aspect ratio to look natural. Dual SD and HD outputs will be around for some time into the future, so whether at the transmitter or at the set-top converter, it is important to protect the image for later formatting to SD. This technique is often called center safe.

The need to cut content from regular programming has caused most broadcasters to opt for a center cut from the HD image for delivering the SD copy, keeping the top and bottom of the frame aligned, and cutting off one-eighth of the frame from each side. (See Figure 2 below and Figure 3 on page 68.) This results in an oversampled NTSC picture, with excellent picture quality and a reasonable compromise between the best resolution possible and the most appropriate rendition of the scene.

Tapeless workflow

Other parts of the transition are not quite as settled as aspect ratio and

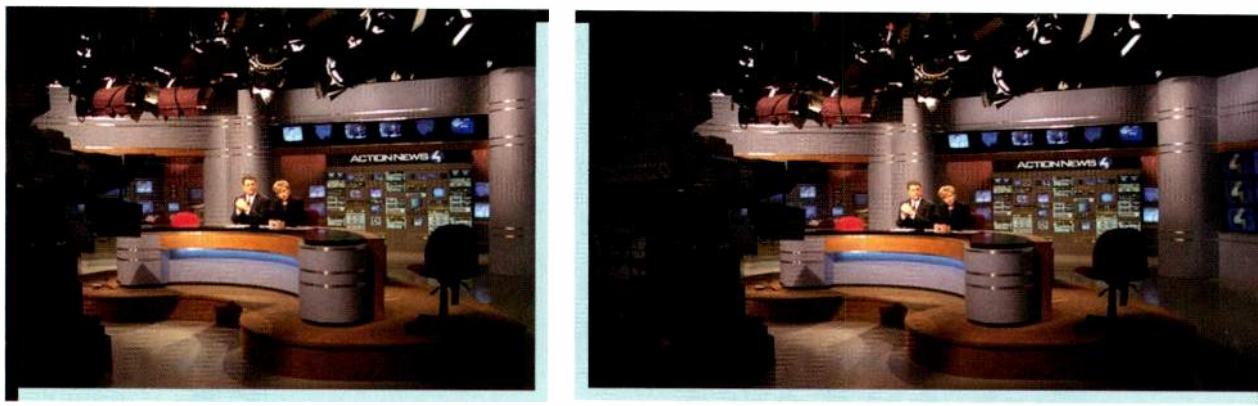


Figure 2. Studio sets require the same aspect ratio as cameras. The photo on the left shows a 4:3 image, while the photo on the right shows a 16:9 one. Courtesy HD Consulting.

staging issues. News operations are in the throws of conversion to so-called tapeless workflows. Unfortunately, just as momentum is building and stations are making that transition more smoothly, an immature HD news production infrastructure creates new barriers that deter progress.

Just as momentum is building and stations are making that transition more smoothly, an immature HD news production infrastructure creates new barriers.

HD news requires about three times the storage bandwidth of SD. HDV recorders eat up about 25Mb/s, and Panasonic DVCPRO-HD, generally on P2 cards, requires four times the bandwidth. Sony's XDCAM-HD records at 18Mb/s to 35Mb/s on Blu-ray disks.

This is happening at a confusing time in the industry. Hard disk storage is now as cheap as videotape. According to Screen Digest, disk storage of HD content is more than 20 percent cheaper than popular tape formats. By 2008, it is expected to be less than 30 percent of the cost of storage on tape. This offsets the cost of switching to nonlinear workflow and will reverse the adverse economics that HD news faces this year.

Infrastructure

In addition to the cost issues, there is simply less infrastructure available for HD nonlinear news, and what is available is still new in the marketplace. The cost and training barriers are exacerbated by the need to integrate SD legacy and field footage into HD news programs. Even the national news providers that have announced plans to transition to HD acknowledge that field acquisition will remain 4:3 SD, while converting to 16:9 SD and HD over an extended period of time.

At the network level, the investment required to fully enable HD acquisition and production for news is a huge barrier, one without proven sources of new revenue to justify the investment. It's possible that HD news conversion will proceed for the same reasons that helicopters and other large-ticket purchases for news

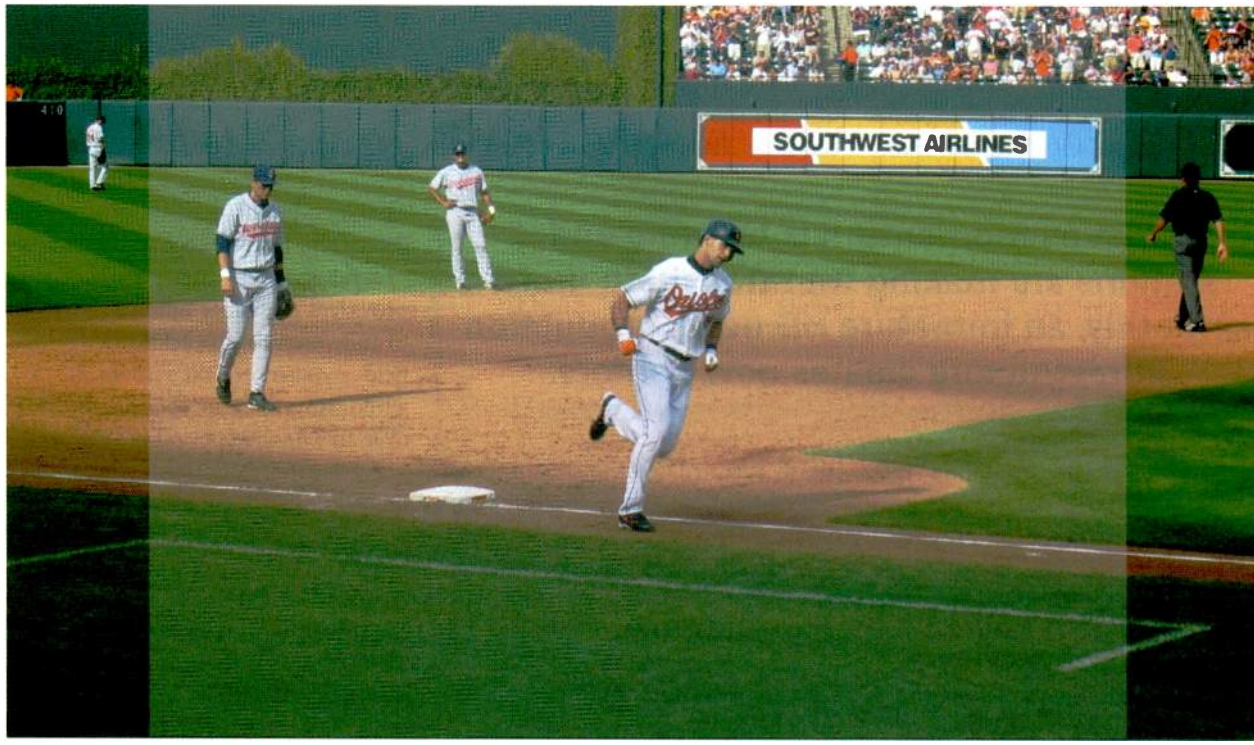


Figure 3. An example of a 4:3 center cut from a 16:9 source. Courtesy HD Consulting.

are made, which is of course competitive pressure.

HDV

One factor that helps significantly in ramping up the conversion of field acquisition to HD is the availability of HDV as an acquisition format. Although it was initially conceived as a format for consumers and prosumers, the incredible picture quality and availability of professional features on cameras costing less than $7500 make this an attractive option for newsgathering at all levels.

Network conversion strategies announced by more than one company include the use of HDV as a primary newsgathering system. Editing HDV in some systems has been available for more than a year. Now it is quite possible to integrate HDV into a professional workflow.

In most cases, a nonlinear workflow can accommodate the changes in aspect ratio and resolution in the editing system. This leaves a burden on the editor, but allows the freedom to compose a story using both SD and HD content on one timeline. Render times will suffer, of course, which might make external format conversion before editing more desirable.

It's possible that HD news conversion will proceed for the same reasons that helicopters and other large-ticket purchases for news are made, which is of course competitive pressure.

Control rooms

The control room is in a state of conversion. For the last decade, it has been considerably more expensive and complex to design a production system for HD origination. As HD equipment has become less expensive, and more available in all product categories, the incentive to build less expensive SD control rooms has eroded.

Now the premium for HD facilities is less than 20 percent, and compared with SD costs a few years ago, it is now about the same price. The complication of building a facility that integrates both formats is that many converters might be necessary to convert all media to a house format, for example 1080i, before feeds are recorded and sent to a control room. One factor that makes this a bit easier is that most HD VTRs have downconverted SD outputs for use as needed, and some format agile SD-capable machines have upconverted outputs as well.

That leaves the most likely choice an HD control room from which a center-cut SD program is derived. Several manufacturers have developed production switchers that integrate both SD and HD internally, lessening or removing the need to convert signals before feeding to the production switcher.

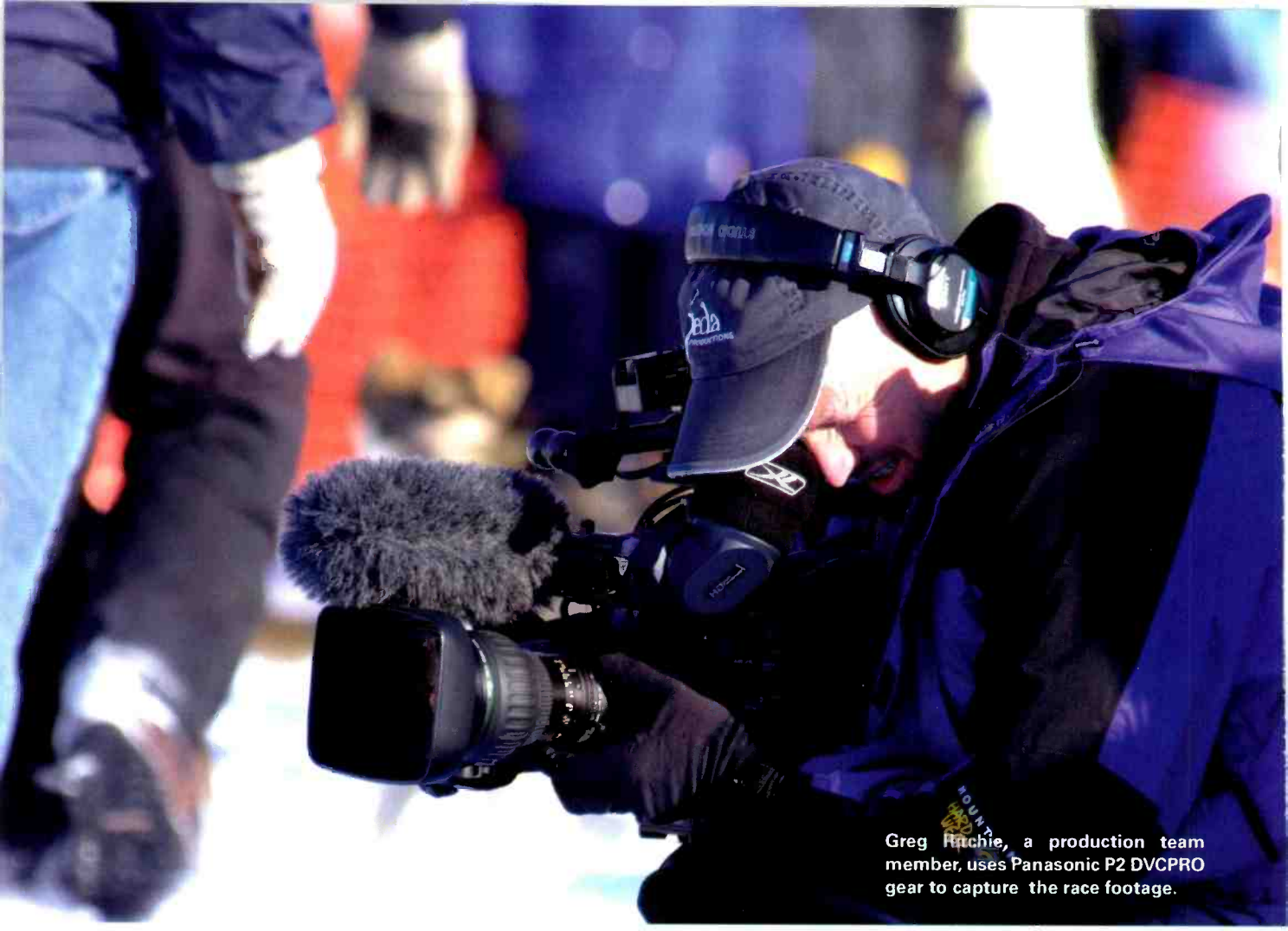
Channel 2, WSB-TV-DT, Atlanta's first DTV facility, transitioned to HD on Sept. 27, 2006. The BDI-designed HD studio played a prominent role in the launch.

Some of these switchers can process both SD and HD simultaneously. This is a powerful workflow feature that removes the need to build a single format facility and leaves flexibility for the production to seamlessly adapt to content that arrives unexpectedly in the wrong format.

In sync

Studio, control room editing can integrate HD and SD. There is no free lunch, even, or perhaps especially, with audio. Digital production switchers, monitor wall multiviewer processors and flat-screen displays all have latency that is not present in audio. This requires considerable care when designing a control room to ensure that the production team sees and hears precisely the right signals, and that sync is carefully maintained before it leaves the control room. Lip sync is the biggest complaint from consumers, and if facilities don't treat it with caution, it will be difficult to address effectively later. BE

John Luff is a broadcast technology consultant.



Greg Ritchie, a production team member, uses Panasonic P2 DVCPRO gear to capture the race footage.

P2 technology captures Iditarod race

BY MICHAEL GROTTICELLI

At the outset, Greg Heister was skeptical about using solid-state recording technology to capture the harsh conditions of the 2007 Iditarod Trail Sled Dog Race. Having been involved with the world-famous 1150mi endurance race on and off for more than 10 years, he'd seen videotape freeze to rotating recording heads, plastic cassettes crack, moving metal parts become brittle and break off, and all sorts of other problems with equipment he was familiar with. In his mind, the Iditarod trail was not the place to test video production gear and new formats.

When the race committee agreed to use Panasonic's P2 DVCPRO gear, Heister was charged with hiring the crews and making it work. As the production supervisor, his goal was to coordinate and produce coverage during the race and later use it to create a compilation DVD that would be sold and distributed to broadcast outlets around the world. In addition, this year's race would be the first time the production crew used HD equipment.

Improved production logistics

The logistics of putting people in place was massive to say the least. The production team consisted of five two-man crews that had all worked on previous outdoor races and were familiar with the cold conditions and with shooting sporting events.

During the 10-day race, five crews traveled along the race trail — three in small airplanes, two on snowmobiles and one in a helicopter with a Wescam mount.

During the 10-day race, five crews traveled along the race trail — three

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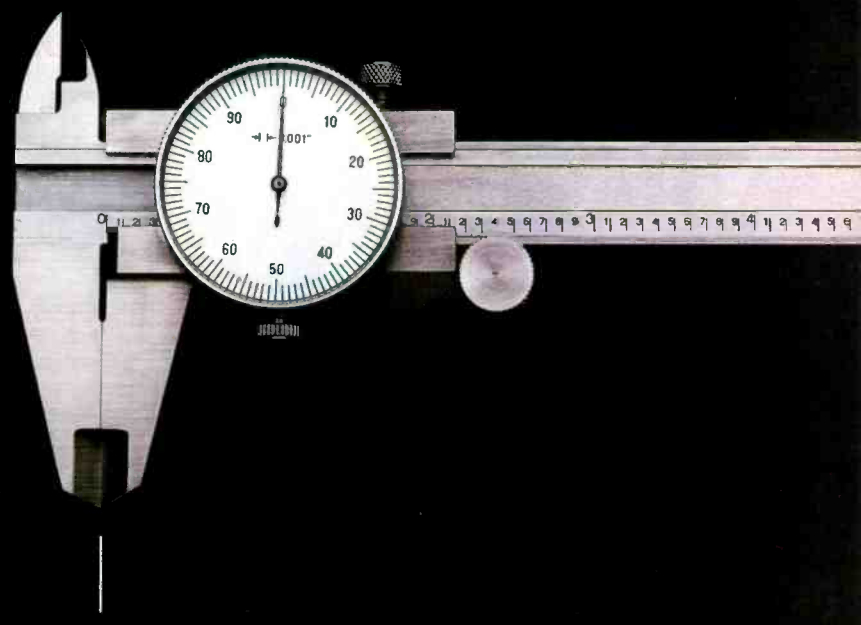

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Production crews captured every last second of the 10-day Alaska Iditarod dog sled race with Panasonic HPX2000 shoulder-mounted camcorders and HVX200 handheld P2 HD cameras. This was the first year the footage was shot with P2 technology and strictly HD gear.

in small airplanes, two on snowmobiles and one in a helicopter with a Wescam mount. Each crew was given a Panasonic HPX2000 shoulder-mounted camcorder as its main camera and an HVX200 handheld P2 HD camcorder for incidental shots.

The HVX200s were initially purchased to use as a backup cameras, but they were never used in that capacity. Instead, they captured close-up interviews and footage at the indoor and outdoor checkpoints. Panasonic's new HPX500 was also used sparingly.

The crews had access to 150 P2 8GB memory cards. The helicopter crew received 50 cards, while each ground crew got 20, which was more than enough to match the crews' need.

The crews shot about five hours each day, then downloaded clips to an Apple MacBook Pro laptop running Final Cut Pro editing software. Some of the footage shot during the day was uploaded to the Internet for public viewing in as little as 20 minutes after it was shot.

Pulling its weight

Solid-state memory aside, the biggest difference for the crews this year was the size and weight of the equipment. Last year, the crews carried large CPU towers for ingesting tape footage, Betacam SP decks and other heavy gear. This year, they used the much lighter P2 cameras, a P2 Mobile portable recorder/player, a MacBook Pro laptop and a GTECH 1TB portable hard drive. The reduced weight made traveling around much easier, so the crews could cover more ground. It also made working in a cramped airplane, helicopter or snowmobile much more manageable.

Along the Iditarod racecourse, there were 20 checkpoints set up for production teams and those participating in the race. Most of the checkpoints had some type of Internet connection. Last year, the crews transported a C-band uplink dish to get footage from remote locations back to the base stations. This year, they were able to use a DSL line, which made things much quicker. They uploaded 20 to 30 clips per day, showing worldwide viewers where the racers were on the course and who was in the lead.

Kevin Bodhi, a member of the Iditarod crew, captures sideline color at the ceremonial start of the race.

The crew never lost a clip on the P2 cards. They learned to "right-protect"

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the cards by moving the little tab to the right to protect the data and avoid overwriting. As soon as an operator removed a card from the camera (each camera holds five cards), the card was right-protected.

Protecting the gear

Due to the harsh conditions, the cameras were protected with Porta Brace thermal vests made specifically for the race. These were used sparingly to transport the cameras into and out of the elements. The camera operators sometimes found it hard to work with the vests in the field because many of the camera buttons and controls were covered up.

Michael Caporale films Kevin Bodhi getting a close-up of the dogs. The crew shot 110 hours of footage in 720p HD at 24fps.

Anton Bauer provided HyTron 140 Li-Ion batteries that enabled up to four hours of run time in the cold weather. By carrying two batteries each, the shooters were able to work continuously without having to change batteries during the course of a day. The company's ElipZ batteries, which mount under the camera, were used with the HVX200 camcorders.

At one point, the cameras were exposed to the elements for five days straight, at -35 degrees and below, and they performed flawlessly. It got so cold that one of the lenses broke off a camera at the lens-mount, because the screws became metal-fatigued and simply crumbled as the camera was being picked up. (And it wasn't a heavy lens.) Yet, the cameras, the cards and the images stored on the P2 cards were not affected by the cold.

In another incident, a producer was juggling P2 cards in and out of a camera. To prevent dropping a card in the snow, she stuck one in her mouth for a second, and it froze to her tongue. The images on the card remained intact.

Despite the low temperatures, 50mph wind gusts and a frozen play/record switch on one of the cameras, overall the equipment performed well. The crew captured 110 hours of stunning footage in 720p HD at 24fps and turned around short segments in less than 20 minutes for viewing on the Internet. This had never been possible with the

tape-based workflow used in previous years.

Training the crew

To ensure that things went smoothly, Panasonic sent five consultants to Anchorage and Nome, AL, prior to the start of the race. The consultants included Art Aldrich, C.R. Caillouet, Michael Caporale, Barry Green and Bernie Mitchell. For two days, they helped train the camera crews on using the P2 cameras and developing a

One of the Iditarod crew members captures footage on the sideline with a Panasonic HPX2000 camcorder.

workflow with the P2 Mobile deck to get clips off the cards and into a computer for editing on Final Cut Pro. Files were stored in the QuickTime format, so the system could immediately recognize the clips and editors could begin working.

Aldrich, who helped set up the Apple/Panasonic workflow, set up systems for his own production (for Panasonic's internal use) with a single 1TB GTECH RAID unit and a Quantum SDLT600A for tape archive. The Iditarod teams used two GTECH units (1TB each) raided together on the Mac laptops for redundancy. Proper management and planning were important to carefully log footage, as was keeping track of individual solid-state cards.

Home free

Heister is now working on a 90-minute HD program, which will be released on DVD later this year. Panasonic is also producing a behind-the-scenes documentary. Heister is cutting on a Mac G5 workstation running Final Cut Pro. The P2 system records video as digital files, so he anticipates his time in post to be about one-third less than in previous years when he worked from videotape.

The 2007 Iditarod race started in Anchorage on March 4, and the winner, Lance Mackey, crossed the finish line in Nome nine days, five hours, eight minutes and 41 seconds later. Images of the race can be viewed at *www.iditarod.com* and *www.panasonic.com/iditarod.* BE

Michael Grotticelli regularly reports on the professional video and broadcast technology industries.

IPTV ADVERTISING: a gold mine for telcos?

BY ROB VAN DEN DAM

New technology is disrupting traditional advertising. In its place new forms of advertising are evolving. Advertising spending in emerging online channels is growing fast. At the 2007 3GSM World Congress, the IBM Institute for Business Value unveiled "A Future in Content(ion)." The report predicted that revenues from in-game, mobile, online and interactive TV promotions will reach $60 billion a year — or 45 percent of the digital content market — by 2010. (See Figure 1 on page 78.)

The emerging advertising channels leave marketers licking their chops. Marketers want more effective ways to optimize their expenditure. This new ad space allows them to target their ads in a highly personal way. The more growth that the targeted personal ad market sees, the less money is available for traditional advertising.

Everyone is fighting for the new media advertising revenue, and telcos are beginning to realize that advertising can become an important source of revenue — an irresistible opportunity.

Telcos' role in advertising

Although telecom operators have little presence in advertising today, advertising represents an emerging opportunity that operators are uniquely positioned to address. They have unique assets that advertisers value. First, they have a large customer base. Due to their authentication, authorization and accounting controls, telcos can determine who the customers are and what services and products they are buying. This proves useful not only for controlling where the ads go, but also for tracking advertising effectiveness.

Telcos have a direct relationship with customers. They collect vast quantities of customer data, which they can use to develop profiles of their subscribers, including demographic characteristics, personal attributes and preferences. Telcos may even have the analytical tools and capabilities to look at their customers' shopping habits and viewing patterns.

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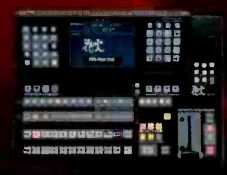

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They can combine these customer insights with their ability to identify where individual users are based and offer highly targeted, localized promotions. Moreover, many operators have already developed solid relationships with local advertisers through their directory businesses.

Telcos are also well placed to enable the advertising experience practically anywhere, on any device and at any time. They can, for example, manage the delivery of ads across the mobile, PC and TV, as well as over fixed, wireless and other networks. What's more, they also provide a direct interactive response channel for the customers and a feedback loop to advertisers to allow them to track advertising performance.

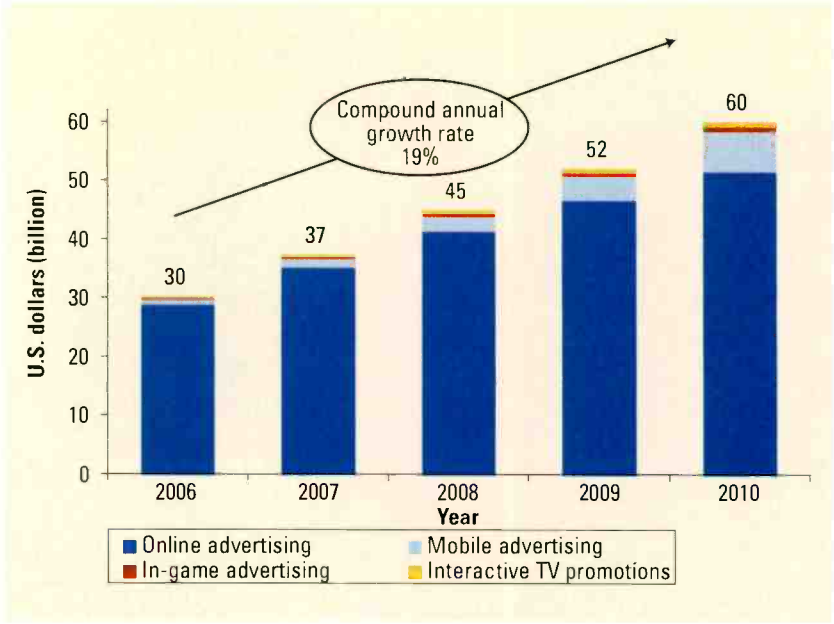


Figure 1. Revenues from emerging channels, such as in-game, mobile and interactive TV promotions, are expected to reach $60 billion a year — or 45 percent of the digital content market — by 2010.

As telcos move into media — an industry that has historically been part funded through advertising — it will find that relying on subscriptions and pay-per-view models will be unsustainable in a world where consumers do not expect to pay for all content. Content is expensive to generate and offer to consumers, and advertising provides a means to offer richer content at a more reasonable cost. Many telcos are therefore experimenting

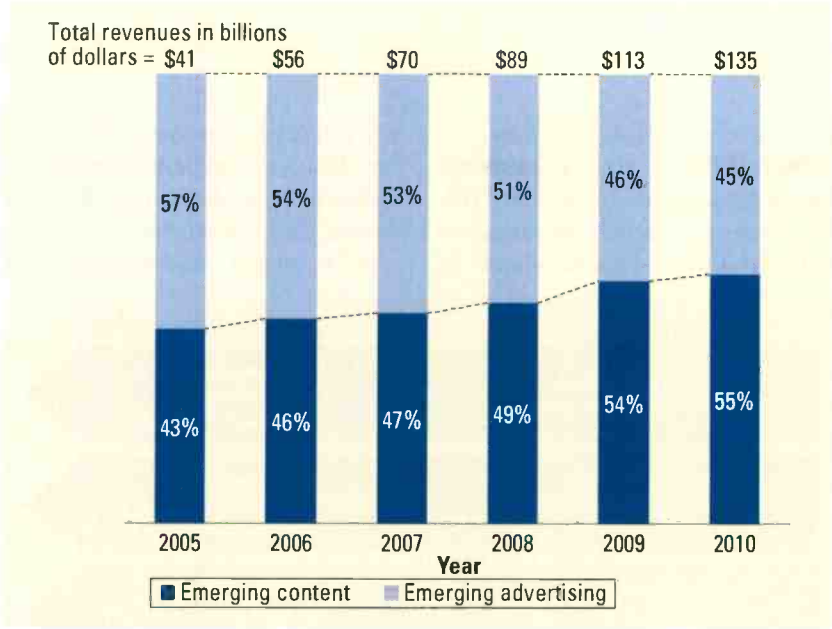


Figure 2. Advertising is expected to be a significant contributor to overall spending in emerging media channels.

with opt-in advertising plans to fund content. Perhaps this is the most significant benefit as it allows consumer access to richer content and media. Advertising may also provide consumers with access to content they previously were unaware of. Several operators have taken steps toward adding advertising on IPTV and cell phones. (See Figure 2.)

IPTV advertising

The bulk of advertising revenue still comes from television, but the traditional TV advertising model is becoming increasingly unsustainable. With the shift from analog to digital broadcasting, the number of TV channels has multiplied, and audiences are becoming more fragmented.

This reduces the efficacy of an approach reliant on centrally scheduled programs to deliver real-time advertising to a large, undifferentiated audience. It results in low effectiveness, as advertisers need to pay for a large audience even if they want to reach a small fraction of the viewers, making TV ads too expensive.

IPTV could provide the answer. IPTV presents the opportunity to combine the powerful brand-building effect of conventional TV-quality advertising with the strengths of online. This enables advertisers to target

specific audiences and allows customers to easily pursue their interest in a product even to the point of purchase. (See Figure 3.)

IPTV is an advertiser's dream. It allows telcos to control where the ads go to, target the large or small groups, or even sets within a household. The ads can be fine-tuned to the people within a household who are most likely to be watching at a certain time.

When watching IPTV, users will be able to freeze the programming in order to interact with any advertising that attracts their attention, submit their details for further information on a brand or in some cases make online purchases. IPTV also provides a means to measure precisely how many people have seen a particular advertisement. Payment models can be geared to actual viewers watching, the number of red button presses, or perhaps a percentage of the sales.

With IPTV, the ways in which ads can be personalized are limitless. Different ads can be generated once an ad has been shown a specific number of times. It gives advertisers the benefit that their ads won't annoy irrelevant audiences or be shown too often and alienate their customers.

IPTV creates new opportunities

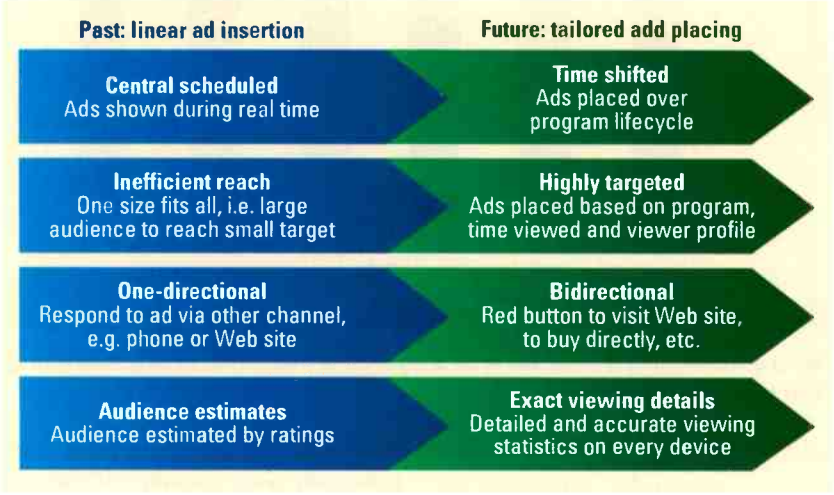


Figure 3. The shift to tailored ad placement. Audiences are fragmented, and some doubt if the traditional cable and TV network advertising models are sustainable.

to diversify ad formats. Ads can be placed when the set-top box boots up, on information screens, as a screensaver, as a buffer when a movie loads or dynamically in the video streams.

The ability to telescope out an advertisement could be possible using a click-through function for the consumer. There is also the possibility of search and recommendation, perhaps in partnership with an Internet search engine.

IPTV could provide a gateway to Internet advertising for sectors traditionally reluctant to embrace the medium. IPTV will attract local companies that would otherwise not have considered TV advertising as an option. Telecom Austria has already explored ultra-local TV advertising in the village of Engerwitzdorf and found out it especially attracted local companies for advertising.

In Europe, the France IPTV market is leading the pack in targeted advertising trials, but IPTV providers in other European countries are also experimenting with advertising. Examples include Telecom Austria and Tiscali TV (formerly known as Homechoice), which runs a dedicated Honda channel in the UK. BT is talking to both brands and agencies about offering (Vision) IPTV advertising.

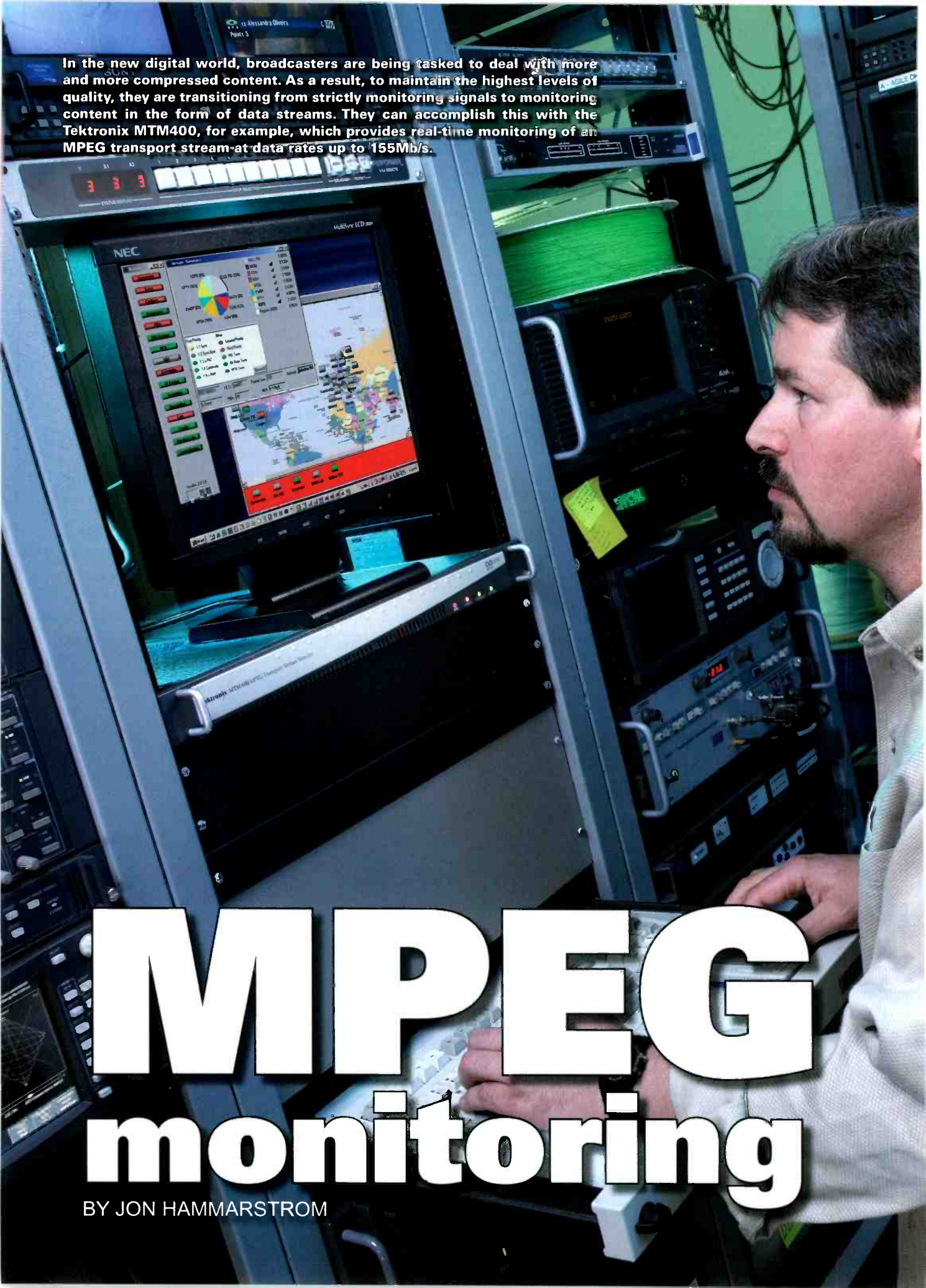
In the United States, Verizon is currently deploying the technical tools that will allow it to insert local ads into its programming. On that foundation, the telco plans to introduce more targeted and interactive ads in its FiOS IPTV service. Although advanced ad deployments are still a ways off, AT&T (with its U-verse IPTV service) also sees the promise of an ad play that combines mobile phones, television and the Internet.

Conclusion

Highly targeted, addressable advertising will significantly increase advertising revenue per viewer while the viewer experience will be more personalized and well received. Several studies have confirmed that subscribers are more likely to respond favorably to advertisements if the topic is of interest to them.

This type of advertising, however, raises the issue of privacy. There are acts in both Europe and the United States to ensure that user-specific data is not used other than for providing the telecommunications service itself. "Opting in" may well be seen as the route to go and prove popular with consumers, as it will give them increasingly relevant ads. Here consumers allow their user-specific data to be used in return for being included in special offers. BE

Rob van den Dam is European Telecommunications Leader for the IBM Institute for Business Value



In the new digital world, broadcasters are being tasked to deal with more and more compressed content. As a result, to maintain the highest levels of quality, they are transitioning from strictly monitoring signals to monitoring content in the form of data streams. They can accomplish this with the Tektronix MTM400, for example, which provides real-time monitoring of an MPEG transport stream at data rates up to 155Mb/s.

MPEG monitoring

BY JON HAMMARSTROM

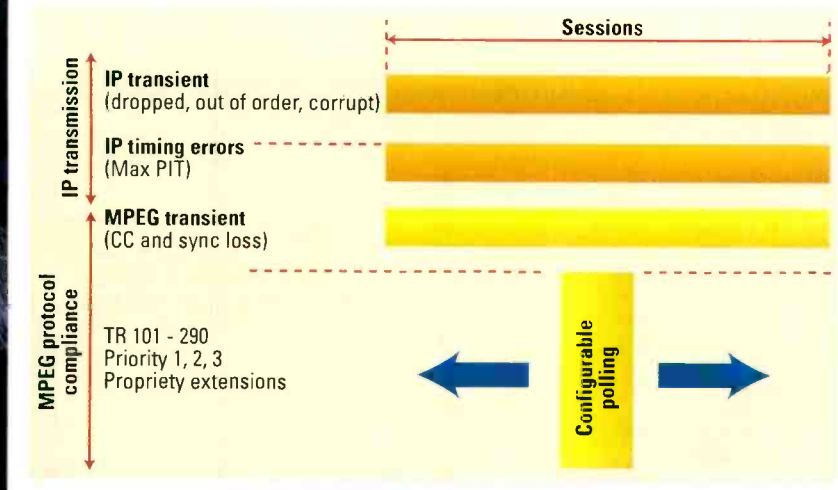


Figure 1. Broad and deep testing scenarios

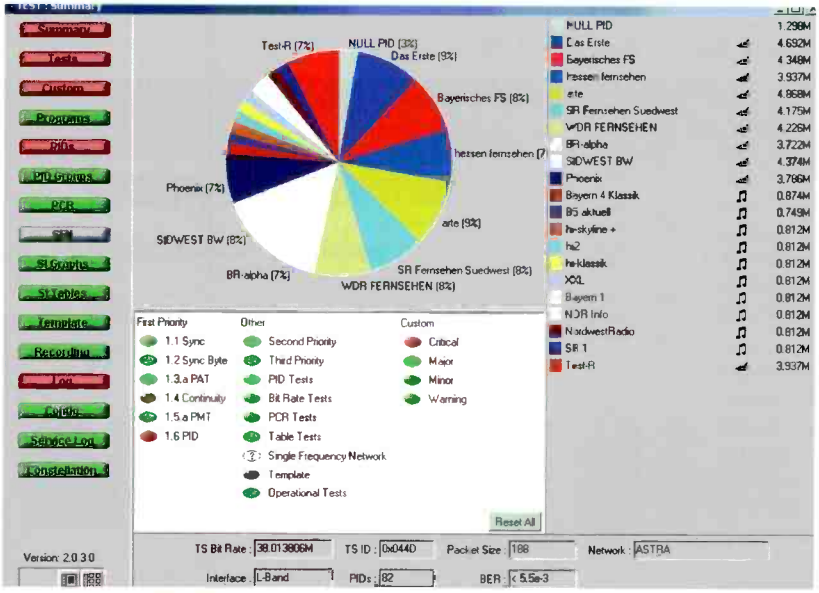


Figure 2. MPEG layer summary screen

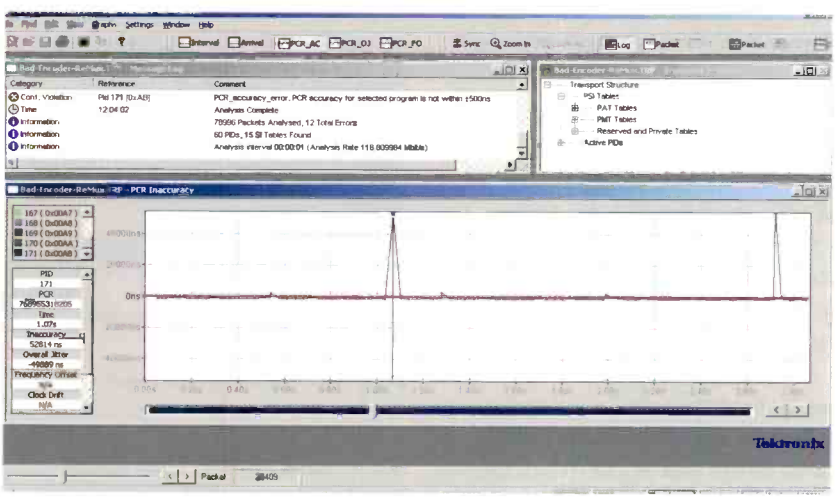


Figure 3. PCR inaccuracy created by faulty encoder

The secret of maintaining reliable, high-quality services over the different digital television transmission systems is to focus on those critical factors that may compromise the integrity of the system. The key is to monitor the right critical parameters with cost-effective test equipment at the right place.

Operators should also strive to detect problems ahead of critical times in order to allow a cost-effective resolution before it becomes an urgent issue to the engineering staff or the viewer. This may mean real-time monitoring with alarms, but it also could involve recording an offending MPEG stream at critical points and analyzing it offline — perhaps many miles away — to get to the root of the problem.

Today a compressed video distribution system may include digital servers for video on demand, carousel and interactive services, and a degree of IP infrastructure. All of these outputs end up on GigE or ATM networks, from which the transmitters draw their stream feed for broadcast. There may also be backhaul and backchannel systems, with some signals and controls even feeding back to the original source servers.

Monitoring equipment, therefore, can be positioned anywhere, even in RF paths. And it must be capable of returning analysis data — and even stream samples themselves — over these intranet/network-type return paths.

In large multichannel environments, operators may require a cost-effective RF and IP monitoring solution with wide monitoring of critical MPEG parameters and deep MPEG analysis of a single program or channel. This supports rapid fault resolution by expanding the monitoring coverage of time-sampled RF channels or IP streams, with the ability to drill down through the RF/IP layer to analyze the MPEG layer in depth.

An MPEG monitor capable of sequential sampling of multiple streams can provide simultaneous monitoring of up to 500 IP sessions for critical

MPEG transport stream errors (e.g. sync and continuity count), IP errors (e.g. lost and out-of-order Real-time Transfer Protocol, or RTP, packets and packet CRC errors) and packet arrival interval limit testing. Transport stream error testing should be undertaken at the packet ID (PID) level and support both multi-program transport streams (MPTS) and single-program transport streams (SPTS). (See Figure 1 on page 83.)

A seamless linkage can exist between IP, RF and MPEG layers when a consistent error log with common time stamps is provided. It must also allow network operators to quickly isolate faults to the RF, IP or MPEG layer.

Critical measurements and strategy

On the MPEG side, there is a vast range of measurements available from monitoring equipment and analyzers. It is important that the test equipment provides a summary screen that can give an at-a-glance view of the most critical and important measurements to focus on. Figure 2 on page 83 shows a moving pie chart of the multiplex occupancy. This enables users to quickly see if a stream is live and decoding. The bit rates and program and service names are important but not critical.

Some monitors and analyzers can be configured to trigger a stream recording to pin down difficult problems. Recording triggers can be assigned to any of the tests, with a pre-trigger buffer to see what led up to the problem. Error logs can help track the frequency and occurrence of the fault condition.

Note the alarm indicators at the base of the summary screen also show the seriousness of the error. ETSI's DVB standard TR 101 290 assists here, grading the stream errors into three priorities:

• *Priority 1.* These errors prevent decodability. They are either packet header errors, such as sync byte or continuity count (which indicate dropped packets), or program mapping errors, such as program allocation table (PAT), program map table (PMT) or missing stream PIDs.

• *Priority 2.* These errors impair decodability and might cause artifacts in the decoded picture or intermittent decoding

• *Priority 3.* These errors indicate a problem at the encoder or multiplexer but do not affect decodability (e.g. table errors that affect the electronic program guide).

Summary screens that can be configured for custom error classification allow users to select particular tests that may be especially critical to their facility. These might be special PIDs involved in conditional access, without

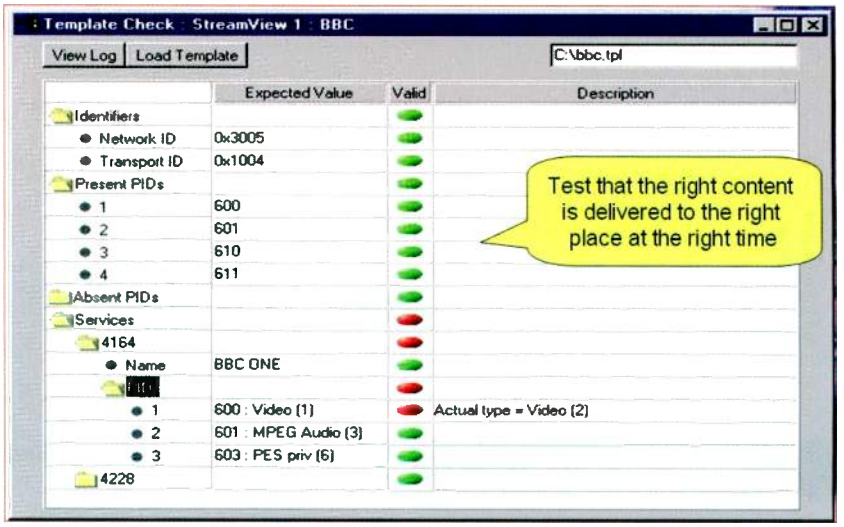


Figure 4. Service plan template

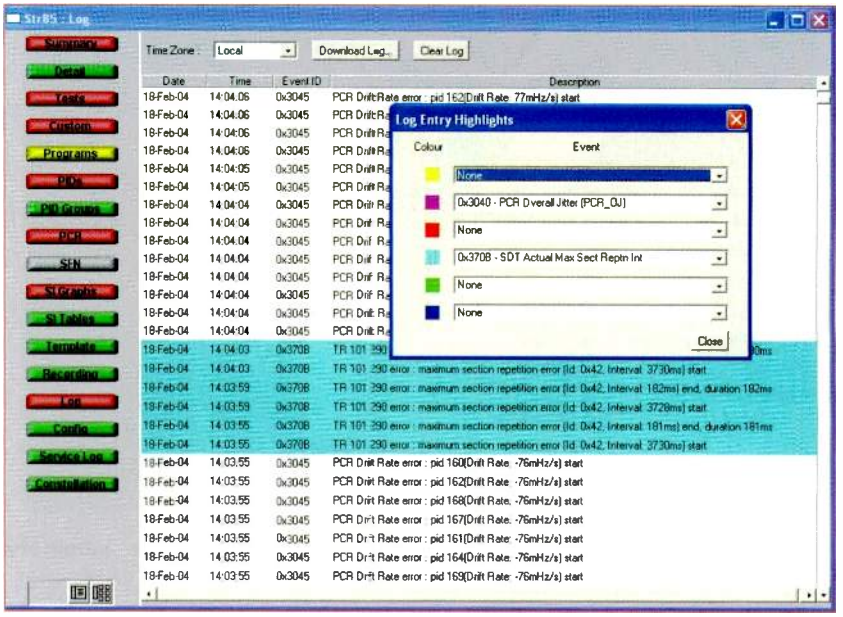


Figure 5. Error logs with highlight

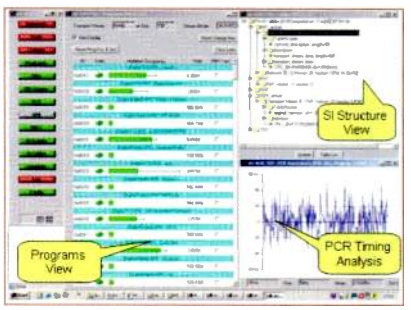


Figure 6. Multiple test view

which viewers can see nothing. Summary screens can add significantly to efficiencies of both the technical and operations teams.

Are PCR measurements critical?

A program clock reference (PCR) enables the MPEG decoder to synchronize to the encoder. The system time clock is locked to the stream PCRs. A 42-bit sample of the sinewave of the system time clock at the encoder indicates to the demultiplexer what the clock's time should be at the decoder when each clock reference is received. Synchronization errors arise if the PCR value generated by the multiplexer is inaccurate, or if it is received late because of network delays, such as jitter.

The STC is used to create color burst and syncs. It is the reference for audio and video decoding and presentation time stamps. Jitter and inaccuracy errors can lead to decoder errors.

PCR errors originate from faulty encoder PCR circuitry, faulty remultiplexer PCR circuitry or failure to seamlessly loop a transport file. PCR jitter can come from an unstable RF demodulator, unstable fiber demultiplexer, ATM network packet jitter or the way MPEG is packetized in IP networks. The buffers in set-top boxes should cope and smooth this, but there may be problems, particularly with large PCR spikes. Figure 3 on page 83 shows evidence of a faulty encoder.

Modern H.264 systems (as in IPTV) may not strictly need PCR, but encoders allow it to be generated, as it is a good indicator of timing integrity (and jitter) of the IP pathway delivery system. Much test equipment has built-in alarms for limit violation to flag the errors, so operators are making sure that PCR is present in its output.

Ensuring that the contents of the transport stream are correct requires the monitoring equipment to have prior knowledge of what broadcasters plan to transmit. One method of achieving this is to enable the broadcaster to identify a small number of key parameters that can be used to verify the contents of the transport stream. These parameters form a service plan, or template, in which the operator enters the values that are expected to be present in the transport stream. The monitoring equipment extracts the actual values from the transport stream and compares them against the template, indicating when a discrepancy occurs.

Ensuring that the contents of the transport stream are correct requires the monitoring equipment to have prior knowledge of what broadcasters plan to transmit.

Plans may vary according to the region and DTV standard. For example, service descriptor table is just one example for DVB, and there are other and similar service information tables for ATSC or Japanese ISDB services.

Figure 4 shows an example template screen. Note that a single simple alarm template error on the summary screen will guide operators to this display, where it is possible to drill down and trace the fault in the transmission. In this case, an incorrect stream type is easily found in the service.

Monitoring equipment also should have the ability to change templates automatically at scheduled times — for example, when service plans change over on regional news insertion. Broadcasters may be asked to verify that local content has been inserted correctly and on time. This can be dealt with by templates as shown here. Legal service level agreements may involve tracking delivery of packets over time to indicate bandwidth delivered.

Most test equipment has error logs. These can make tracking of intermittent errors easier because broadcasters can detect time, date and nature of errors. Error filtering can help because broadcasters can restrict the type of errors logged to just the critical ones, or broadcasters may want to know all the errors, but just highlight and color code the critical ones they are worried about. (See Figure 5.)

Summary

There are basic critical tests that are common across most DTV systems. These are graded into three priorities by ETSI TR 101 290. Monitoring equipment and analyzers should support all three of levels of prioritization and prominently display results in a summary screen.

There are additional tests that, for certain operators, may be most critical to their particular business. For example, cable operators may want to focus on modulation error ratio (MER), but once operators know it's within spec, they will exit the RF layer test menu. Thereafter, they may want to ensure their bit rates are maintained, and appropriate services are being delivered during a given time period. So the template and bit-rate alarms may be their prime concern.

Test equipment that provides alarms and a configurable user interface can contribute significantly to improved operational efficiency. (See Figure 6.) Polling can provide a cost-effective method to achieve broad MPEG, RF or IP measurements and deep MPEG protocol compliance testing across hundreds of channels. BE

Jon Hammarstrom is senior video marketing manager for Tektronix.

Flywheel technology

As spring storms begin, stations should consider this technology as an alternative power system.

BY GARY RACKOW

Continuous power is vital to the broadcast industry. People rely on television and radio in emergency situations, and being off the air as the result of a powerful weather or electrical event can result not only in lost viewers and listeners, but also in lost advertising revenue.

In addition, a sudden loss of power can prove costly in terms of the damage that sensitive broadcast equipment can suffer due to an unexpected hard shutdown. As broadcast engineers continually seek better and more efficient solutions to address this situation, a new twist on an established technology is becoming a serious option when it comes to choosing the best uninterruptible power supply (UPS) solution.

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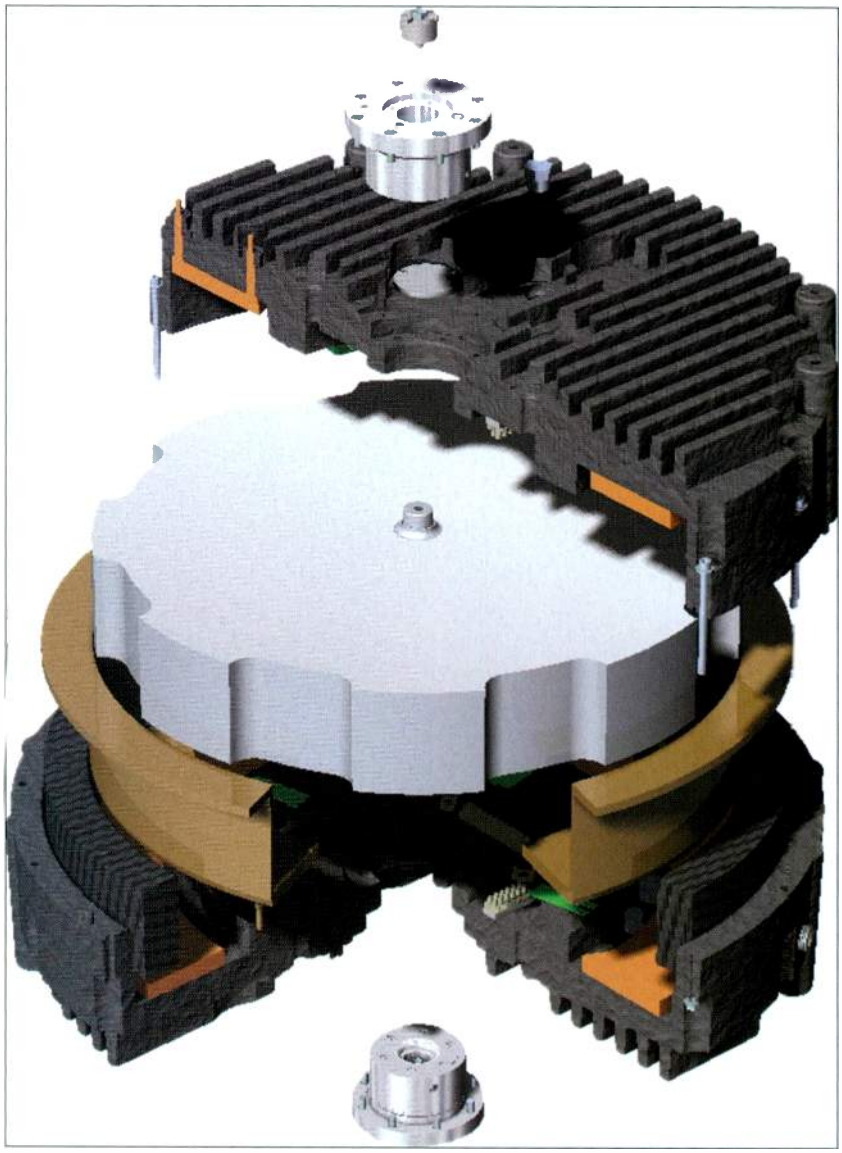
The power gap

On October 17, 1989, the Oakland Athletics were squaring off against the San Francisco Giants in game three of the World Series. Oakland won the first two games, and the Giants were anxious to wrest some momentum back from their bay area rival.

groomed for the most important game of the baseball season, and game time excitement was building. As the players prepared for the game, the broadcast announcers ran through statistics and the various story angles that infuse baseball with its sense of drama.

Suddenly, people began to sense



Active Power introduced the first integrated UPS and DC power system using flywheel motor-generator technology in 1996. The flywheel energy storage system stores kinetic energy, energy produced by motion, by constantly spinning a compact rotor (shown in white above) in a low-friction environment.

As game time approached, the weather was beautiful. It was a typical Northern California afternoon, the diamond was meticulously

that something was wrong. The earth began to vibrate, and the fans assembling in the stadium became uneasy. Within moments, it was

clear that nature was intervening in America's pastime and that this was a significant event. Al Michaels, the ABC Sports play-by-play commentator, addressed the audience with the following: "I'll tell you what; we're having an earth..." Michaels' commentary was cut short due to a power failure. ABC quickly had the power up and running and began broadcasting news coverage of the unfolding seismic events.

Michaels' words were lost in a "power gap," the space between full power and backup power caused by the temporary interruption of power flow. The interruption can last for milliseconds, seconds or even a matter of minutes, but it can be disproportionably costly to broadcasters. With the sensitive electronic equipment now in use in almost every facet of broadcasting, even the slightest interruption of power, or the provision of poor quality power, can cause capital loss and mounting difficulties for engineers.

Historically, batteries have been the primary energy storage medium for UPS systems, but increasingly the broadcast industry is turning to UPS systems using flywheel technology. This change is occurring because flywheel technology has proven to be more reliable, more cost-effective and a more environmentally sound alternative to traditional lead-acid battery-based systems.

UPS systems meeting power grid challenges

According to a report created by the North American Electric Reliability Council, over the next 10 years, the demand for electricity is expected to increase 19 percent, while power generation will only grow by 6 percent. This alone points to the potential forces working against broadcasters who face considerable challenges and cost in maintaining continuous power for their operations. Power grid infrastructure shortcomings, coupled with erratic weather conditions, power surges

and brownouts, are all serious sources of concern for broadcasters.

Fortunately, UPS systems are easily justified in studio broadcast applications that cannot tolerate any interruptions, including maintenance interruptions that are scheduled in advance. In these situations, the cost of the UPS system is usually a small part of the total infrastructure cost and the potential loss in revenue due to the interruption in program transmission.

Flywheel-based UPS systems are financially attractive to a wide range of broadcasting studios and transmitters sites. They can:

- reduce maintenance costs, particularly those related to batteries;
- reduce additional utility costs that result from UPS system efficiency losses;
- handle crowbar events and keep the transmitter protected; and
- improve UPS system reliability.

Maintenance and utility costs

Valve-regulated lead-acid (VRLA) batteries are commonly used at all UPS power levels. They are the predominant UPS battery used in studio operations because they cost less and require less space than conventional vented lead-acid batteries (wet cells).

Batteries, particularly VRLA batteries, are recognized as being the highest failure component of UPS systems. For a typical 240-cell battery system, one would expect a few batteries to fail in the first couple of years and then about 50 or more to fail in each of the next two years.

VRLA batteries predominantly fail in open circuits, so any single-cell failure results in failure of the entire battery system. Therefore, the mean time between failures of the entire battery system will be measured in months or weeks rather than years.

Additionally, batteries leak, are toxic and must be disposed of in a costly and environmentally sound way. Thus, eliminating batteries greatly improves overall reliability, and at the same time, eliminates the costs associated with battery maintenance and replacement.

Some flywheel UPS systems use a line-interactive design that makes them much more efficient than conventional double-conversion, battery-based UPS systems. As a result, utility costs resulting from UPS system efficiency losses are lower.

UPS systems designed with integrated flywheel energy storage can achieve efficiencies of 98 percent compared with 93 percent or 94 percent for conventional battery-based UPS system. In the 1000 kVA size range, such as at large transmitter sites, the difference can easily amount to an annual energy savings of $18,000 to $20,000. In addition to the electrical characteristics, the smaller space requirements and wider operating temperature range of flywheel UPS systems make them easier and less costly to retrofit and install.

Most flywheels have a design life of 20 years or more, so replacement costs are nonrelevant.

Operating costs

A UPS system's operating costs can vary significantly, depending on the energy storage chosen. Annual operating costs for a 900-kVA flywheel UPS system will amount to about $29,000, assuming an electricity cost of seven cents per kilowatt-hour. Battery-based UPS system operating costs vary between $51,000 in years when battery replacements are minimal, to about $105,000 in years when full battery system replacements are required.

In most cases, conventional UPS systems have not been able to meet the technical or financial criteria required to justify capital expenditures in broadcast transmitting environments. There are several reasons for this.

First, the total cost of the UPS system installation, including facility modifications to create a suitable environment for the batteries, has been too high, even when the cost of UPS equipment alone is well within required capital cost limits.

Second, UPS system maintenance costs, including those resulting from the ongoing costs of scheduled and unscheduled battery replacements, significantly increase annual operating expenditures. By comparison, most flywheels have a design life of 20 years or more, so replacement costs are nonrelevant. Utility costs increase due to electrical loss of the UPS equipment.

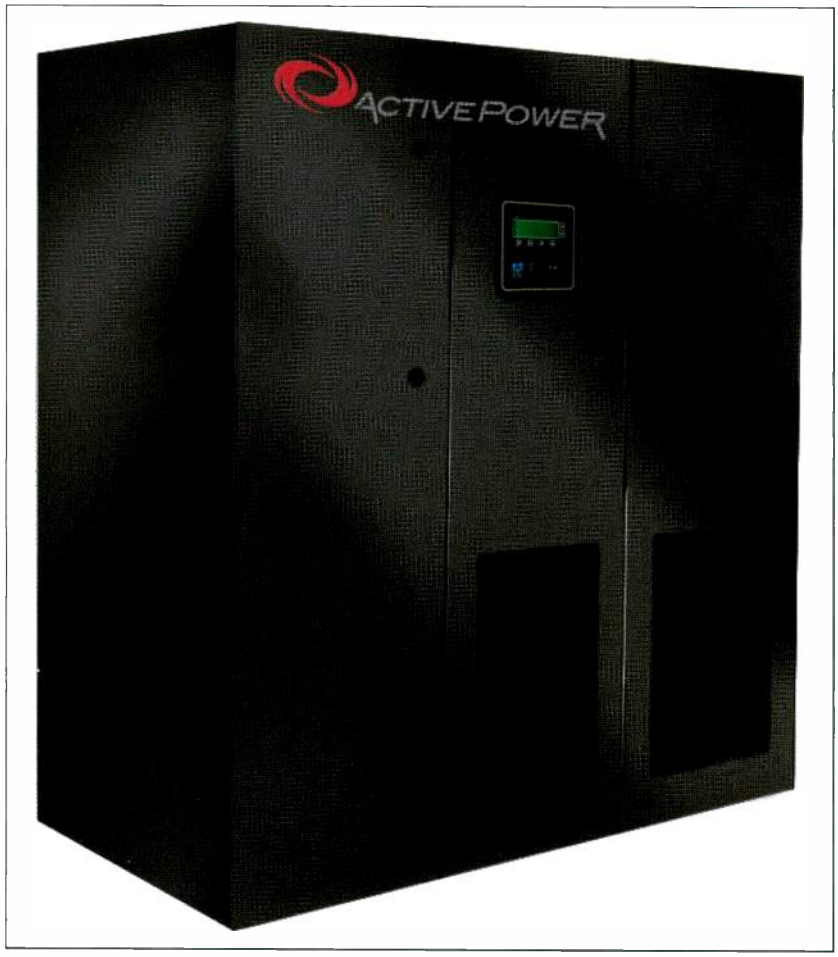
Finally, the possibility of transmission interruptions due to crowbar events offsets any upfront financial advantages held by traditional UPS systems. A crowbar event is the automatic shutdown method used in high-power transmitters as a safety circuit. The shutdown protects the transmitter amplifier tube or the inductive output tube (IOT) in the event of an arc-over inside the IOT. The function of the crowbar is to remove the high voltage from the amplifier as quickly as possible, typically within a few microseconds of the detected problem. The crowbar circuit shorts out the high-voltage DC power supply to the IOT for a brief period of time, often in the range of several milliseconds.

This function is typically performed with a device called a thyratron, which is a gas-filled tube that is similar in construction to a vacuum tube. The thyratron is connected directly across the high-voltage DC supply. It is a fast, high-voltage switch, comparable to a silicon-controlled rectifier but with much higher voltage ratings and

speed. When a problem is detected in the amplifier, the crowbar acts quickly. Otherwise, the IOT would be destroyed, resulting in significant capital expense. The crowbar action produces a current of several thousand amps on the AC input of the high-voltage supply and, therefore, on the output of the UPS system supplying the transmitter.

The event is equivalent to a short-circuit applied directly to the output of the UPS system, which can draw up to 20 times rated current. Assuming the input power supply to the transmitter can supply the large current that is demanded, the action of the crowbar does no harm to the transmitting equipment and after a few seconds, the high-voltage supply returns to normal.

In the event of an overload from a crowbar event, an integrated flywheel-based UPS system switches to bypass in order to help supply the desired current from the lowest impedance source, and it does so without disturbing the operation of other transmitters on the same circuit.



Active Power's CleanSource UPS systems provide efficient, reliable and green critical power. The line has more than 27 million hours of run time in applications around the world, operating at up to 98 percent efficiency.

Transmitter protection

The architecture of an integrated, line-interactive flywheel-based UPS system is designed to handle overloads and large step loads that could disrupt studio transmissions or crowbar events that are inherent to transmitter sites.

Other typical power events are easily taken care of with the flywheel UPS design. Two examples of these types of installations are given below — Telemundo and the Christian Television Network.

Telemundo

Telemundo's KVEA-TV in Los Angeles, CA, knew that the slightest power disturbance could cause interruptions in studio transmission of programming and possible loss of views in a competitive Spanish-speaking market. As the fastest growing network in the country, Telemundo Communications Group wanted an expandable power quality system that could provide maximum protection for the station's sensitive digital equipment while withstanding the existing environmental conditions in the switchgear control room. Legacy battery-based systems could not tolerate the environmental requirements due to the need for constant battery cooling.

The station satisfied its requirements with an integrated flywheel UPS system along with a generator set inside an outdoor enclosure that includes a base tank. KVEA is now assured critical load protection from all IEEE 587 power anomalies — from transients to long-term outages — without disruption to the studio's production.

After its first flywheel UPS system successfully protected the critical load from numerous utility disturbances, Telemundo placed additional flywheel UPS systems across the country. As a result, when the network needed uninterruptible power to protect multiple transmitters at the top of the Empire State Building, two flywheel UPS systems were the obvious choice, due to their efficiency, space savings and environmental benefits.

Christian Television Network

When evaluating a UPS system for broadcast applications, one factor to consider is programming loss. The

costs of replacing transmitter tubes, operational efficiency and maintenance are important factors in operational efficiency and budgets.

When Christian Television Network's (CTN) chief engineer needed UPS systems for the network's transmitters, he recalled working with another station that had a large, battery-based UPS system for its transmitters. He remembered that batteries caused problems, so he steered his acquisition efforts toward flywheels.

All of CTN's transmitters are high-current devices with voltages in excess of 20kV. This was key in driving the network's capital expenditures for its UPS system. CTN's transmitters put out 60kW of power, 24 hours a day. A power interruption shuts off the transmitter and stops cooling water flow. This is a nonstandard shut down that dramatically shortens tube life. The various tubes that CTN uses to power its equipment cost anywhere from under $30,000 to more than $40,000, so the initial cost of a midpower flywheel UPS system can potentially pay for the costs incurred in just one outage, in addition to the constant savings due to low maintenance and efficient operations.

The network, which has a potential audience of more than 15 million viewers, has several flywheel UPS systems installed at different transmitter sites throughout the Southeastern United States. At a site near Tampa, crowbar testing was performed on the output of one of its flywheel UPS systems. This transmission site has a primary 60kW analog transmitter. A backup 30kW transmitter shares the output of the UPS system with a new 65kW digital transmitter equipped with a crowbar circuit.

The UPS system was tested several times in order to view the response of the system during a digital transmitter crowbar event. The current delivered by the UPS system during the crowbar test peaked at 3000 to 4000 amps, varying due to the position of the voltage sine wave when the crowbar fired.

In one of the crowbar tests, the UPS system only discharged for a short period and did not have to go to bypass. In five of the six crowbar tests, the system went to bypass via static bypass switch and displayed a warning message due to the severe step load.

UPS systems based on flywheel technology are inherently more reliable than battery-based systems, particularly in broadcast applications, where they can handle crowbar events effectively.

The UPS system then returned to normal online operation within a few seconds. The UPS system is configured so that if this same warning message occurs more than once per hour, the system will remain in bypass mode and will require an operator to reset it. Additionally, an external contact signal from a delay relay may be used to automatically return the UPS system to online operation if multiple crowbar events are expected within one hour.

The other transmitter at CTN's site, which was connected to the output of the UPS system, stayed on the air without a glitch during all of the crowbar tests. This is partly because the UPS static bypass switch allows transfer to the bypass source without affecting downstream equipment; otherwise, the critical loads could be subject to power disturbance during the event. The crowbar test at CTN's transmitter site indicates that flywheel-based UPS systems perform exceptionally well under extreme conditions and deliver stable, uninterrupted power to sensitive loads — even during severe transient conditions.

The future of flywheel technology

These two examples illustrate some of the common power supply experiences of broadcast stations and the compelling benefits of flywheel-based UPS systems. There is little question that the provision of high-quality, uninterrupted power for broadcast facilities will be a continued source of concern for broadcast engineers for the foreseeable future.

In the absence of alternatives, batteries have been the prevailing energy storage solution for decades, but UPS systems based on flywheel technologies have been proven, are more widely adopted today and offer many advantages. These sysetms are inherently more reliable than battery-based systems, particularly in broadcast applications, where they handle crowbar events effectively.

They also cost less over the life of the system, due principally to the lower installation and maintenance costs and reduced utility costs that result from UPS system efficiency losses. They are an environmentally friendly solution, which makes them easier to manage and ideal for transmission sites.

In short, flywheel UPS systems help broadcasters stay on-air and maintain a competitive edge in a world of increasing power challenges and proliferating sources for news and entertainment. BE

Gary Rackow is vice president of sales for the Americas at Active Power.

The evolution o

The broadcast industry is reaching a milestone in the evolution of digital technology. First, there were individual digital applications, usually at the high end of post production. From there, broadcasters used digital acquisition, editing and manipulation, albeit often using proprietary formats and interconnecting through SDI — a dedicated video-style interface. Now, the industry is finally recognizing digital video and audio files for what they are — data.

As a succession of ones and zeros, they are identical to any other data in any other computer application. We need to treat them as such. Think about how it would affect your work if you applied this exclusionary attitude to all data. What if your spreadsheets needed to run on separate computers, networks and servers from your e-mail, or your documents in Microsoft Word needed to be decoded to raw ASCII before they could be passed on to someone else? This would clearly be unacceptable.

But it happens in most broadcast environments today. If, for example, you have a file in a Grass Valley server and you want to get it into an Avid editor, you have to decompress the file to SDI, pass it over a real-time connection and then encode it into the new format. It is only now that the barriers are being broken down and open standards allow ready interconnection.

The purpose of this article is not to talk about these open standards and file interchanges, but to look at what happens when open transfers become possible. Once you have a facilitywide system that can exchange digital files as data, with each broadcast application being able to share common content, then the logical step is to provide a central store for that content.

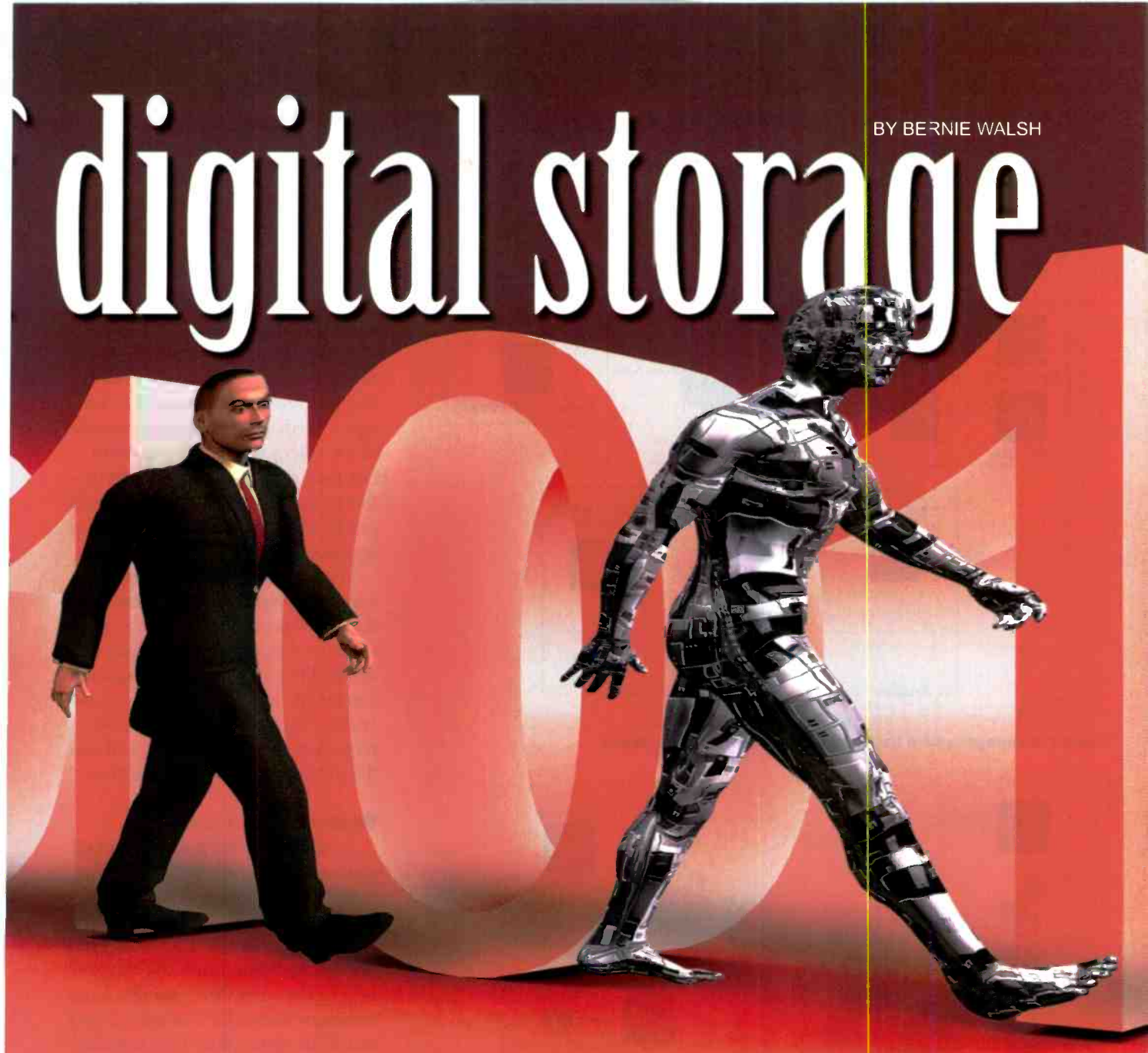
Layered storage

The traditional IT approach to centralized storage is to create a hierarchical view of the system that includes:

- *online* — expensive spinning disks with high throughput for immediate delivery of data;
- *nearline* — less expensive spinning disks that can move content to the online server quickly when required;

digital storage

BY BERNIE WALSH



• *archive* — a tape or optical disk library system that takes content from the nearline disks when capacity is an issue; and
• *offline* — shelved storage of tapes or optical media when the archive system is full.

From top to bottom, those four levels decrease in convenience and access speed but also decrease in cost. (See Figure 1.) The art of the system designer is to achieve the right capacity at each stage to meet the service level requirements at the minimum cost.

Broadly speaking, this is a good way to visualize the overall structure of a video content storage management system. That is not to say, however, that a standard IT storage management system will meet broadcast requirements. Television has specific demands to consider.

First, some applications have higher priorities than others. Most obviously, playout has to be at the top. If the

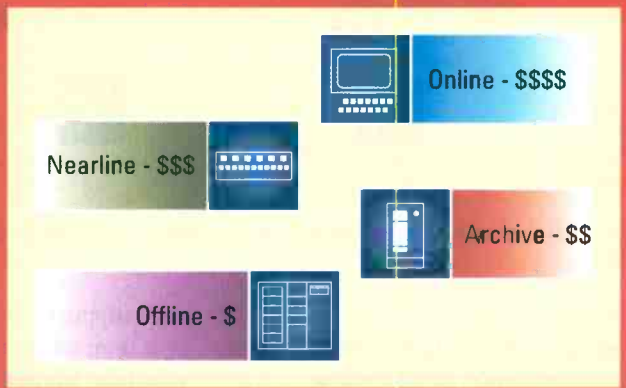


Figure 1. Storage has a hierarchy of performance and cost. Tapes on shelves may cost less but need manual handling.

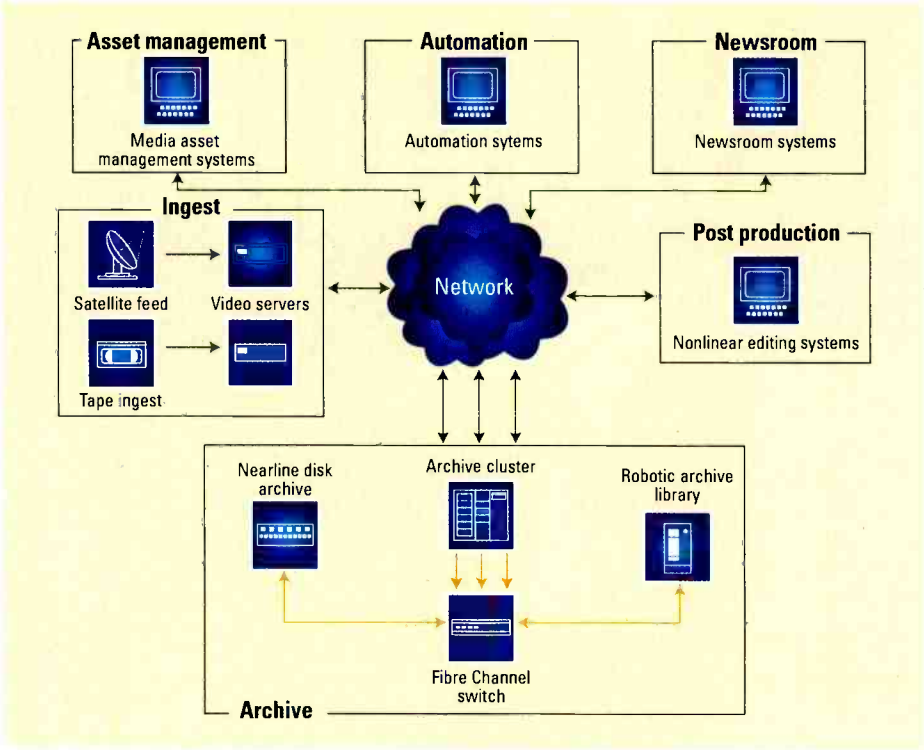


Figure 2. A storage system has to serve many different user types.

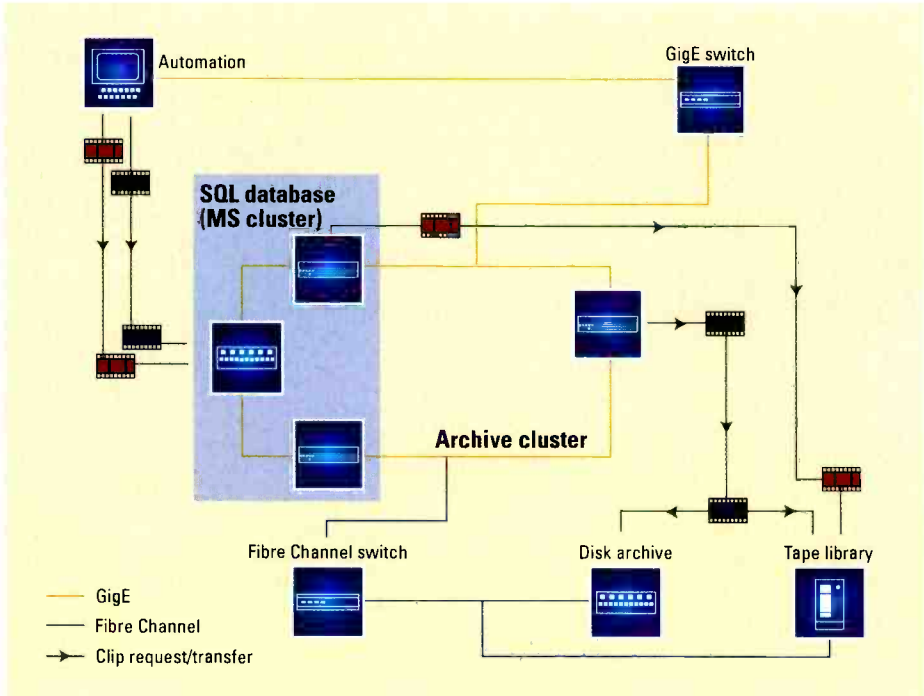


Figure 3. A clustered architecture can provide significant benefits in operational flexibility and resilience.

content is not available on the playout server at its scheduled time, it's not an inconvenience; it is a disaster.

Second, the storage management system has to be transparent to the users it supports. (See Figure 2.) Whether it is an editor in an Avid suite or a scheduler preparing the final playout rundown, users simply need to ask for content and be confident that it will be delivered, where they need it, when they need it. Users should not need to worry about where their content is within the central storage or about the mechanics of how it gets to where they want it.

Third, the rules concerning how and when content is moved between levels of storage are much more complicated than how recently it has been used. For example, every broadcaster has content it needs to be able to air instantly in an emergency, but this content is not used on a regular basis. Alternatively, content that was used recently can be archived (a news story that has reached its conclusion, for example).

The critical issue is to design a system that is based on the business and the service levels you require. A guarantee of five nines (99.999 percent) availability means designing resilience, bandwidth and throughput into the system. Through this, you can determine your service level agreement and the consequent return on investment.

System architecture

As already noted, a central storage system will normally be spread across multiple layers. The broadcast application itself (editor or playout server, for example) will have its own local storage. In some products, this will be a buffer store (the local disk on a nonlinear editor, for example). Other broadcast applications have sufficient capacity and their own network capabilities to provide what is, in effect, an online server.

Because it has to look like a single system to the applications, the temptation is to design the storage management with a single server to manage it. In servers, broadcasters have three key needs:

- the ability to expand the content storage network, both in terms of connectivity to delivery applications from broadcast to Web and mobile and in terms of storage capacity itself;
- a guarantee that the data throughput will meet current requirements and grow as the network expands; and
- security, in that the system will be

TV Broadcast and Satellite

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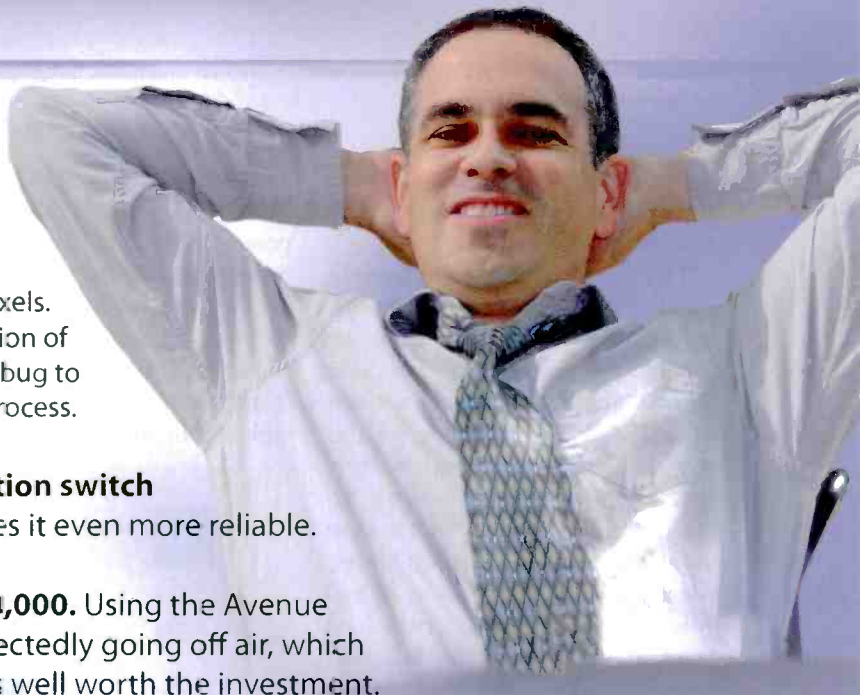
Superior circuitry detects black levels, TRS, audio presence, freeze and EDH for HD or SD signals. For ASI signals PIDs are evaluated. You set the parameters for when a switch occurs. You might decide 10 seconds of signal below 12 IRE or 14 seconds of no embedded audio should cause a switch to the secondary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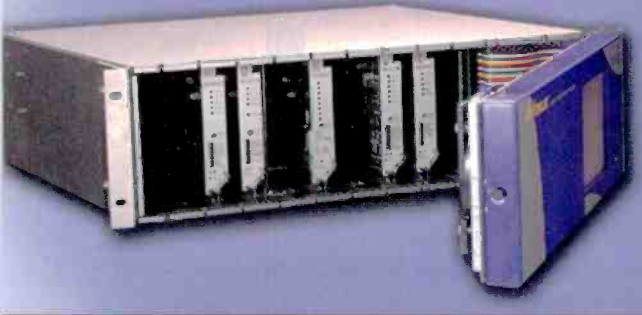

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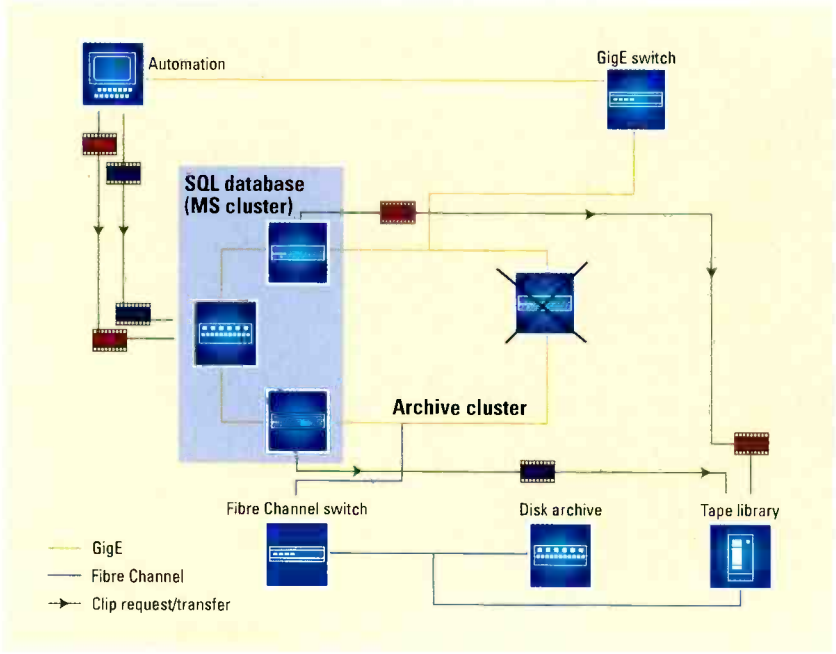

Figure 4. In a clustered architecture, a service runs on one node, but any other node can take over that role.

highly resilient to failure and that the data itself will be protected by redundancy.

It is only by understanding these issues and the need to meet them that you can make sensible decisions on systems architecture. In particular, I believe that this rules out a single server architecture, as there are distinct limitations under each of these three key headings that severely restrict the ability of the system to meet real-world requirements. At worst, it is a single point of failure; at best — with mirrored single servers — it demands operator response to initiate manual processes in the event of failure. A clustered architecture provides significant benefits in operational flexibility, resilience and, ultimately, cost of ownership.

Cluster for resilience

In a clustered solution, every server is physically identical (typically HP DL380 servers or equivalent), and each runs Windows and Microsoft SQL. (See Figure 3 on page 94.) Identical hardware and operating software makes for simple maintenance. A typical installation will be comprised of a database (consisting of two or more servers) and a number of servers comprising the cluster (also referred to as nodes). Certain essential services run on only one node at a time, though they are installed on all servers.

Because every server is identical, it makes sense for each to be loaded with exactly the same set of software. That gives the potential for any physical piece of hardware to instantly take up the task of any logical device or service. (See Figure 4.)

Content prioritization

Another critical element for the success of the system is prioritization of content. Again, there are specific requirements that cause this to be more than just a simple list. Some tasks will take longer than others. Obviously, moving a two-hour movie will take longer than a 30-second commercial. But a well-designed storage management system should allow for partial restore.

For example, a story could be cut using browse resolution copies and only the selects and handles from the EDL that needs to be transferred to the online conformer. If the material is on tape, then it will take time to spool to each clip.

Priority setting is also an issue. Some tasks will be regarded as more important than others. Loading material into the playout server for immediate transmission is an obvious example. Requests for archive material into the news editing environment are often urgent. There is also the issue of managing resources to best

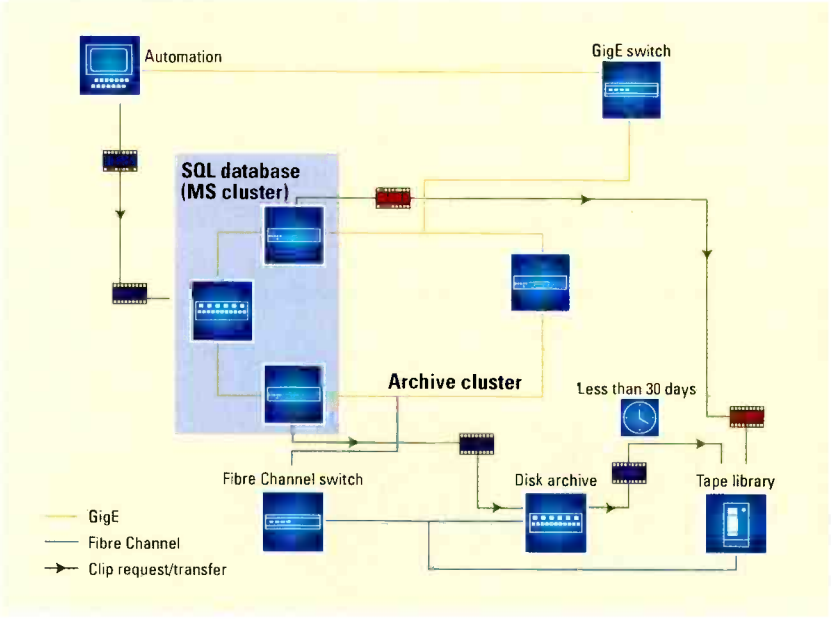

Figure 5. On the nearline storage, two tape copies of a file can be stored — one in a robot and the other in a secure vault.

SGL's FlashNet manages content across a hierarchy of media formats from disk to data tape.

effect. By its nature, tape storage works best when reading or writing at its maximum data rate.

Content lifecycle management

It is worth emphasizing once again that a well-designed central storage system should be invisible to the day-to-day user by complementing the broadcast application. With valuable content now routinely delivered to broadcasters as files over IP circuits rather than on videotape, secure storage of that content is increasingly important. A common request that can be set up using lifecycle rules is to store the content on nearline disks, even if it is to be played soon, and to make two tape backups. (See Figure 5.) One of the tapes is retained in the archive, and the other is delivered to secure storage.

The largest broadcasters and playout facilities have disaster recovery sites. These alternative playout centers are at remote locations and can take over if an event takes the main facility out of action. The content storage system should have the ability to communicate with the disaster recovery site to minimize time off-air should there be a need to go to the backup.

Deleting content

Another important field that is governed by the rules of content lifecycle management is how you handle deleted content. Material might be deleted for a number of reasons. Bought-in programming will be licensed for a certain number of transmissions, and the contract with the producer may even specify that the recording must be wiped at the end of the license period.

In news, there may be a requirement to keep all raw footage for a short while. After that, you might want to archive only the cut stories, or the selected takes, EDL and voiceover as separate linked files.

The automation or asset management system may delete the content from its database, but it is only when it is wiped from the central storage system that it actually disappears. When it is wiped, it leaves empty space, which can be used for new content. A new piece of content is unlikely to match the size of the hole left by a deleted piece of content, so the space needs to be managed. Today's disk systems have sufficient power to cope with fragmented files and will manage their storage accordingly.

Content preservation

One new application is content preservation. Major broadcasters and content producers have a large back catalog of programs, which exist as tape or film on shelves. The tapes may be in formats that are hard to replay. The content may well be physically deteriorating.

The owner needs to secure the content for future use; however, the owner may not be in a position to implement a full-scale asset management system at this stage, for logistical or cost reasons. A simple way of storing the content and capturing the basic information is required.

Data exchange

The ultimate benefit of digital television is that all content is handled as data, readily available and exchanged between multiple content delivery systems without the restrictions of a limited number of real-time video paths. Data can be moved faster than real time across Gigabit Ethernet or Fibre Channel networks, or it can be handed off to remote disaster recovery sites at slower than real time. An organization can create a storage and archive infrastructure that precisely meets its operational and business needs.

The goal is to make all this possible without the bottlenecks in workflow that compromise content delivery to critical on-air applications or risk valuable content. A central storage management system developed with these specific requirements in mind cannot be based on a conventional IT approach.

Broadcasters typically cannot tolerate any down time and its consequent loss of revenue. It is, therefore, vital that the central storage system have failover architecture that is fully automated, fast, integrated with the management software and designed in from day one. That can only be achieved with a clustered architecture. It also allows for planned maintenance and system expansion, with the same availability as far as broadcast applications are concerned. BE

Bernie Walsh is the marketing director for SGL.

Scopus' DPI system

The IVG-7500 Intelligent Video Splicer offers comprehensive ad insertion.

BY MICHAEL ACER

Local ad insertion has long been a method used by television networks and service providers to supplement revenues. It allows them to combine national programming with local advertising, thus profiting from airing commercials for local businesses.

The growth of digital television content via satellite and cable transmission has brought about the need for ad insertion into digital programs. Digital program insertion can enhance the potential for additional income if done effectively. On top of performing ad insertion, digital program insertion allows network operators to switch programs seamlessly, as in moving from a national feed to a local feed, for example.

Digital satellite and cable systems deliver an ever-growing number of channels to their viewers. Increasingly, this content is compressed and sent to digital set-top boxes (STBs) in homes.

These systems require broadcasters to use digital turnaround solutions, which remove a digital program from a national source and add it to a multichannel, digital multiplexed stream — digital in to digital out. Digital turnaround-based systems can benefit from using digital program insertion (DPI).

Scopus' IVG-7500 Intelligent Video Splicer provides ad insertion, rate shaping and grooming capabilities for digital simulcast network architectures.

Ad insertion techniques

Ad insertion products are comprehensive systems that integrate several different components including storage devices, a compression system, scheduling programs, distribution networks and a switcher/splicer. (See Figure 1.)

Storage is the central component in an ad insertion system. Ads are stored in videotape banks in analog format or in video servers in digital form after being compressed using, for example, the MPEG standard. The server receives new programming and advertising content from such sources as tapes, encoders, compressed files on DVDs, or from the distribution network.

The digital compression system consists of encoders that compress the ads to high-quality constant bit rate (CBR) MPEG files for storage and playback. Scheduling systems create the time controls for the ad or clip database, arrange the ads on the server, build ad packages, and remap the outputs from the video server. Billing and management functions may also be included with scheduling. Contribution is performed through the master headend by file transfer over an existing network. This process is necessary for distributing the compressed ads or programs to several sites.

When both the original program and stored ads are in analog TV format, a standard switch can function as

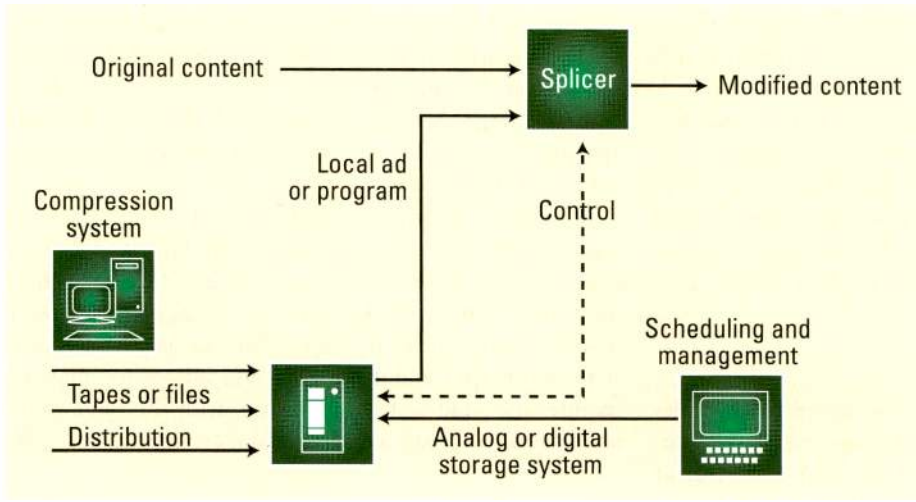

Figure 1. Basic ad insertion system

the splicer. Selecting between the incoming program and the stored ads is predetermined. The switch becomes a multiplexing unit with splicing capabilities for digital TV services. The splicing of MPEG streams allows local ads to be inserted into digital programming seamlessly and assures smooth and uninterrupted delivery of the content.

Analog ad insertion

Original ad insertion systems operated solely on analog programs and ads. National feeds would sometimes include gaps into which local ads were to be dubbed. The splicer would switch, at predetermined times, from the national content to local ads or programming. Automated analog playout systems included cue tones in the original content, such as a movie, to indicate the points of insertion for ads. These audio cue tones were used to trigger insertion into the network feed with a video switch.

When television networks and service providers started transmitting digital compressed programming, local content insertion still used analog methods. In the analog workflow, incoming MPEG-2 content is decoded back to analog formats (NTSC, PAL).

The local content, if stored digitally, is also converted to analog and inserted into the output stream. Systems that transmit digital content to the user's home would require that the modified program be encoded again to MPEG. Most ad insertion solutions available today use analog insertion techniques. (See Figure 2.)

The splicing of MPEG streams allows local ads to be inserted into digital programming seamlessly.

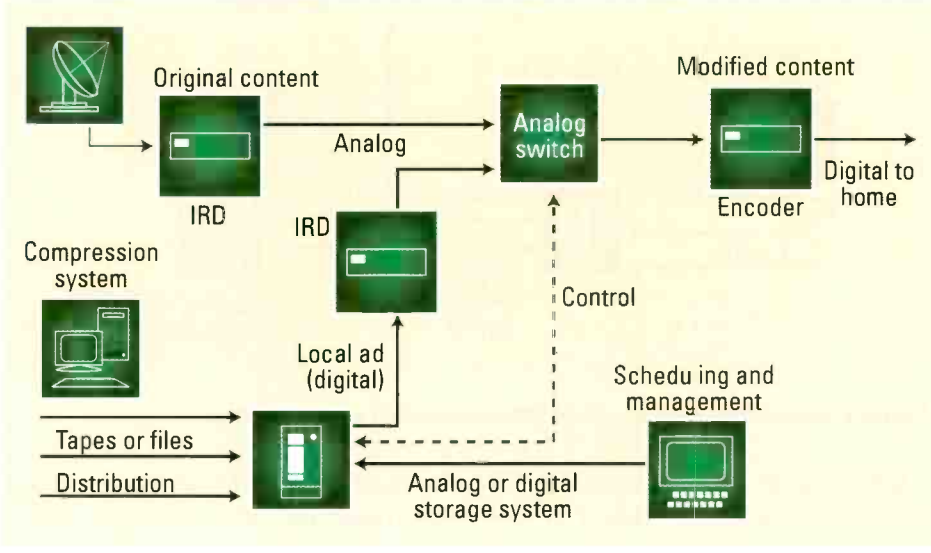

Figure 2. Analog ad insertion for digital content

Though this process is effective for local content replacement, it is problematic. The process of two encoding/decoding passes can degrade overall video quality.

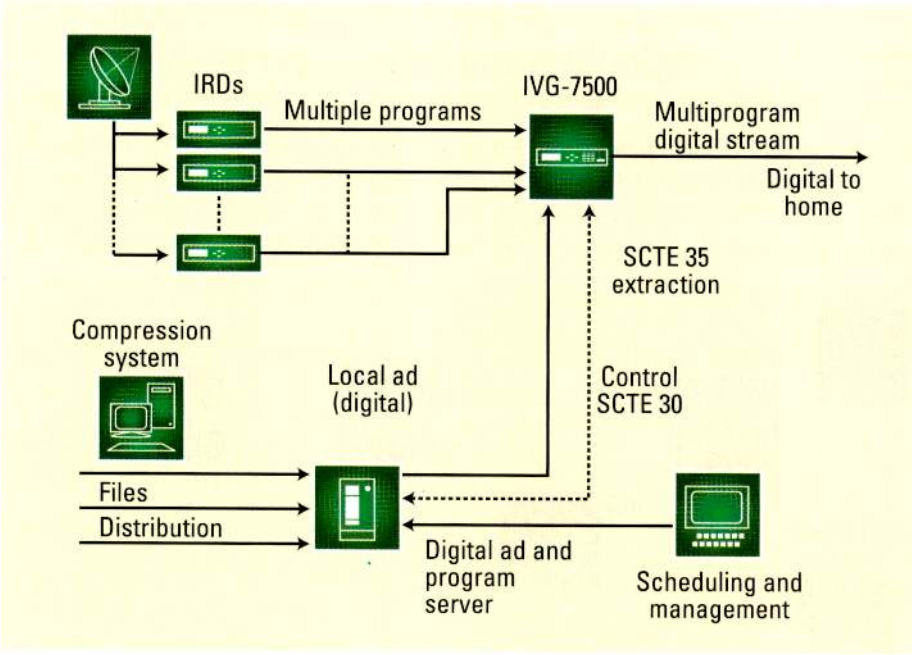

Figure 3. Scopus' IVG-7500 combines DPI, multiplexing and transrating.

MPEG is a lossy compression system that deletes unnecessary information the human eye does not see. Multiple encoding and decoding may remove too much information, causing visual artifacts.

A more important issue to the provider is that analog insertion in a digital system is a very expensive process. Multiple decoders and an encoder may be required to create the system, which thus requires increased time and labor for system configuration and management.

Digital program insertion

DPI is a completely digital version of local content insertion. DPI requires that original content include ad insertion markers in the MPEG-2 transport stream as part of the service information tables and according to the SCTE 35 standard.

Special encoders enable creation of the program insertion markers in the transport stream during the contribution process. These digital markers are similar to the cue tones used in analog ad insertion. At the local station or headend, the splicer detects insertion markers in the transport stream. The insertion markers trigger the video server to insert the relevant ads automatically. Communication between the splicer and the video server is based on the SCTE 30 protocol.

The benefits of DPI

Programming remains in MPEG form throughout the process, so multiple encoding and decoding is not required, and image quality is preserved. The the content's quality is based solely on original encoding parameters, which the broadcaster controls.

DPI equipment costs less than analog insertion. It does not need decoders to convert the original content and local ads to analog formats. Likewise, no encoder is required to recompress the modified content back to digital format. The equipment cost savings is multiplied by the number of digital channels the local service provider offers on its system.

Bit-rate issues

One issue that must be considered with DPI systems is dealing with the different bit rates of the original and local content. Due to system bandwidth limitations and the fact that ads are stored in constant-bit-rate format, the DPI system must be able to adjust the bit rate of the local content to match the original program. This process is known as transrating and is performed in the digital domain.

Transrating may also be required on the modified content to be combined properly into a multichannel multiplex that has a limited aggregate bit rate. A single device may now perform both the transrating and splicing functions.

The Scopus solution

Scopus Video Networks offers a comprehensive ad insertion solution for distributors, direct broadcast satellite and cable TV operators. The solution is based on the company's IVG-7500 Intelligent Video Splicer, part of the IVG-7000 Intelligent Gateway series, and its real-time encoders and receivers, which feature advanced DPI capabilities. (See Figure 3.)

The video gateway enables service providers to offer targeted services to

DPI equipment costs less than analog insertion. It does not need decoders to convert ... local ads to analog formats.

their subscribers. It is a powerful and scalable DSP-based headend in a box, housed in a 1RU chassis.

At the distribution or contribution site, Scopus encoders allow injection of the SCTE 35 ad insertion marker. The IVG-7500 accomplishes powerful digital processing, statistical multiplexing, bit-rate reduction, flexible grooming and extensive stream monitoring. Conditional-access control is also monitored through the system.

It simplifies the DPI system at the local station or headend. Original content is received and decrypted using IRDs. The DPI system then allows service providers to combine the functions of splicing, scheduling, transrating and multiplexing into one device. It coordinates the video server via SCTE 30-defined interface. The system can handle ad insertion for multiple programs simultaneously. Therefore, it also reduces the need for individual splicing functions per program.

Advanced management and redundancy solutions built into the IVG-7500 help users maximize uptime.

Along with flexible ad insertion, the splicer offers PSI/SI and PSIP processing, electronic program guide insertion, conditional-access integration, complete network management and personalized services, such as pay-per-view. It reduces the amount of hardware required to accomplish local content insertion, while increasing the system flexibility for a service provider.

The splicer provides ad insertion, rate shaping and grooming capabilities for digital simulcast network architectures. The system features superior-quality, seamless SD and HD splicing, and standards-based DPI implementation (SCTE 30 and SCTE 35) for compatibility with major ad servers and, in turn, an integrated ad insertion solution within a distributed or centralized all-digital architecture. This capability gives cable operators the valuable option of inserting local ads and program content, such as off-air or PEG channels, into premium HDTV content.

In addition to its DPI capabilities, the new system offers an advanced joint transrating statistical multiplexing mechanism, as well as powerful and flexible grooming features and high-quality rate shaping. Advanced management and redundancy solutions built into the IVG-7500 help users maximize uptime.

Taking targeted ads further

Continually evolving technologies for targeted content insertion hold the promise of reaching consumers on an individual basis. The increasing adoption of digital STBs by consumers and the wholesale migration of the broadcast industry to digital operations, in conjunction with advances in the leveraging of purchasing and marketing data, mean that DPI has the potential to bring tailored advertising to specific household viewers. Robust encoding and multiplexing solutions allow broadcasters to maximize local ad dollars for a valuable bottom-line boost. **BE**

Michael Acer is a manager of customer engineering for Scopus Video Networks.

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- ANSI/SCTE 30 2006 Digital Program Insertion Splicing API

Gepco cables

The cables perform as well as the players do at Michigan State University's Spartan Stadium.

BY RICK CHURCH

Michigan State University recently set out to upgrade a portion of Spartan Stadium, home of the school's football team, to better serve the fans and university community. Part of the space was torn down to accommodate the construction of a tower to house a new press box, 24 luxury suites, 862 club seats and two floors of university office space.

In addition to the fans receiving better accommodations, there were also plans to make improvements to the media facilities. The renovation included the installation of more than 200 TVs around the stadium as well as a new headend system. As Michigan State's director of sports broadcasting, I was in charge of making selections for all the broadcast technologies purchased, including connectivity equipment.

Michigan State University's broadcast control room uses Gepco's coax, triax and audio cables to ensure that broadcasters do not miss a minute of the action on the field.

Transmission is critical

The cable running throughout the stadium ranged in age from a few years to more than 20, and we noticed inconsistent transmission performance from wear and tear. With the Spartans consistently competitive, major local and national networks will broadcast from our facility throughout the season.

A majority of the cables previously run through the stadium were laid years ago by broadcasters who regularly covered games, whereas others were installed more recently by the university. Unfortunately, there was no way to distinguish between them. When broadcasters connected our cables to their equipment, it was uncertain how they would perform.

National networks such as ABC and ESPN will pull up on a given Saturday to cover a game, so we needed to select interconnects that were going to perform as well as the players on the field. Many of the networks covering the games are now transmitting in HD and are looking for HD–compatible connectivity solutions. Because most of our cables were installed many years ago, they were incompatible with the current HD technologies.

The university staff also uses the equipment for video projected on the stadium's big screen and for broadcast via the campus' in-house TV network, so we wanted to ensure that the fans throughout the stadium were also receiving high-quality video and audio. Through input from the regular broadcasters and with my experience working with varying types of cable, we decided to use Gepco to meet the stringent demands for this upgrade.

The installation

All of the content collected by both the networks and university staff is broadcast live, so proper transmission is essential. With time being a big factor in a live setup, the ability to connect their equipment while having extreme confidence in its performance allows broadcasters to focus on more pressing elements of the broadcast.

Having used Gepco in the past, I knew the cables would provide consistent delivery without having to constantly monitor its performance. (For the list of what we used, see "Install selection.") Despite long distance runs, the recently installed cables present superior transmission without signal loss. Now broadcasters are able to connect their equipment to any cable in the building and are guaranteed consistent transmission.

The content collected by the networks and university staff is broadcast live, so proper transmission is critical.

Broadcasters that use the facility have been satisfied with the cables' performance, as has the stadium staff; the cables have performed flawlessly at each and every game. In particular, the HDTV coax cables have been popular, receiving the most positive response from broadcasters because they now have a means to connect

their HD cameras, monitors, blimps, and other equipment. Prior to the installation of the HDTV coax cables, broadcasters had to run their own cable, creating additional setup time.

First in HD

With the increasing shift from standard definition to high definition, broadcasters are looking for HD-compatible interconnect solutions, and Michigan State University is one of the first university stadiums in the country to offer HD cabling for broadcast. Having great appreciation for its capabilities, we expect to install additional Gepco HDTV coax in future expansion plans.

Our football team puts its all into every game it plays, and we want to make sure that it is delivered successfully to viewers across the television screen. With the proper cabling solution, we can be sure viewers receive the highest quality transmission possible, so that the images Michigan State fans see at home give them the experience of being with the fans here in the stadium. BE

Rick Church is director of sports broadcasting for Michigan State University.

With the increasing shift from standard definition to high definition, broadcasters are looking for HD-compatible interconnect solutions.

Install selection

ADC audio and video patch panels
Gepco
- Custom panels
- G37 DT12 multi-pin connectors
- GA61812GFC Gep-Flex 12-pair cable
- GSC132 speaker cable
- HDTV coax
  - VPM2000 RG59
  - VSD2001 RG6
  - VSD2001TS Plenum RG6
- Multi-pair audio cables
  - 6604HS Plenum
  - 6606HS Plenum
  - 6612HS Plenum
- Sigle-pair audio cables
  - 61801EZ
  - 61801HS Plenum
- Triax
  - VT61811 RG 11 triax
  - VT61811TK RG11 Plenum triax

Neutrik XLRs

Tapeless action

ESPN cuts the tape strings for the X Games.

BY MICHAEL GROTTICELLI

ESPN's positive experience producing its 11th annual Winter X Games from Aspen, CO, in SD, was more than capturing the spectacle of athletic prowess in the snow. It was a testing ground to experiment with a virtually tapeless post-production environment.

ESPN plans to use this template for future remotes, including the upcoming Summer X Games in Los Angeles. This is no small undertaking, considering that the extra network connectivity will have to be twice or three times the size and complexity.

Perhaps the biggest challenge is putting together a system that equals any traditional all-digital studio environment. The technology — nonlinear edit systems and a shared storage environment — isn't new. But it has rarely been done with such tight integration and technical sophistication.

There is also the monumental challenge of setting up an entire, networked production environment on-site in four days. Lots of fiber will be used for high-speed backbones, as well as miles of copper and coax cabling.

At the Winter X Games, edit suites were set up on site in a hotel conference room, where production staff logged footage and accessed clips and program elements via laptop computers. The Summer X Games will be handled the same way.

On-site broadcast center

Material from each event will be captured on Sony BVP-900 hard cameras and BVP-950 handhelds, and Grass Valley LDK 6000s with an assortment of Canon lenses at various venues via on-site production trucks provided by NEP Supershooters. This footage will be stored locally on EVS XT servers. Program feeds, wow reels and melts will be transferred via EVS XFile network to the main production truck, which will also serve the anchor elements of the on-site broadcast center. The broadcast center will include a core signal routing framework set up by NMT Productions, with Bexel Broadcast Services providing additional XFile and IP Director facilities within several NLE rooms in the Home Depot Center.

The broadcast center truck will include about a dozen EVS XT[2] six-channel servers that will store and transfer the material as Motion JPEG files. Both clean and dirty program records will also be recorded on the truck's XT[2] servers.

ESPN plans to use this template for future remotes. This is no small undertaking, considering that the extra network connectivity will have to be twice or three times the size and complexity.

Inside the Home Depot Center portion of the broadcast center, numerous IP Directors and XFile archive devices will be set up in edit bays and screening rooms, as well as at logging stations. These devices serve multiple functions — transferring media between venue mobile units and the central broadcast truck, moving media between the EVS network to the Avid Unity network and logging the raw programs and ISO feeds from the individual venues.

Additionally, these stations will allow the transfer of media between the active EVS storage network and a 9TB Windows-based server with the combined capacity of 10 XT servers. Each server holds six drives at 147GB per drive.

This will allow ESPN editors working in on-site edit rooms (using Avid

Symphony and Adrenaline systems) on an Avid Unity server environment to instantly access clips and begin creating finished segments for air. Previously they've had to wait for tapes to be digitized before they could begin working.

Also, prescreened clips can be located and retrieved with ease. That certainly wasn't the case during previous X Games productions.

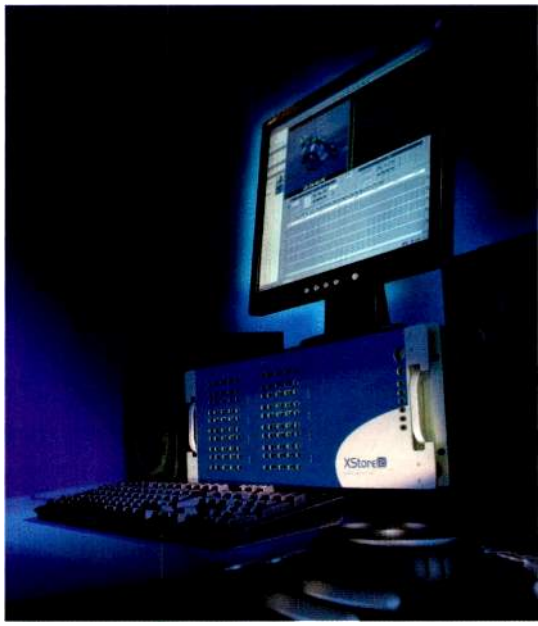
Edited segments will be pushed back to the XT[2] network in the broadcast truck and played back directly to air or sent to the venue truck's XT network via XFile interconnect if they are being incorporated into a venue segment. EVS servers will handle the bulk of the media while the extended storage array Windows server can be used for accessing offline clips from past events (to include background perspective for segments on particular athletes) and for archiving.

Seamless data transfer

In Colorado, putting together a shared-storage system necessitated interfacing the EVS servers to the on-site Windows server and building an outboard interface between the production trucks and the broadcast center. In Los Angeles, a lot of server support and the interfacing of the systems and the trucks will have to be coordinated between ESPN network engineering and Bexel.

The most significant challenges facing this SD workflow are configuration issues, such as getting all the systems to communicate and work together. EVS has provided a custom application, first used at the Winter X Games, to help automate the file transfer processes between the mobile truck XT system, the broadcast center truck XT[2] system and the Windows server. Such applications will certainly be put into play in Los Angeles.

Part of the solution is to place different production locations as close as physically possible to each other so that cable runs are shorter and signals can be sent and received without implementing complex transport schemes. Gigabit Ethernet connectivity was used for the Winter X Games, but when the event moves to HD (probably for the next Winter X Games), mainly fiber-optic cables and perhaps 3Gb/s technology will have to be used to handle the increased bandwidth needs of passing 16 HD streams through the network. ESPN will use GigE switches and aggregate ports together when necessary, in addition to using multiple network interface cards or Fibre Channel interfaces within the XFiles.



The EVS Store[2], a dedicated media storage system, and the XT[2] server, are at the heart of the ESPN's move away from videotape.

Delivering audio data for multiple platforms

At the Winter X Games, the crew mainly used embedded audio with the video streams (eight four-channel and three eight-channel streams). Looking forward, the network is

talking about developing a system of 12 channels of embedded audio plant-wide. This will allow ESPN audio engineers to create true 5.1 elements as well as digital stereo mixes. It will also enable them to ensure compatibility with international feeds, which ESPN must address.

With all of the various platforms that ESPN services — TV, radio, Web, cell phones and podcasting — each individual outlet must be sent as a separate audio and sometimes video element or encoded file that matches their needs. One network might be able to run an original piece of music while another might not be able to due to copyright issues, so individual accommodations must be made. And the system has to be able to do that semiautomatically. These separate audio elements are retrieved from the EVS and Avid servers, which are stored there as separate clips linked together via highly specific metadata.

Developing a tapeless workflow clearly brings many advantages, saving the production considerable time and effort overall while bringing edited segments to air faster.

Looking forward

Future X Games events will also include the ability to send material from the on-site location back to ESPN's Digital Center in Bristol, CT. This will allow the network to take full advantage of the ongoing event, in real time. Currently, boxes of tape are shipped back at the end of each day. Some day, the material stored on the servers will be shipped back and the files integrated automatically, with significantly less human intervention.

Developing a tapeless workflow clearly brings many advantages, saving the production considerable time and effort overall while bringing edited segments to air faster. ESPN has been doing X Games since 1995, and in that time it has learned a few things. The network's engineering team is up to the challenge and, once the dust settles in Los Angeles, it will have some valuable data transfer lessons to benefit from. BE

Michael Grotticelli regularly reports on the professional video and broadcast technology industries.

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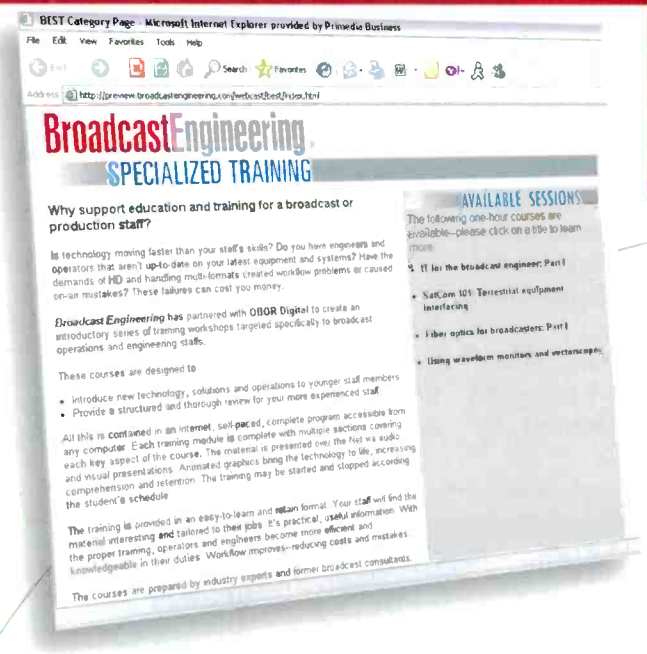

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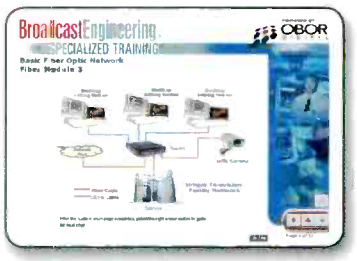

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KTUU links to HD

The Anchorage station captures and monitors content with Blackmagic.

BY STEVEN RYCHETNIK

Broadcast engineers in Alaska essentially do the same things as their southern engineering cousins. Working in the land of the midnight sun, however, does have its challenges. The environment doesn't tolerate poorly designed or temperamental equipment. In addition, Alaska's distance from the lower 48 states — and the weather — makes it difficult for stations to receive support.

The state gets 90 percent of its supplies via cargo ship twice a week through the port of Anchorage. So, when something fails, or a part is needed, time is not on our side. Due to the weather, airfreight isn't dependable either. The same goes for shipping with the well-known carriers. Shipping overnight often takes a week. These factors all contribute to how a broadcaster selects products.

KTUU's reach

I grew up in the television business, getting my feet wet in my father's production company. Now I work for KTUU-TV Channel 2, the local NBC affiliate in Anchorage.

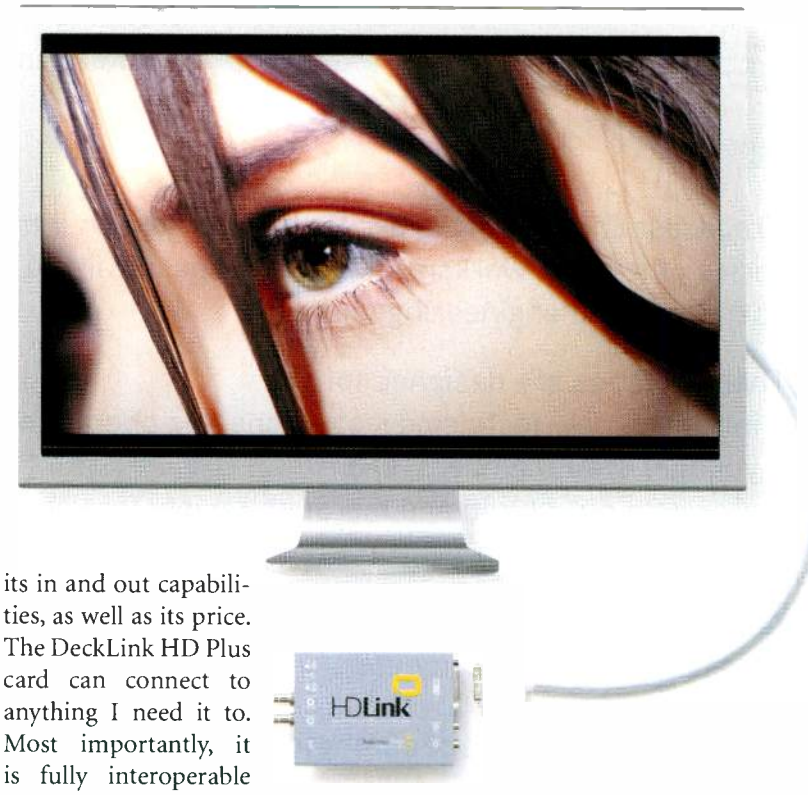
The station serves Anchorage, as well as translators that serve all of south-central Alaska. In addition, much of our programming is also on Alaska Rural Communications Services (ARCS), a satellite service that provides our news programming to the entire state. Two-thirds of Alaska's viewing audience watched KTUU's morning show during the November sweeps. We have a footprint that many stations, not to mention networks, envy.

Capture and review

In August 2005, I was authorized to rebuild our news graphics room. Keeping future operations in mind, I wanted this new facility to have the capacity of receiving high definition in and out.

After reviewing several manufacturers' capture cards, I chose the Blackmagic Design equipment for its in and out capabilities, as well as its price. The DeckLink HD Plus card can connect to anything I need it to. Most importantly, it is fully interoperable with my software suite, which consists of Sony Vegas, and Adobe's After Effects and Photoshop. With the card installed, I can receive HD and SD in and out of my computer. My next step was to find a way to easily view the HD material.

We have limited HD monitoring capability with only SD throughout our station. To view video on an HD monitor, I had to walk across the building. My solution was to install Blackmagic's HDLink. It allows me to connect SDI video directly into my LCD monitor via its DVI-D output port. I get incredible HDTV resolution, and every individual pixel is mapped directly onto the pixels of the monitor, resulting in an ideal digital-to-screen pixel-for-pixel HDTV display. I now can view the conversion in my office on a 24in Dell LCD panel in full 1920 x 1080 resolution.



The SDI-to-DVI/HDMI converter instantly switches between HD and SD and includes 4:2:2 and dual link 4:4:4 feature film quality.

When working in NTSC, HDLink doubles the size of the displayed image, making viewing easier. Most computer displays are limited to a refresh rate of approximately 60Hz, so HDLink automatically applies pull-down to display video frame

Kevin Fowler, an editor at KTUU in Anchorage, AK, edits an on-air promotion piece using a computer equipped with a Blackmagic DeckLink card and Thomson Grass Valley's NewsEdit SC. Edited material gets sent to playback server system. The output of the system is monitored by the HDLink in another part of the building.

rates. It includes a built-in Power PC processor, allowing automatic adjustment of native display resolutions using VESA E-EDID1.3.

Help in a pinch

During the last Winter Olympics, we had just started broadcasting in digital with the ability to air HD. Some State of Alaska public safety spots were made in HD, but the only way to get them to tape and then on-air was to import the HD computer file into Sony Vegas and export them through the capture card as an HD SDI output. I had preplanned the hardware and functionality, and it went right to air with a paying client in just six months.

Future uses

The HDLink could also be used in other ways at KTUU. For example, our sales team could attract clients by setting up examples of our NBC prime-time programming with locally produced HD spots inserted. And the presentation could be done in-house or at the client's place of business.

Another possibility is using it at tradeshows. Prime time is our money-maker for commercial sales, so to show our programming at the HD level is a useful tool, and HDLink makes this easy.

All we need to do is to take our HDCAM tape machine and show it on an HD monitor instead of an ordinary SD monitor. This would allow us to show our potential sponsor the video in HD right on the spot. The HDLink doesn't require an engineer to set it up for the sales team. It is simple enough for the salespeople to set up themselves.

While we can't control the weather, dependable, high-quality products like those that we have recently integrated into our station make my life easier. BE

Steven Rychetnik is director of news and graphics technical operations at KTUU-TV Channel 2, the NBC affiliate in Anchorage, AK.

The tipping point

This year, video servers may finally replace videotape.

BY JOHN LUFF

This year, TV recording technology may finally reach its tipping point. Ever since the first computer-based video servers were introduced at NAB in 1994, industry analysts have predicted that they would replace videotape.

Just the stats

In 2006, HD content could be stored at 50Mb/s cheaper on disk than tape, according to Screen Digest. (See Table 1.) If these estimates are accurate, the differential in 2007 will be 2:1 in favor of disk storage.

To truly eliminate tape disk, or any other media, new technology must be capable of replacing the workflow that tape supports.

It's too early to predict the death of videotape on the basis of only one data point. To truly eliminate tape disk, or any other media, new technology must be capable of replacing the workflow that tape supports. In addition, it will be impossible for videotape to die out until it is economically efficient to replace all of the media archives stored on tape. Given the large amount of storage on tape around the world, it seems unlikely that all content will be converted any time soon.

The storage pyramid

Today's modern storage environment is often a mix of many types of storage, all picked to enhance the workflow in specific ways. Tape, along with removable disks, memory cards and optical disk storage, is the media of choice for all types of field acquisition. Using nonremovable media in the field would radically change the workflow. When hard drives reach sufficient capacity in hardened packages comparable in size and cost to other removable media, they might also be a practical option. For now, they are still much more expensive than other media for field use.

The situation in fixed facilities is quite different. Certainly tape remains viable, especially considering the impact of workflow changes in existing facilities. But with the new economics, tiered storage becomes a viable alternative. (See Figure 1.) Hard disks are almost always part of this approach. The concept of hard disks does not focus so much on how a file is stored but rather whether it arrives in a timely manner.

This is quite different from videotape, which relies more on where the physical media resides. Videotape is tangible. Hard disk enables an inherently nonlinear workflow. It also allows the use of the most cost-effective media.

At the top of the pyramid, the cost per gigabyte is highest, and the access is the fastest. Transfers can be faster than real time. At the bottom of the pyramid, access is slower, cost is lower, and capacity is larger. Changes to the storage structure can be made without disrupting existing files in any part of the pyramid because transfers to new types of media can be made without reconstituting the content itself.

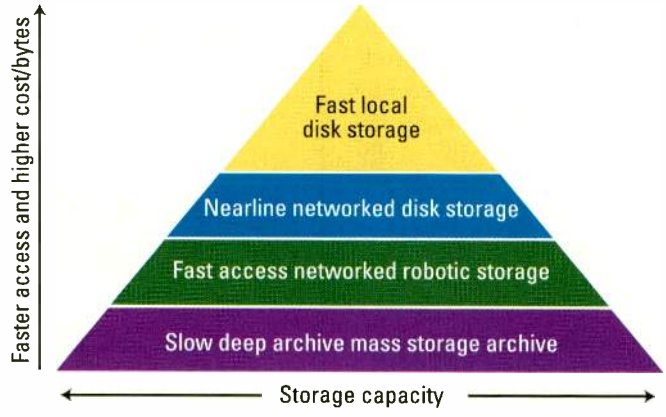


Figure 1. Storage systems usually take a hierarchical form, with media that needs to be accessed quickly held close to the point of use.

Prolonging the life of content

This general approach has some issues, which professional archivists fight daily. About 10 years ago, an industry guru told me that once content was digital, it would be impossible to lose it. Unfortunately, the very fact that the content has been stored for computer access creates potential issues.

Let's say you stored content in a wavelet-based editing system in 1996. Picture quality would likely have been wonderful. It would be the same today, as long as the codec that was used could run under currently available operating systems and hardware. That, however, would be problematic.

Year	Hard disk cost per gigabyte ($)	Hard disk (50Mb/s) cost per hour ($)	PRO DV tape cost per hour ($)
1995	820.00	18,450.00	20.00
1996	256.00	5760.00	20.00
1997	123.00	2767.00	15.00
1998	62.00	1395.00	15.00
1999	31.00	697.50	12.00
2000	12.00	270.00	12.00
2001	6.00	135.00	12.00
2002	3.00	67.50	12.00
2003	2.00	45.00	12.00
2004	1.50	33.75	12.00
2005	0.70	15.75	10.00
2006	0.35	7.88	10.00
2007	0.20	4.50	10.00
2008	0.10	2.25	8.00
2009	0.04	0.90	8.00
2010	0.03	0.68	8.00

Table 1. In 2006, HD content could be stored at 50Mb/s cheaper on disk than on tape. Table courtesy Screen Digest.

Graphics stored on 8in floppy disks were commonplace at one time but are unreadable today. The only sure way to prevent this obsolescence is to clone the content, making a copy in a new format that will extend the life of the file for the future.

This is not as easy as a simple file copy. For some formats, such as MPEG-2, decoders will be available long into the future. Other more proprietary formats may have less longevity. The only way to protect these formats is to decode them to retrieve the original essence and then restore them using new tools.

File formats, as distinguished from compression or essence formats, can be handled with more elegant tools. Unwrapping and rewrapping can be done without changing the essence. That might be appropriate if you are moving the content from a discontinued video server's proprietary format to the house format for a new server. Converting, or flipping, the file perfectly recreates the essence in a new format.

In the not too distant future, we should be able to move content from one facility to another in a seamless way.

Media archives

An analogous issue exists with media archives. SMPTE is in the initial stages of creating a standard language to speak to archives, as well as a common file format that all archive manufacturers would adopt for media content.

In the not too distant future, we should be able to move content from one facility to another in a seamless way, literally between two competing archive manufacturers. Users would then be able to order content from a service provider for inclusion in a VOD system without wondering if the archive tape it is delivered on will play in the archive they own.

MXF has a place in this continuum as well. Those who have been struggling to make MXF work in the real world know it is only a language, and it can be implemented in a spectrum of choices. At the instigation of Turner Entertainment, the Advanced Media Workflow Association is working on a proposal that will put some boundaries on a specific implementation of MXF for program storage purposes. If agreed on by industry groups, it will be an important methodology, which will help make the tapeless world more transparent.

A new pyramid

This year of transition will experience continuous downward pressure on storage costs. I look forward to the day my personal video recorder has a couple of terabytes of storage and my HDV camcorder can transfer files directly to the PVR's storage without conversion. In the final layer of the tiered pyramid, it is not unreasonable for the file to be transferred directly to storage in the home, which begins a new pyramid on top. BE

John Luff is a broadcast technology consultant.

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

Decimator — SED Systems

One-half size PCI card uses digital technology and Fast Fourier Transformations to make quick, accurate measurements; accepts all L-band signals from 950MHz to 2150MHz and input power levels ranging from –75dBm to –5dBm; draws power with PCI connection; communicates via built-in Ethernet port; accessible locally or remotely by any network-connected location; provides SNMP status interface.

306-931-3425; www.sedsystems.ca

xStack DGS-3612G — D-Link

Multilayer, single IP management 12-port gigabit switch supports IPv4 and IPv6 routing; provides virtual stacking functionality that allows up to 32 units to be managed via a single IP address; features support for 12 1000BASE-X and/or 100BASE-FX fiber transceivers; designed for long-distance connections of more than 330ft when paired with another switch in departmental buildings.

800-326-1688; www.dlink.com

HMI line — Frezzi

Extensive line of portable lighting includes the lightweight 18W and 24W HMI as well as 200W and 400W HMI; provides more than 80lm/W efficiency; features on-board batteries with 200 watt hours in Li-Ion and 150 watt hours in NiMH; balanced for natural daylight at 5500K with a 92-color rendering index.

973-427-1160; www.frezzi.com

GN ESP series — AKG Acoustics

Gooseneck microphones feature a programmable mute switch, rugged construction, self-cleaning capsule contacts and hidden controls with jumpers inside; offer high radio frequency interference immunity and XLR connector; provide gold-plated contacts and an LED ring to display mic status.

818-920-3212; www.akg.com

apt-X Live — APT

New coding technology delivers compression of up to 8:1 while retaining acoustics and ultra-low delay; features include a single-chip implementation, mono/stereo audio encoder/decoder; up to 22.5kHz stereo duplex with a single device, sampling rate of up to 48kHz, linear phase response and embedded auxiliary data transmission up to 12kb/s.

800-955-2789; www.aptx.com

AirSpeed v2.5 — Avid Technology

Video ingest and playout server runs in Avid Unity shared storage environment and as a standalone server; connects directly to the company's editing workstations over a network to provide direct ingest and playout to and from these systems; features include 720p/50 ingest, direct output of longitudinal time code and backup DNS server support.

978-640-6789; www.avid.com

HR-1-P and HR-2 — Wafian

Direct-to-disk video recorders store recorded clips as QuickTime or AVI files immediately viewable on Intel-based Macs and Windows computers; HR-1-P records more than 10 hours, at 160Mb/s, in 1920 x 1080 10-bit 4:2:2 HD-SDI using the CineForm Intermediate format; includes a hot-swappable media drive for an optional 160GB solid-state disk to hold more than two hours of video; HR-2 for digital film acquisition records in 10-bit 4:4:4 using the CineForm 444 format at 360Mb/s.

858-863-4166; www.wafian

Daptor Three — JK Audio

Wireless audio interface offers 20kHz stereo audio playback through cell phones and portables using Bluetooth wireless technology; features XLR mono balanced line input/output, 3.5mm stereo line input/output and 9V DC battery; weighs 7oz and measures 4.4in x 2.7in x 1.2in.

815-786-2929; www.jkaudio.com

SkyRAY Light — ND SatCom

Lightweight, robust mobile VSAT antenna subsystem features an aerodynamic design, fast deployment and plug-and-play operation; fits any vehicle's standard roof bars; can be integrated in mobile IP VSAT applications for vertical markets such as disaster recovery, business continuity, governmental applications and broadcasting.

214-231-3400; www.ndsatcom.com

PFCU and MFCU — Chief Manufacturing

Mobile carts provide toolless telescoping height adjustment; the PFCU is tailored for 42in to 63in screens, and the MFCU is for 30in to 50in screens; feature Centris technology, providing fingertip adjustable tilt; allow for quick assembly and hide cables out of sight with integrated cable management; fit in doorways and corners with compact angled base; include lockable rear wheels for added stability.

800-582-6480; www.chiefmfg.com

DVDO iScan VP50 — Anchor Bay Technologies

HD video processor and A/V hub converts SD, HD (including 1080p) and PC signals from DVD players, HD-DVD players, Blu-ray players, HD DVRs, game consoles and PCs to any output resolution between VGA and 1080p, including HDTV resolutions 720p and 1080i; features Video Reference Series technologies.

866-423-3836; www.anchorbaytech.com

D-Cube-News v3.0 — Dayang

Tapeless live news production system integrates input, editing, approval, broadcasting and post-transmission archiving on a single platform; features a more intuitive user interface, integration with other Dayang newsroom solutions, optimization for remote and offline news editing, and native MOS support.

+852 2730 2117; www.dayang.com

STP cables — Belden

Shielded twisted pair Plenum-rated, low-capacitance cables; available in two- or three-pair configurations and in 500ft and 1000ft lengths; feature 22 AWG stranded tinned copper conductors and a common 24 AWG stranded tinned copper drain wire; include Beldfoil aluminum/polyester foil shield that reduces the potential for noise ingress/egress.

765-983-5200; www.belden.com

C DX 3610 — LYNX Technik

Multiformat, multimode HD downconverter auto-detects and self-configures to the input signal; functions as an SDTV D/A converter or an HDTV downconverter with analog and digital video outputs; functions as a multiformat analog and digital test pattern generator; supplies several test signals for analog and digital applications; provides automatic color space conversion and several selectable output formats; offers on-board aperture correction.

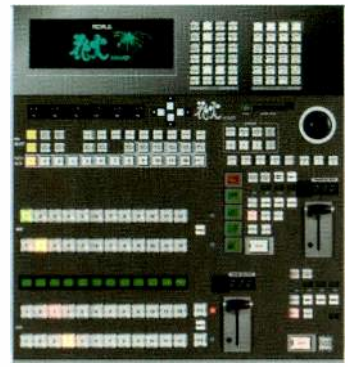
661-251-8600
www.lynx-technik.com

iCR — Snell & Wilcox

Enables broadcasters and content owners to master content once and repurpose it for multiple distribution platforms; workstation combines image conditioning tools, content mastering, quality control and content repurposing functionality.

818-556-2616
www.snellwilcox.com

HVS-1500HS — FOR-A



HANABI 1.5 M/E switcher supports all major HD formats, as well as 525/60 and 625/50; offers three types of control panels, including 16- and 24-button and a rack-mountable 12-button, as well as a high-performance DVE capable of real 3-D DVE effects; accommodates an optional two quad split-screen function; supports 16 inputs and 10 standard aux output buses; supports up to four channels for upconverter input or downconverter output.

714-894-3311; www.for-a.com

Unity 550-2 — WEGENER

Enterprise media receiver includes MPEG-4 ABC video coding for SD/HD and DVB-S2 modulation; streams to additional WEGENER decoders that are addressable over existing internal IP networks; features Compel Control, which makes product backward-compatible with the company's DVB receivers; provide hands-free satellite downlink operations to remotely monitor and reconfigure Unity receivers.

770-814-4000; www.wegener.com

Evo — Studio Network Solutions

Shared workstation storage specifically developed for post-production workgroups, integrates a NAS and SAN into one system; includes Fibre Channel, iSCSI and NAS into a single product; ships with 4TB of storage and can accommodate up to six direct connect Mac and PC clients via 4GB/s FC and iSCSI over GigE.

314-733-0551
www.studionetworksolutions.com

LumaVue — Wireworks

Customizable panels and plates provide maximum electrical isolation between connectors; available in various sizes and shapes, including standard gang plates, wall plates and rack panels, and a thickness of either 1/8in or 1/4in; feature nonmetallic cell cast acrylic and rear engraving; UV stabilized for outdoor use; available in 10 colors and gloss or matte with no glare finish.

800-642-9473; www.wireworks.com

HDL-F50 — Ikegami

Multiformat CMOS camera meets the size requirements for gyro-stabilized aerial camera mounts; minimizes the number of camera input and output signals with one-piece design, simplifying signal transport; features low power consumption; provides multiformat 1080i or 720p HD image capture.

201-368-9171; www.ikegami.com

Command Channel — Sennheiser

Option for the SKM 5200 handheld mic transmitter, EK 3241 portable receiver and the EM 3532, 3032 and 1046 rack-mounted receivers; provides a second audio channel between the transmitter and receiver that permits a variety of secondary functions to be implemented for broadcast and live performance applications.

860-434-9190; www.sennheiser.com

SPS200 — SoundField

Compact, lightweight A-Format mic for stereo and 5.1 surround recording; offers software plug-in A-Format to B-Format conversion and stereo and surround-sound decoding and manipulation in place of an outboard control unit; can capture 5.1-, 6.1- and 7.1-channel audio and simultaneous stereo with variable width; comprises four low-noise, studio grade condenser capsules; offers standard 48V phantom power; relies on included software for all format conversion, decoding and manipulation.

+44 1924 201089
www.soundfield.com

RemoteMix 4 — JK Audio

Portable four-channel field mixer and headphone amplifier routes audio through cell phones and portables using Bluetooth wireless technology; offers up to 20kHz audio bandwidth; features a phone line hybrid and keypad, a PBX handset interface and a 2.5mm cell phone interface.

815-786-2929; www.jkaudio.com

TRX800 and ZFR800 — Zaxcom

TRX800 handheld wireless microphone and ZFR800 handheld wireless recorder provide internal recording capabilities for applications where sound quality and mobility are equally important; TRX800 handheld uses digital modulation and produces a time code-referenced recording that serves as a back-up; offer audio quality equivalent to AES audio on a hardwired cable.

973-835-5000; www.zaxcom.com

C DX 3624 — LYNX Technik

HD downconverter adds embedded audio support; de-embeds complete audio payload from the SDI input, automatically delays it to compensate for the video processing delay and re-embeds it back into the SDTV outputs; can be used as SDTV de-embedder and D/A converter or to generate multiple test patterns with multiformat outputs.

661-251-8600
www.lynx-technik.com

Observer-HD — Volicon

Storage and retrieval system supports large numbers of simultaneous users, with 24/7 access to live and archived HD content from the desktop using a Microsoft Internet Explorer-compatible interface; allows broadcasters to record, store, search, retrieve and view HD material in real time from multiple broadcast sources and from any desktop within the broadcast facility.

781-221-7400; www.volicon.com

ZL series — PAG

Series of travel pack ENG batteries contains no lithium, allowing users to carry them in luggage on airplanes; comprises 50W/h and 150W/h battery packs compatible with V-Mount, PAGlok or NP1 formats.

818-760-8265; www.paguk.com

SDR-S10 — Panasonic

SD memory card camcorder features a water/impact-resistant and dust-proof construction without moving parts; 10X optical zoom, quick-start technology, 2.7in LCD and a 2GB SD card capable of holding up to 100 minutes of video in LP mode.

201-392-4127
www.panasonic.com/broadcast

Furnace 4 — The Foundry

Version 4 plug-ins offer a suite of more than 30 image-processing tools for use with Apple's Shake, many of which automate time-consuming processes in the creation of digital effects.

310-399-4555
www.thefoundry.co.uk

Flex Control Network Station Playout System — DNF Controls

Modular, Ethernet-based, real-time machine control system provides control over video server channels for on-air playout and video clip ingest; controls a source VTR for ingest; supports segmented program playout; generates an as-run log; offers a redundant playout option; plays out a list of clips, under manual control of an operator, at the press of a key or GPI trigger.

818-898-3380; www.dnfcontrols.com

TeleThon — Telecast Fiber Systems

Transceiver system combines the functionality of Telecast's Python II series of transmitters and receivers with the CWDM wavelength functionality of the company's Teleport system; accepts both optical and electrical digital signals, ranging from 19.4Mb/s up to 1.5Gb/s uncompressed HD/SDI; multiplexes the signals for transmission in either or both directions, with up to 16 optical signals on one fiber.

201-848-9818
www.telecast-fiber.com

D VD 3601 MiniModule — LYNX Technik

Multimode unit facilitates SD/HD downconversion and functions as an SD/HD distribution amplifier and multiformat test generator; processes any embedded audio up to eight AES channels and four audio groups; features selectable SD 4:3 output modes, including letterbox, center cut and stretch to fill, and automatic color space conversion; provides full 10-bit processing.

661-251-8600; www.lynx-technik.com

PESA Cheetah DRS 64x64 — QuStream

Distributed routing switcher offers all AES/analog/time code or mix with 64 AES or analog inputs by 64 analog or AES outputs; features include Dolby E routing, soft switching and delay functionality in the input and output frames; delays an incoming frame-synced video signal coming into the router; matches processing delay in the video with audio output delay.

631-912-1301; www.pesa.com

XA88x8.8BESM — Fujinon

HD lens features 88X magnification with the widest focal length of 8.8mm to 777mm telephoto; is ideal for large sporting events, with its ability to capture wide-angle shots or long-range close-ups in 16:9, 4:3 HD or SD; is equipped with Fujinon's GO-Technology, which improves image resolution and chromatic aberrations at all focal lengths.

973-633-5600
www.fujinonbroadcast.com

HLM-1710R — Ikegami

HD/SD 17in multiformat color monitor provides a space-saving solution for mobile production trucks, large HD control rooms and camera-equipped aircraft; integrates LCD panel with improved 170-degree total viewing angle; features improved renditions of flesh tones and other visuals that demand critical viewing in broadcast applications.

201-368-9171; www.ikegami.com

DLX series — Neutrik

Series of chassis connectors is an enhanced version of the DL XLR connectors; features compact, all-metal housing for RF protection and electromagnetic shielding; duplex ground contact provides contact integrity between chassis and cable connector; offers a male connector designed with a metal retention bar for improved pull-out force.

732-901-9488; www.neutrikusa.com

HC 577 — AKG Acoustics

Headset mic is moisture- and perspiration-resistant; features an adjustable headband, dual-ear temple pieces and dual-diaphragm technology; offers flexibility with an adjustable length, flexible mic boom and choice of left- or right-hand use; incorporates a CK77 omnidirectional transducer and is compatible with all standard AKG wireless systems.

818-920-3212; www.akg.com

PM5639 — DK-Technologies

Color analyzer set measures both CRT and LCD monitors; includes an LCD probe, a CRT probe and a display unit; the LCD probe has a stand to hold it steady in front of the monitor screen, while the CRT probe comes with a suction cup to secure it to the screen; is packaged in a suitcase, making it easy to transport and offering it protection when it is not in use; ideal for facilities making the switch from CRT to LCD monitors.

800-421-0888
www.dk-technologies.com

CleanEdit Suite — EVS

Production system designed for sports and news allows multiple users to take advantage of a common pool of media; offers ingest applications with ingest scheduler and VTR control, browsing, clipping and media management, editing in proxy or high resolution in native HD and SD formats, and immediate playout.

973-575-7811; www.evs.tv

ABT2010 — Anchor Bay Technologies

Video processing chip features Video Reference series technologies, including Precision Deinterlacing, 10-bit Precision Video Scaling II and Progressive Reprocessing, which reverts the progressive video signal output from source equipment to its original interlaced format, then converts the interlaced signal to progressive format to eliminate degrading effects.

866-423-3836
www.anchorbaytech.com

StorNext 3.0 — Quantum

Data management software extends high performance, resilient data sharing to LAN servers and integrates the company's data de-duplication technology to reduce data retention costs; enables applications to access shared storage faster; Dynamic Resource Allocation increases uptime; allows users to scale storage by adding or swapping out disk arrays while the system is active.

719-536-5263; www.quantum.com

DashBoard Control System — Ross Video

OS-independent software application allows users to control and monitor operations within any network using intuitive GUIs; monitors and controls a wide variety of multivendor solutions in the openGear platform; features systemwide alarm reporting, instant access to multiple control windows, in-field card upgradeability and save and recall of control and monitoring layouts.

613-652-4886; www.rossvideo.com

DiviCatch v4.0 — ENENSYS Technologies

Compact USB self-powered broadcast recorder/analyzer includes software featuring MPEG-2 TS real-time table parsing and bit-rate monitoring; now integrates standardized ETR290 guidelines that provide an exhaustive overview of elements that matter for the transmission of a stream; splits parameters tested in ETR290 over three priorities; implements parameters and alerts the user each time an element in the data stream exceeds preset boundaries.

+33 1707 25170; www.enensys.com

EMC-XLR — Neutrik

Cable connector designed for EMI protection comprised of three-pole male/female XLR cable connectors with integrated LC filters, which avoid the RD interference and LF noise; includes a 360-degree shield contact on the female connector to ensure the best possible shielding and chassis contact.

732-901-9488; www.neutrikusa.com

Professional Disc for XDCAM — Maxell

Optical media for XDCAM high-definition video systems designed for professional video and broadcast direct-to-disc tapeless recording; provides 23.3GB of high-capacity storage, fast transfer rates and a high-precision polycarbonate plastic cartridge to protect against dust, scratches and fingerprints; offers 122 minutes of record and playback time in the MPEG HD LP mode, more than 65 minutes in the MPEG HD HQ mode, about 45 minutes at 50Mb/s in the MPEG IMX mode, and up to 85 minutes in the DVCAM mode.

800-533-2836; www.maxell.com

Fortel 603 — QuStream

Distribution/signal processing frame features 20 slots, redundant internal power supplies, frame controller cards and cooling fans in a 3RU frame; creates a powerful, flexible platform to house distribution amplifier cards.

631-912-1301; www.pesa.com

XA22x7BES — Fujinon

An HD studio lens designed for stations using ENG-type cameras for studio applications as well as those employing smaller field production units; features a focal length ranging from 7mm to 154mm; ideal for shooting in tight locations and smaller studios; incorporates a belt drive for zoom and focus, enabling smooth and precise operation.

973-633-5600
www.fujinonbroadcast.com

PF1 and MF1 — Chief Manufacturing

Stands feature telescoping design, Centris technology and a low-profile base with steel construction; the PF1 is for 42in to 63in screens, and the MF1 is for 30in to 50in screens, available in single or dual display models; include optional accessories such as a custom travel case and accessory shelf.

800-582-6480; www.chiefmfg.com

Observer RPM — Volicon

Remote program monitor designed to help MSO and cable operators monitor the quality of their broadcasts in central and remote unmanned headend facilities; monitors and records 500 or more video channels for audio and video signal integrity; notifies the operator, by e-mail or SMS alerts, if the signal does not conform to prespecified limits.

781-221-7400; www.volicon.com

NexGuard for STBs — Thomson Technology

Video watermarking technology designed for set-top-box companies, conditional-access system vendors and VOD/push-VOD operators; works with compression codecs, including MPEG-2, MPEG-4/AVC and VC-1; has been integrated into ST Microelectronics' STx7100 family of System-on-Chips; deters illegal copying and distribution of all forms of broadcast content delivered via IPTV, satellite, cable or traditional broadcast and viewed with digital STBs.

818-260-3683; www.thomson.net

OPUS 2 — OmniBus Systems

Content management system moves the content process from specialized hardware to a standard IT platform; features soft-XML support for customized logging and annotation, frame-accurate proxy generation and viewing, full-text indexing and searching, seamless integration with production editing systems such as Avid and Final Cut Pro, and standardized Web services data exchange with adjacent systems.

303-237-4868; www.omnibus.tv

Media Distribution System — RapcoHorizon

Eight-output MDS-108 and 12-output MDS-112 models are designed for applications where one mic is split to multiple video recorders or cameras; features 1/4in and XLR input connectors, as well as transformer-isolated channels; can drive several outputs; includes 1/8in connectors on the first two output channels and 20dB pads with ground lift switches on the input section; multiple MDS units can be daisy chained together to provide more than 12 outputs.

800-467-2726; www.rapcohorizon.com

Certification

For Sale

Help Wanted

NBC UNIVERSAL/SYSTEMS ENGINEER (NABET)

Burbank, CA; Responsibilities: Diagnose and repair audio/video systems and equipment. Qualifications: Applicants must be familiar with all popular component/composite analog/digital video, videotape, and audio standards; Must have experience with non-linear editing systems. Apply: **www.nbcunicareers.com**, #455837.

Help Wanted

ABC, Inc.

ABC, Inc. is a broad-based international media company with broadcasting, cable and publishing properties, as well as programming services and licenses, in more than 100 countries.

B O & E, Broadcast Operations & Engineering

Broadcast Operations and Engineering provides trained personnel and technical facilities to support the production and distribution of ABC Television Network programming.

The Engineering Department in BO&E is responsible for planning, designing, installing, and testing professional broadcast systems (audio/video/control/IT/etc) used by ABC Television Network. Engineering works together with several groups to successfully meet the needs to Operations and Production (including ABC News, ABC Sports, ABC Daytime, ABC Entertainment.) Previous Engineering projects include automation implementation, large and small scale routers, Post Production systems, production studios, Graphics Facilities, Distribution, Broadcast IT Backbones, transition from analog to digital and High Definition, Plant Infrastructure, Intercom, unplanned "OBWs", etc. Some projects are new from the ground up, while some are modifications to existing facilities. Engineering handles all projects – large, medium and small.

Current open positions include: Broadcast Engineers, Project Manager, Technology Planning Group, Broadcast Technical Specialist, and Manager, Network technical Maintenance.
How To Apply: please visit our website **www.disneycareers.com** where you can search by keyword and location.

MAINTENANCE ENGINEER

UNIVISION seeks Maintenance Engineer for WUVC television station in Raleigh, NC market. Responsible for repair/maintenance of all broadcast equipment, digital and analog, including automation, video servers, digital switchers, cameras, audio, and microwave equipment. Requirements include a minimum of 3 years experience troubleshooting/repairing to component level broadcast video tape recorders, cameras, and studio production equipment. Knowledge of signal flow for studio equipment systems and must work flexible hours. Preferred candidates are experienced troubleshooting/repairing high-powered UHF transmitters, microwave, automation systems, computers/computer network equipment. Bilingual skill not required. Salary based on qualifications. For more info or to apply, mail resume, fax or email to: WUVC/EEO, 230 Donaldson Street, Fayetteville, NC 28301, Fax: (910) 323-3924 **ncjobs@univision.net**. UNIVISION IS AN EQUAL OPPORTUNITY EMPLOYER

Help Wanted

Corporate production company seeking staff & freelance talent for upcoming projects. We are team oriented, and want professionals who like to get their hands dirty. No "white glovers" please.

Technical Director (TV) – Operate video switcher, DVE, call cameras, responsible for line cut to tape.

Tape Op. – HDCam, DVCPro, DVCProHD, BetaSP, DNF controller proficient.

EVS Op – EVS LSM HD proficient

Hi Res Switcher Operator – Spyder, Screen Pro Plus proficient, digital and analog.

Video Engineer – Full fly-pack system setup, VTR setup, camera setup and shading experience. Full knowledge and troubleshooting experience with analog and digital SD, HD & hi res signals.

Camera Operator – ENG & Studio, SD and HD. Lighting experience a plus.

Truck EIC – Must have complete working knowledge of HD systems, signal path, and the ability to roll with the punches under pressure.

Please forward all resumes, web links, portfolio info, client lists, etc. to: **corporateproduction@gmail.com**. References a plus.

DIRECTOR OF ENGINEERING

KTVU-TV/KICU-TV (EOE), the Cox-owned FOX affiliate in San Francisco, is looking for an experienced Director of Engineering.

We're looking for someone who can demonstrate success in future planning, managing capital and operating budgets, along with a thorough understanding of transmission and RF systems. Excellent digital, IT and networking skills are a must, with a solid grasp of broadcast technical operations.

Candidate must have proven outstanding management skills to direct and manage people in a complex multi-station broadcast environment. Since we're first in HD local news, programming and production, working with high expectations is required. You must have a minimum 5-years experience in television engineering management. A BSEE, and SBE certification is desired. If you're up to the challenge of working at the #1 station in San Francisco contact: Human Resources, 2 Jack London Square, Oakland, CA 94607, (510) 874-0331 fax. **Human.resources@ktvu.com**

FOX's Upcoming Business Channel is seeking experienced Engineers.

OPEN POSITIONS:

- Engineering Technician: Master Control – Automation. Harris expertise a major plus.
- Engineering Technician: General electronic maintenance of control rooms, studios, NLE edit, comms. HD a plus.
- Engineering Project Manager
- Graphics Systems Engineer

Fox News Network is an EOE. Please send resume to **resumes@foxnews.com**.

Help Wanted

RADIO CHIEF ENGINEER/IT ASSISTANT

Manage daily engineering of WMFE-FM; assist with IT management; assist in construction of new equipment or modifications; perform repairs and adjustments. Go to **www.wmfe.org** for complete job description. Resume to: WMFE, 11510 E. Colonial Drive, Orlando, FL 32817; or fax to 407/206-2791; or e-mail to: jobs@wmfe.org. Open untill filled. EOE & DFW.

NBC UNIVERSAL/RF ENGINEER-FIELD OPERATIONS (NABET)

Long Island City, NY; Responsibilities: Provide technical, logistical, and maintenance support for the NBC News Gathering operation worldwide as well as remote broadcasts for the entire organization. Qualifications: 5 years RF experience in RF network design or RF performance engineering; BSEE. Apply: **www.nbcunicareers.com**, #582089.

TURNER STUDIOS

TURNER STUDIOS is seeking motivated, experienced, client-oriented Engineers to join our expanding team in Atlanta. If your passion is cutting edge technology in a creative, fast-paced environment, we're looking for you!

Engineering Manager / Projects
End-to-end project, personnel and resource management, proven SD/HD production and post facility experience.

Production Engineers / Effects
Supporting high-end 3D, Design, Compositing and Graphics production in a multi-OS environment.

Please submit resumes to:
Jeff Sharpe - Director of Engineering
Turner Studios
jeff.sharpe@turner.com
or fax to 404-878-4014
No phone calls, please

Please visit:
www.turnerstudios.com
www.turnerjobs.com

Turner Broadcasting System, Inc. and its subsidiaries are Equal Opportunity Employers.

Help Wanted

CHIEF ENGINEER

KIKU-TV 20 in Honolulu seeks a hands-on Chief Engineer to repair and maintain technical facilities at this independent, multi-lingual TV station. Will maintain microwave, satellite, solid state transmitter facilities, automated master control and editing equipment, as well as provide computer support. The successful candidate will have at least 3 years experience in broadcast transmitter and studio maintenance, and have good working knowledge of FCC rules and regs. SBE certification preferred. Full time in beautiful Hawaii. Send resume to **jobs@LA18.tv**. EOE

Panasonic Broadcast & Television Systems Company (PBTS) has an opening for a full time opportunity as a Zone Manager based in Los Angeles, CA.

APPLY NOW: Candidates interested in this or any position with Panasonic must register and login at the Panasonic Career Center: **www.panasonic.com/careers**
Job requisition number: 13745

BASIC FUNCTION: Leading/Managing both direct & reseller Regional Sales Activity & Regional Sales Personnel

ACCOUNTABILITIES:
1. Managing Region Sales Performance as it relates to the Business Plan
2. HQ Reporting and Communication
3. Travel the Region visiting resellers and end users with DSM's monitoring and aiding in sales activities; participate in shows, presentations and training events in the field; visit key reseller & end-user executives promoting Panasonic from an executive level; keep current on new technical information and make suggestions to advance sales.
4. Account responsibility for key House Accounts

MANAGEMENT: Responsible for Sales in excess of $80M+ & Profit and Loss of the Region. Responsible for the supervision of all regional personnel (direct supervision of 6-9 people).

PROBLEM-SOLVING/KNOW HOW: 6-10 years experience managing staff, dealer and direct sales experience. Able to resolve major customer business problems/complaints. Strong knowledge of word processing, spreadsheets, and presentation software a must; strong management skills.

COMMUNICATION: Must communicate with Senior management, customers, dealers, and internal personnel in a clear and positive manner. Must possess computer skills to communicate via email, spreadsheets, and letters.

We are committed to creating a diverse work environment and proud to be an equal opportunity employer (m/f/d/v). Pre-employment drug testing may be required. Due to the high volume of responses, we will only be able to respond to candidates of interest. All candidates must have valid authorization to work in the U.S.

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Editorial Director: Brad Dick, brad.dick@penton.com
Editor: World Edition: David Austerberry, editor@broadcastengineeringworld.com
Managing Editor: Susan Anderson, susan.anderson@penton.com
Assoc. Editor: Collin LaJoie, collin.lajoie@penton.com
Assoc. Editor: Angela Snell, angela.snell@penton.com
Assoc. Editor: Spring Suptic, spring.suptic@penton.com
Sr. Art Director: Michael J. Knust, mike.knust@penton.com
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Division VP/Group Publisher: Jonathan Chalon, jonathan.chalon@penton.com
Marketing Dir.: Kirby Asplund, kirby.asplund@penton.com
Dir., Online Product Development: Dean Muscio, dean.muscio@penton.com
Vice President of Production: Lisa Parks, lisa.parks@penton.com
Production Manager: Kathy Daniels, kathy.daniels@penton.com
Classified Ad Coord.: Sarah Maxey, sarah.maxey@penton.com
Dir., Audience Marketing: Barbara Kummer, barbara.kummer@penton.com
Group Show Director/LDI: Sharon Morabito, sharon.morabito@penton.com

Penton Media

Penton Media, Inc.
249 West 17th Street
New York, NY 10011
CEO: John French, john.french@penton.com
CFO: Eric Lundberg, Eric.Lundberg@penton.com
VP, General Counsel: Robert Feinberg, Robert.Feinberg@penton.com

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INTERNATIONAL

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

Israel
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More ground to cover

The resources and trade shows available to today's broadcasters continue to increase.

BY ANTHONY R. GARGANO

Another NAB convention is once again Las Vegas history. If you did not have a chance to attend and envelop yourself in the latest in industry technology and products, you can catch up on such things in *Broadcast Engineering's* magazines and e-newsletters.

NAB memories

My earliest NAB memory goes back to the time when the annual conference alternated locations. It moved around, from East Coast to the West Coast, and the Midwest in between. The event was much smaller in those days. The East Coast venue was in Washington, D.C., making it convenient for the politicos and the FCC staffers. It took place at the twin hotels at the top of the hill in Woodley Park — today's Omni Shoreham and Sheraton Washington. I also recall being at the Conrad Hilton for one of the last NABs in snowy Chicago.

Today, given the current requirements for exhibit space and attendee accommodations, there are limited venue choices. That's fine with most. Vegas is a great convention town.

From medium to content

The NAB was founded in 1922 by a then fledgling radio broadcasting industry. An upstart telecasting business was recognized in 1951 when the organization changed its name to the NARTB. Then the organization must have realized that television was here to stay, because in 1958, the NARTB reverted back to the NAB.

NAB2006 was significant because, for the first time at the show, the number of registrants from the video and audio media segment surpassed those from TV and radio broadcasting. As a result of the evolution and application of convergent digital technologies, over the years the show has morphed from the industry's principal broadcast equipment exhibition and conference to the premiere event for those involved in the creation, management and distribution of content.

Broadcast invades post

Earlier this year, the Hollywood Post Alliance held another highly successful HPA Technology Retreat. However, times were not always so successful.

Over the years the show has morphed from the industry's principal broadcast equipment exhibition and conference to the premiere event for those involved in the creation, management and distribution of content.

The retreat was created by the International Teleproduction Society (ITS), which became the Association of Imaging Technology and Sound. It served as the industry umbrella organization of the post-production community.

The ITS lost its way when the industry was enduring the financial repercussions of a deeply depressed market. This deadly combination translated into a lack of confidence and loss of funding, and the ITS ceased all activities in 2001.

The Southern California chapter of the ITS, however, remained vital and vibrant and started up the HPA and brought back the retreat.

Under the administrative management of the HPA and program chairmanship of industry pundit Mark Schubin, the HPA Technology Retreat has flourished into a major gathering of those who are and those who desire to be the technical cognoscenti of the content involved community.

The retreat's format is packed with early morning breakfast roundtables, panels, presentations and demonstrations. And despite its name and roots, this year's program kicked off with an ATSC presentation. It also included a broadcaster's panel with representatives from ABC, CBS, FOX, NBC and PBS, as well as a breakfast roundtable on the latest 8-VSB reception developments.

Learning opportunities

Whether it is 108,000 attending NAB or 500 attending the HPA Technology Retreat, the creation, management and distribution of content has become a finely woven fabric. Therefore, we need to take advantage of every opportunity to educate ourselves in all aspects of these convergent technologies. BE

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

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

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Infrastructure Guide | May 2007

Signal Processing, Distribution, Test & Measurement and Networking

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INTRODUCTION

This guide, detailing the Harris solutions for streamlining your broadcast infrastructure, is designed with one goal in mind: To make your job easier. With support for the latest bandwidth requirements across the portfolio and monitoring and control providing centralized command — Harris is the ONE source for a flexible and integrated approach to building a broadcast infrastructure.

- **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 — and beyond

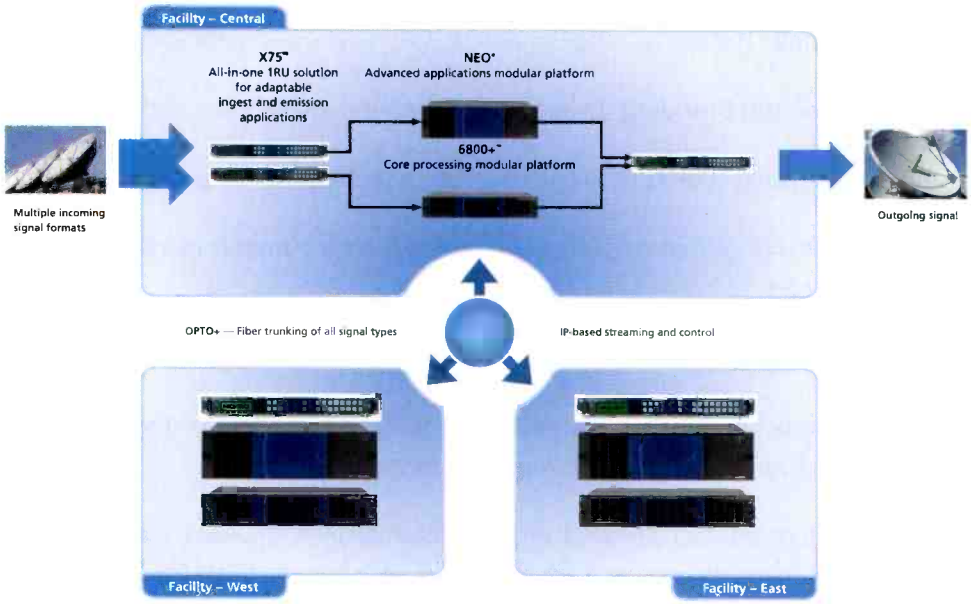
Harris' infrastructure product portfolio provides interoperable solutions that improve workflow efficiency, reduce operating costs and achieve new levels of productivity. The comprehensive Harris offering of HD/SD infrastructure solutions is the critical backbone that helps you reach your goals.

ONE Company. One Direction. The Future.

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

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 our 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.

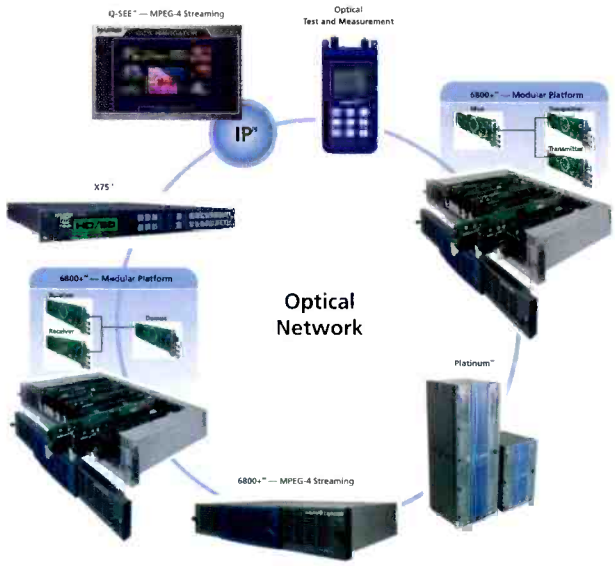
No matter how many signal types and formats you're dealing with, Harris HD conversion solutions ensure that you always provide a superior consumer experience.

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.

6800+™ /NEO®

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.

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.

HDTV SNMP CCS OPTO+

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.

HDTV

Main Features

General

- Capable of handling HDTV, SDI, analog and AES audio, fiber optics and other (non-BNC) interfaces
- Holds up to 20 single-slot cards 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)
- Every frame supports serial control and monitoring with free +Pilot Lite application
- Frame status monitoring by a variety of means including GPI contact closure

FR6802+QXF

The FR6802+QXF 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
- Fits up to 20 modules in 2RU
- Handles 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

Right-side zoom view of back panel with optional Ethernet resource card

Q-SEE HDTV CCS SNMP

FR6800+MB

The FR6800+MB Mix Box frame extends the 6800+ family to the desktop, providing a standalone means of deploying individual 6800+ modules. The Mix Box frame has two slots to accommodate either a single card with a dual-back connector module or two cards with single-back modules. Power is supplied via an off-the-shelf external power supply unit.

- Compatible with Harris 6800+ and 6800 modules
- Two slots to accommodate either a single module with dual-back connector or two cards with single-back connectors
- Integrated low-noise fan for cooling purposes
- Power supplied via external 100-240V AC power supply with mechanically locking connector
- Front-panel LEDs for direct indication of power presence and fan failure
- RoHS-compliant

PRELIMINARY

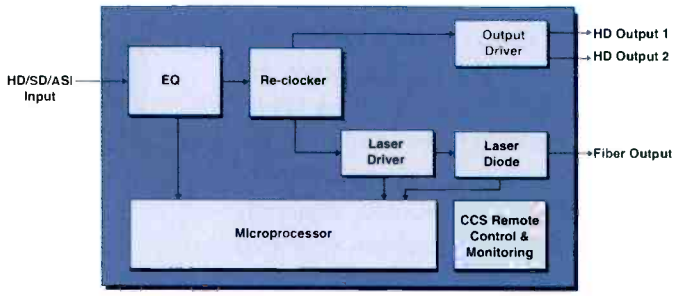
FR6800+MB

HDTV CCS SNMP

HOS6800+S — HD/SD/ASI to Single-mode Optical Transmitter

The HOS6800+S is an HD/SD-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, 540 Mb/s or 1.485 Gb/s
- Automatic cable EQ up to 100 meters for 1.485 Gb/s, or 300 meters for 270 Mb/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



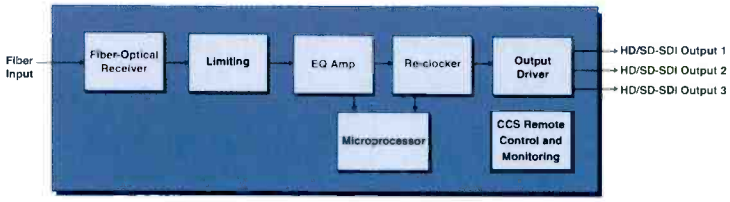
HOS6800+S Single-Slot Back Connector

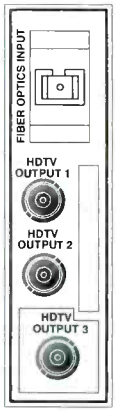
OPTO+™ FIBER OPTICS

OHS6800+S — HD/SD-SDI Single-mode Wideband Optical Receiver

The OHS6800+S is a single-mode fiber optic to HD-SD/SDI/DVB-ASI receiver.

- 1270nm to 1610nm optical input
- Auto-detect and reclocking for 143, 177, 270, 360, 540 Mb/s or 1.485 Gb/s
- Can bypass reclocker when input signal does not lock





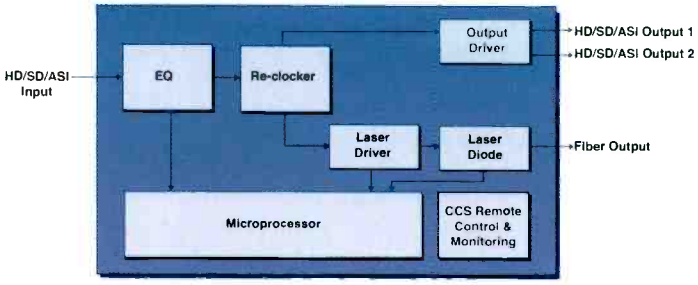
OHS6800+S Single-Slot Back Connector

OPTO+™ FIBER OPTICS

HOS6800+xxS — HD/SD/ASI Single-mode CWDM Optical Transmitter

The HOS6800+xxS 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 wavelengths

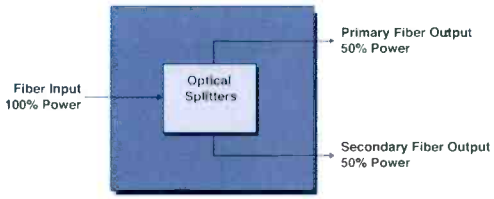


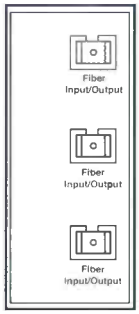
HOS6800+xxS Single-Slot Back Connector

OBS+OP+5050D — Optical Splitter

The OBS+OP+5050D is a passive wideband optical splitter with the power ratio of 50%.

- Supports single 1310nm, 1550nm or up to 16 CWDM wavelengths (ITU-T G.694.2 compliant)





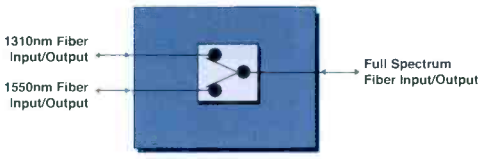
OBS+OP+5050D
Back Connector

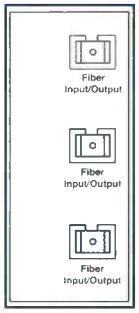
OPTO+™ FIBER OPTICS

OBS6800+D — Bidirectional, Full-spectrum WDM Splitter and Combiner

The OBS6800+D is a single-mode module able to combine and divide 1310nm and 1550nm bands.

- Bidirectional application on one single-mode fiber
- Low insertion loss, high isolation





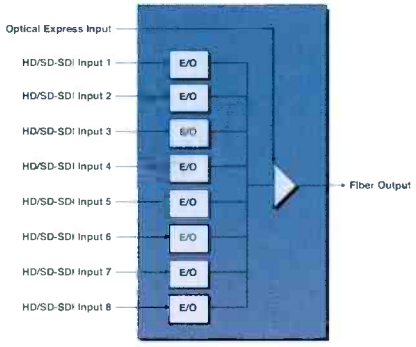
OBS6800+CD
Back Connector

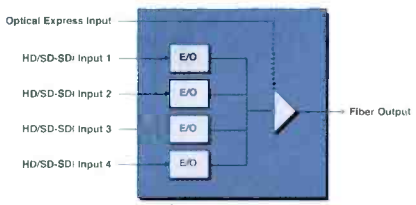
OPTO+™ FIBER OPTICS

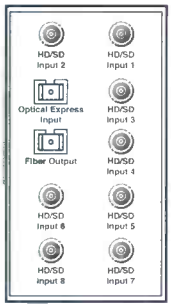
HOMS+OP+CL4D/CU4D/CL8D/CU8D — 4- or 8-channel HD/SD-SDI Active CWDM Multiplexer

The HOMS+OP+ is an active multiplexer, combining the functions of a CWDM demultiplexer along with 4 or 8 CWDM optical to electrical converters in a single module.

- Complies with ITU-T G.694.2 supporting wavelengths between 1270nm and 1610nm
- No requirement for low-water-peak fiber
- Automatic laser protection against irregular power output or excessive laser bias current
- 4/8/12/16-channel expandability







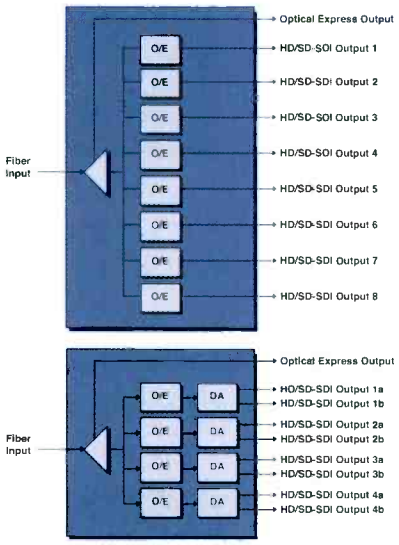
HOMS+OP+
4 and 8 Channel
Back Connector

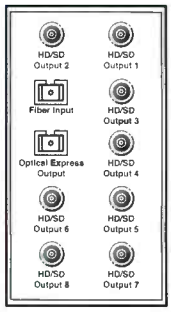
HDTV CCS SNMP

OHDS+OP+CL4D/CU4D/CL8D/CU8D — 4- or 8-channel HD/SD-SDI Active CWDM Demultiplexer

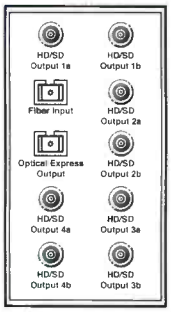
The OHDS+OP+ is an active demultiplexer combining the functions of a CWDM demultiplexer along with 4 or 8 CWDM optical to electrical converters in a single module.

- Complies with ITU-T G.694.2, supporting wavelengths between 1270nm and 1610nm
- No requirement for low-water-peak fiber
- Dual, identical HD/SD-SDI outputs for each channel (4-channel version only)
- 4/8/12/16-channel expandability





8 Channel Back Connector



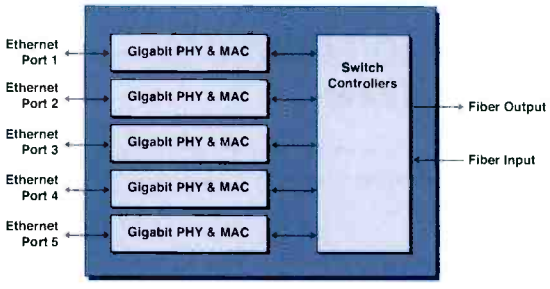
4 Channel Back Connector

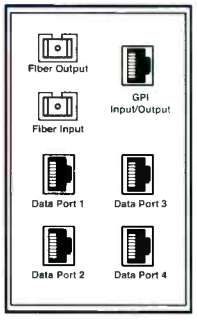
HDTV CCS SNMP

ETHS+OP+CxxD — 10/100/1000 Base T Ethernet Switch Transceiver

The ETHS+OP+CxxD is a 10/100/1000 Mb/s Ethernet switch supporting five RJ45 data ports.

- Non-blocking wire speed performance
- Auto MDI/ MDIX support to detect and correct crossover cables for all ports
- Automatic address learning and aging
- Optional QoS operation by allowing switch traffic to be given different classes of priority or service
- Supports full and half duplex options





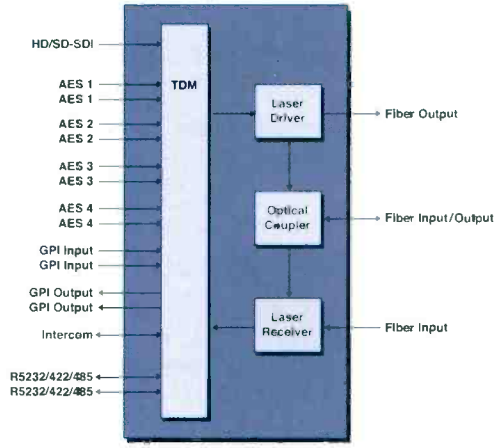
ETHS+OP+CxxD Back Connector

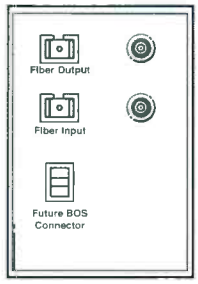
CCS SNMP

HBDOS+OP+xxxD — Studio in a Module Transmitter

The HBDOS+OP module aggregates different types of signals onto the fiber optics domain. This card provides support for up to 1 unidirectional video port (auto sensing HD-SDI, SD-SDI, SDTI, DVB/ASI), 4 unidirectional AES channels and bidirectional flow for dual RS232/422/485 data ports, 4 GPI interface channels and 4-wire intercom channel.

- Automatic EQ, re-clocking and rate reporting
- Supports Q-SEE™ thumbnail streaming within the 6800+ QXF frame
- Supports single 1310nm, 1550nm or 16 CWDM wavelengths (ITU-T G.694.2 compliant)





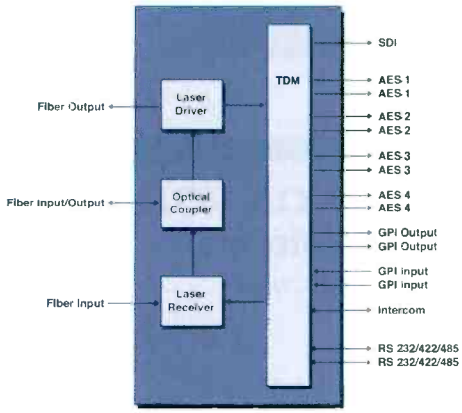
HBDOS+OP
Back Connector

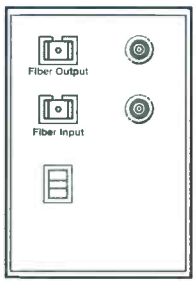
HDTV CCS SNMP OPTO+ Q-SEE™

OHBDS+OP+xxxD — Studio in a Module Receiver

The OHBDS+OP+xxxD modules receive different types of signals from the fiber optics domain. This card supports up to 1 unidirectional video port (auto sensing HD-SDI, SD-SDI, SDTI, DVB/ASI) 4 unidirectional AES channels and bidirectional flow for dual RS 232/422/485 data ports, 4 GPI interface channels and 4-wire intercom channel.

- Supports thumbnail streaming within the 6800+ QXF frame
- Supports single 1310nm, 1550nm or up to 16 CWDM wavelengths (ITU-T G.694.2 compliant)





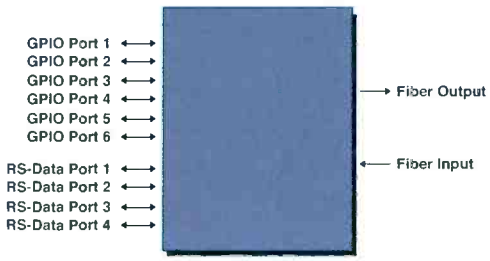
OHBDS+OP
Back Connector

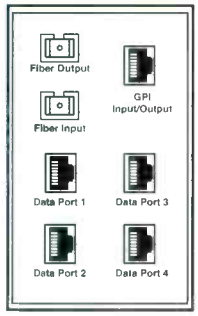
HDTV CCS SNMP OPTO+

DATAS+OP+xxxD — Serial Data and GPI Transceiver

The DATAS+OP modules provide bidirectional data and contact closures via fiber. These modules support up to six contact closures (GPIOs), four pairs of RS232 and four pairs of RS422/485 serial data channels.

- Each data port has individual parameter settings
- Direction of GPIO is user definable
- Support for digital and optical diagnostics
- Supports single 1310nm, 1550nm or up to 16 CWDM wavelengths (ITU-T G.694.2 compliant)





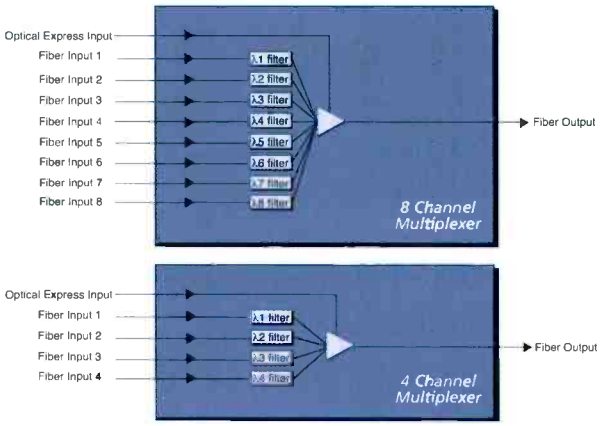
DATAS+OP
Back Connector

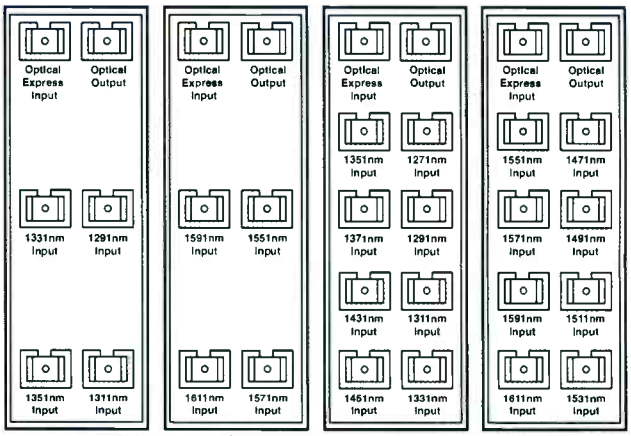
HDTV CCS SNMP

OMS6800+CL4D/CU4D/CL8D/CU8D — 4- or 8-channel CWDM Single-mode Optical Multiplexers

The OMS6800+ is a passive 4- and 8-channel CWDM mulitplexer.

- Passive design
- Support for wavelengths between 1270nm and 1610nm
- Do not require low water peak fiber to utilize all 16 wavelengths



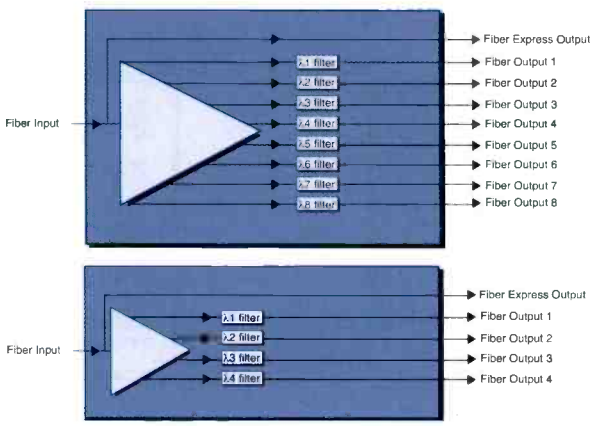


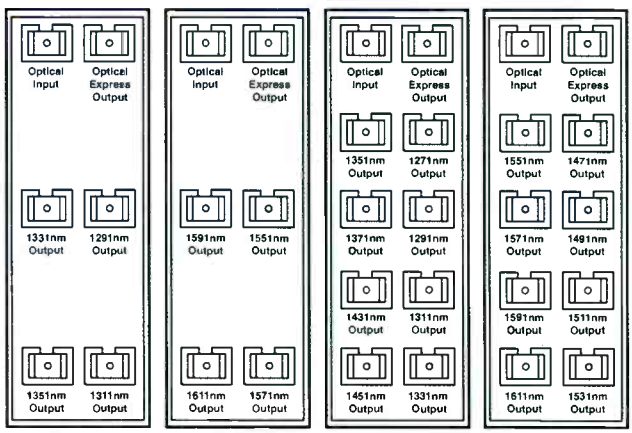
HDTV OPTO+

ODS6800+CL4D/CU4D/CL8D/CU8D — 4- or 8-channel CWDM Single-mode Optical Demultiplexers

The ODS6800+ is a passive 4- or 8-channel CWDM demulitplexer.

- Passive design
- Supports wavelengths between 1270nm and 1610nm
- Do not require low water peak fiber to utilize all 16 wavelengths



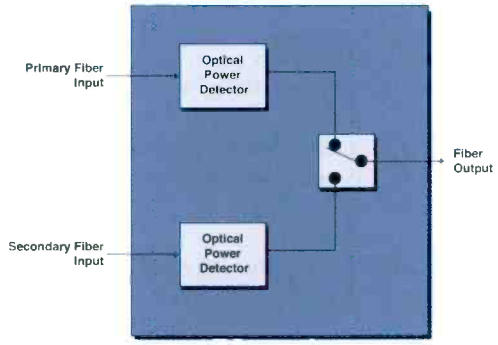


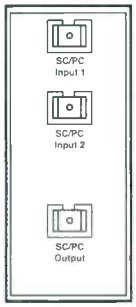
HDTV OPTO+

OPSS+OP+D — Optical Protection Switch

The OPSS+OP+D is an active, 2 to 1 wideband optical protection switch.

- Manual or automatic intelligent switching and change over
- Programmable switching and hysteresis
- Supports single 1310nm and 1550nm or up to 16 CWDM wavelengths (ITU-T G.694.2 compliant)





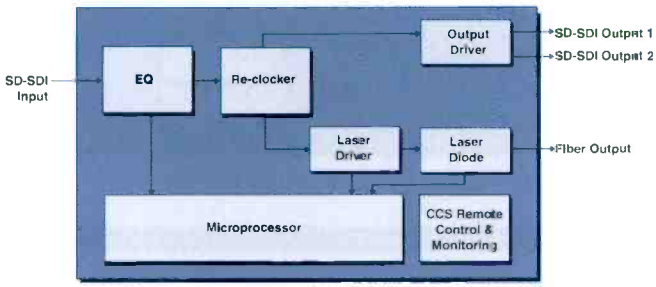
OPSS+OP+D Back Connector

OPTO+™ FIBER OPTICS

SOS6800+xxS — SD-SDI Single-mode CWDM Optical Transmitter

The SOS6800+xxS is a Coarse Wave Division Multiplexer (CWDM) single-mode transmitter.

- Supports single-mode transmission over long "metropolitan" distances
- Supports 16 CWDM optical wavelengths



CCS SNMP OPTO+

SOS6800+xxS Single-Slot Back Connector

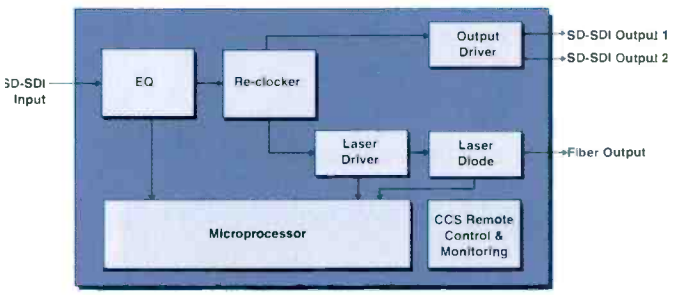
OPTO+™ FIBER OPTICS

SOS6800+S — SD-SDI to Single-mode Optical Transmitter
SOM6800+S — SD-SDI to Multi-mode Optical Transmitter

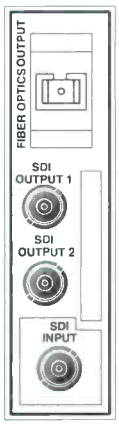
The SOS6800+S is well-suited for transmitting over longer "metropolitan" distances.

The SOM6800+S is best suited for "enterprise" distances.

- Cost-effective solution for transmitting SD-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 270 Mb/s
- 1310nm wavelength output on SC-, ST- or FC-type fiber connector



CCS SNMP OPTO+

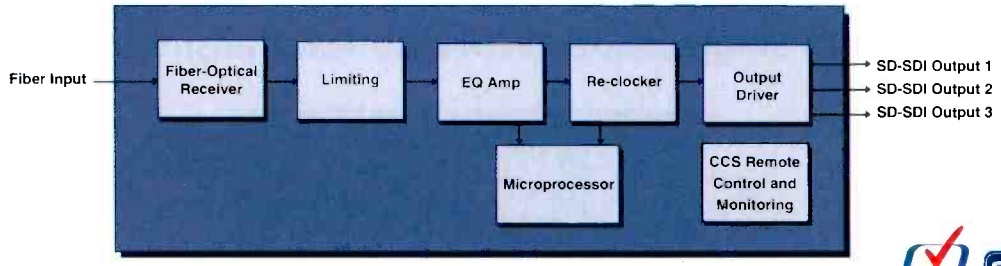


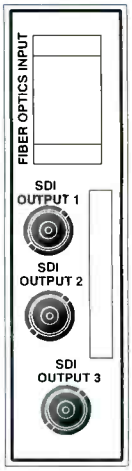
SOS6800+S, SOM6800+S Back Connector

OSS6800+S — SD-SDI/DVB-ASI Single-mode Optical Receiver
OSM6800+S — SD-SDI/DVB-ASI Multi-mode Optical Receiver

The OSS6800+S module is well-suited for reception over longer "metropolitan" distances. The OSM6800+S is best suited for "enterprise" distances.

- Cost-effective solution for reception of SD-SDI and DVB-ASI signals over fiber
- 1270 to 1610nm wavelength input on SC-, ST- or FC-type fiber connector
- Automatic optical input signal detection
- Alarming of input signal loss and non-locked data rate
- Automatic or fixed reclocking of output at 143, 177, 270, 360 or 540 Mb/s
- Bypass mode for non-reclocked data rates





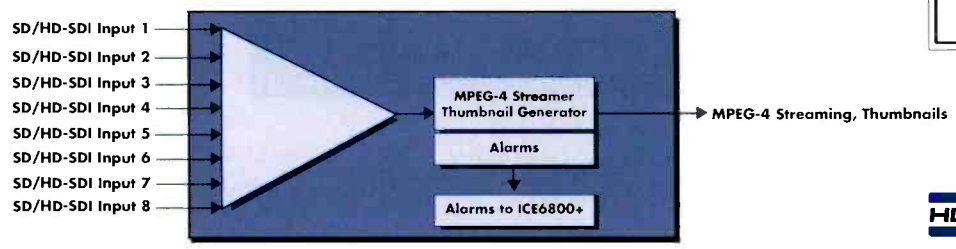
OSS6800+S, OSM6800+S Back Connector

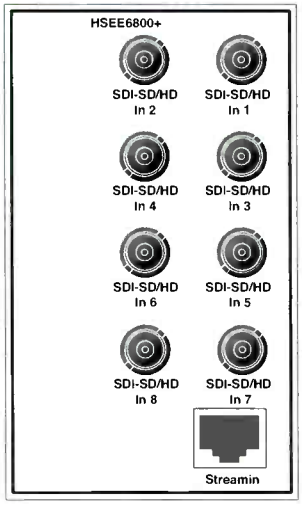
QSEE6800+HS, HST — HD/SD Customizable Monitoring

QSEE6800+HS: HD/SD customizable monitoring
QSEE6800+HST: 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 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 for QSEE6800 with licenses



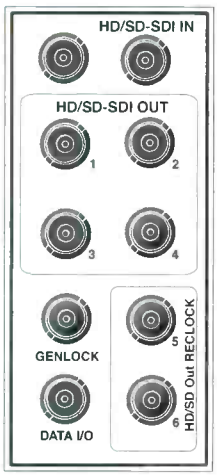


QSEE6800+HS, QSEE6800+HST Back Connector

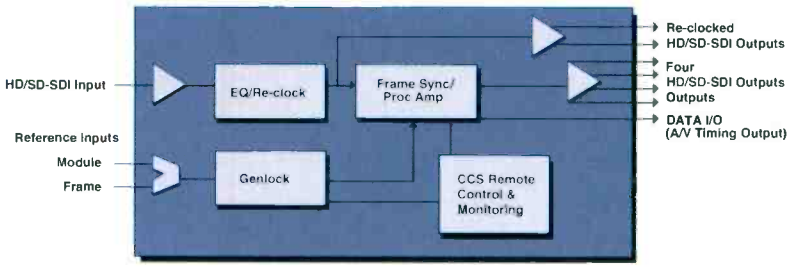
HFS6801+ — HD/SD-SDI Video Frame Synchronizer / Processor

The HFS6801+ is an HDTV auto-sensing HD/SD-SDI video frame synchronizer/processor.

- Auto-sensing HD or SD-SDI input
- 10-bit signal processing for high quality
- User adjustments include H Phase, V Phase, Black level, luminance gain, Cb gain and Cr gain
- Video delay of up to 8 frames less two lines for 1080i standards, and 16 frames less two lines for 720p standard
- In Delay mode passes VANC (Vertical Ancillary) and HANC (Horizontal) data, including compressed audio such as Dolby® E
- When input video is hot switched, the module cleanly handles the output video
- Internal test generator can output color bars for signal path testing
- Card-edge LEDs to indicate video input presence/standard, Genlock presence, and when output video is frozen



HFS6801+
Back Connector



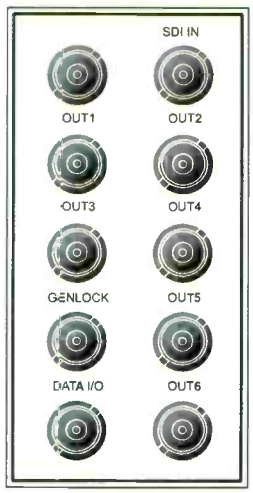
HDTV CCS SNMP

6800+™ HDTV VIDEO

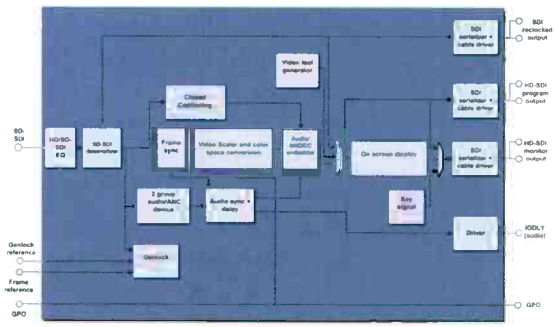
XHD6800+U2 — Broadcast-quality Upconverter

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 reclocked 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)
- On-screen display of parameters and controls for setup and configuration
- SDI output with on-screen safe area overlay
- Optional closed captioning support, transcodes closed captioning from SD to HD signal formats



XHD6800+U1, U2
Back Connector



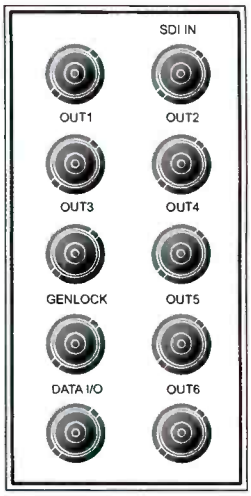
HDTV CCS SNMP

6800+™ HDTV VIDEO

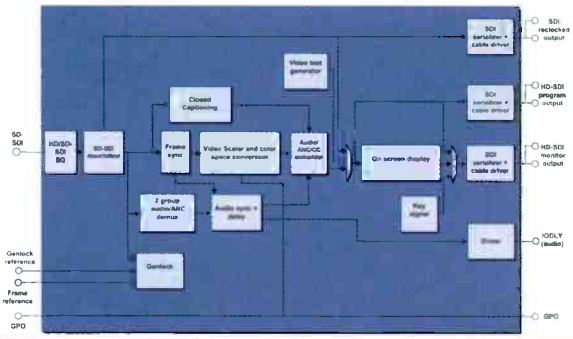
XHD6800+U1 Utility-quality Upconverter

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 reclocked 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)
- On-screen display of parameters and controls for setup and configuration
- HD video test generator
- SDI output with on-screen safe area overlay
- Field upgradeable to broadcast-quality upconversion
- Optional closed captioning support, transcodes closed captioning from SD to HD signal formats



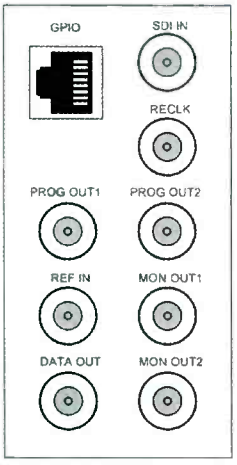
XHD6800+U1, U2
Back Connector



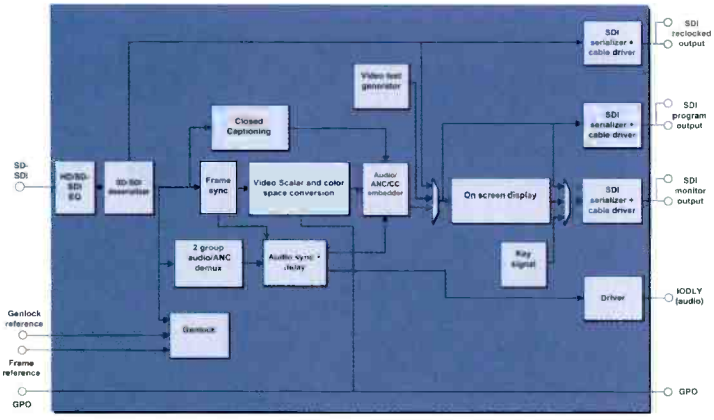
HDTV CCS SNMP

XHD6800+A SDTV — Aspect Ratio Converter

- Automatic input format detection
- High-performance 3D de-interlacer/scalar
- User-configureable picture resizing and positioning (H/V size, H/V position)
- Preset aspect ratios (16:9 Anamorphic, 16:9 Cut, 14:9, 4:3, Pixel True)
- Field upgradeable to XHD6800+U2 broadcast-quality HDTV conversion
- On-screen display of parameters and controls for setup and configuration
- Frame sync with matching audio delay
- GPI inputs/outputs for remote control and status monitoring



XHD6800+A SDTV
Back Connector



HDTV CCS SNMP

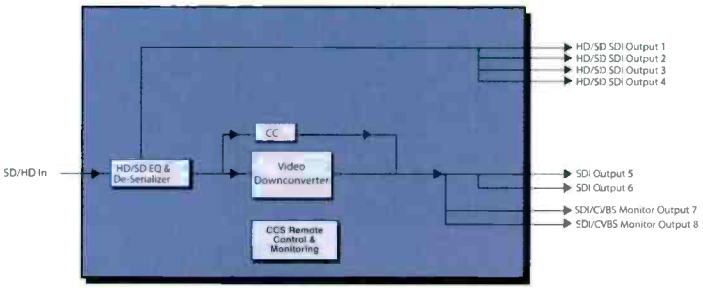
HDC6800+, HDC6800+A — HDTV Utility Downconverter

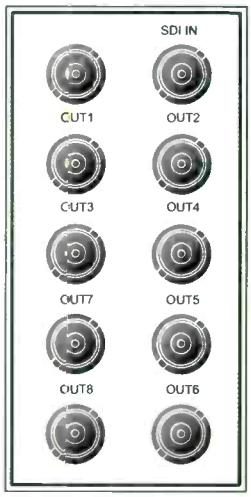
The HDC6800+ provides 10-bit digital down-conversion with user-selectable choice of outputs for use in utility applications.

- 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
- On-screen display of parameters and controls for setup and configuration
- SDI output with on-screen 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





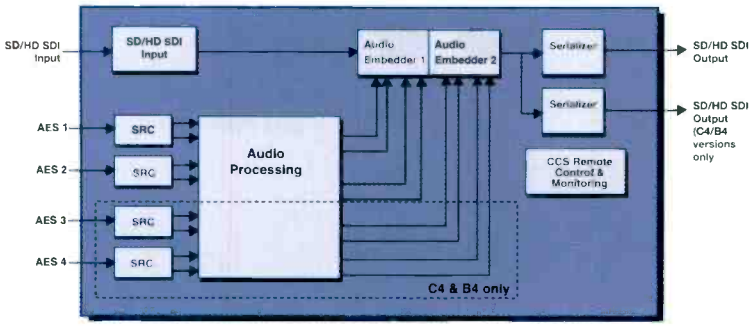
HDC5800+, HDC6800+A Back Connector

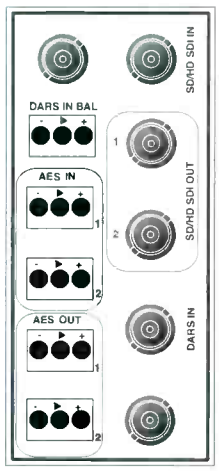
HDTV CCS SNMP

HMX6801+B2, C2, B4, C4 — HD/SD-SDI AES Audio Multiplexers

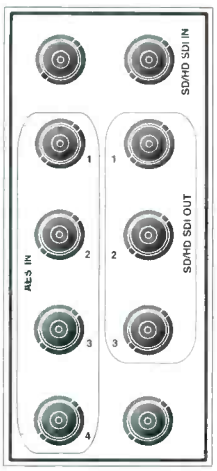
The HMX6801+ AES multiplexers embed two to four AES audio signals into a single 1.485 Gb/s HD or 270 Mb/s SD video stream.

- Automatic detection of input video standard
- Select any mix of audio channel(s) to embed into up to two 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



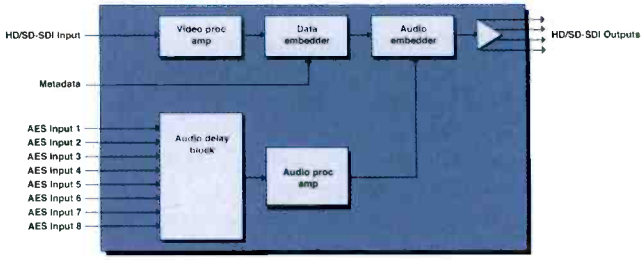
HMX6801+C4 Back Connector. Balanced (+B4) version also available

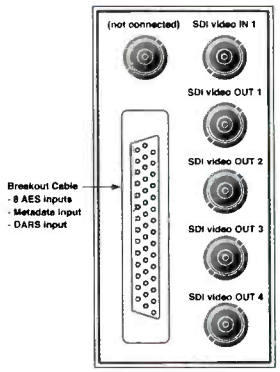
HDTV CCS SNMP

HMX6800+BC8 — Auto-sensing HD/SD-SDI Multiplexer

The HMX6800+BC8 auto-sensing HD/SD-SDI audio multiplexer embeds 8 AES audio signals and metadata into a single 1.5 Gb/s HD or 270 Mb/s SD video stream. Built-in video and audio processing amplifiers allow for full control over the picture and sound.

- Automatic detection of input video standards
- 24-bit AES input audio embedding
- Sample rate conversion disable on AES inputs for Dolby®/compressed audio embedding
- Data embedding (Dolby® E metadata)
- 16-, 20-, or 24-bit audio processing (selectable word length in channel pairs)
- Audio test tone generator
- Programmable audio delay (up to 1.3 s)
- Optional ancillary data space cleaning mode before embedding
- Video delay for 1 video stream (up to 5 frames for HD and 25 frames for SD)
- HD and SD video processing amplifier with controls for luminance gain, luminance offset, chrominance gain, chrominance offset, white clip, black clip, and hue (SD only)
- Audio processing with controls for delay, gain, invert, channel multiplexing, and averaging
- Thumbnail streaming of output video (when installed in an FR6802+QXF frame with 6800+ETH Ethernet resource module)





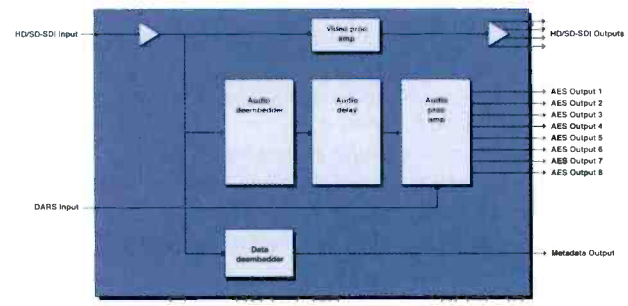
HMX6800+BC8
Back Connector.

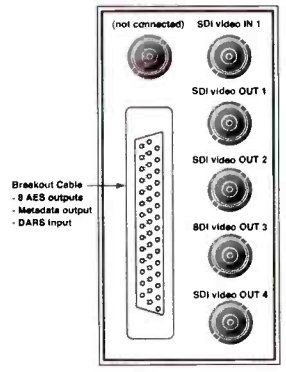
SNMP CCS Q-SEE™

HDX6800+BC8 — Auto-sensing HD/SD-SDI Multiplexer

The HDX6800+BC8 auto-sensing HD/SD-SDI audio demultiplexer de-embeds 8 AES audio signals and metadata from one HD/SD-SDI video stream in both balanced and unbalanced formats. Built-in video and audio processing amplifiers allow for full control over picture and sound.

- Automatic detection of input video standard
- 24-bit AES input audio de-embedding
- Dolby® E metadata de-embedding
- 16-, 20-, or 24-bit audio processing (selectable word length in channel pairs)
- Programmable audio delay (up to 1.3 s)
- Video delay for 1 video stream (up to 5 frames for HD and 25 frames for SD)
- HD and SD video processing amplifier with controls for luminance gain, luminance offset, chrominance gain, chrominance offset, white clip, black clip, and hue (SD only)
- Audio processing amplifier with controls for delay, gain, invert, channel multiplexing, and averaging
- Audio test tone generator
- Thumbnail streaming of output video (when installed in an FR6802+QXF frame with 6800+ETH Ethernet resource module)





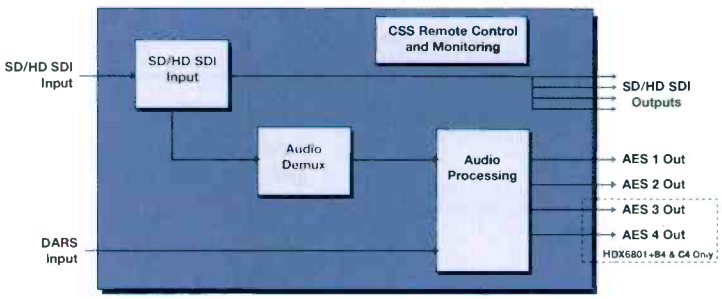
HDX6800+BC8
Back Connector.

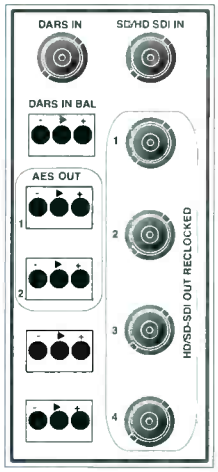
SNMP CCS Q-SEE™

HDX6801+B2, C2, B4, C4 — HD/SD-SDI AES Audio Demultiplexers

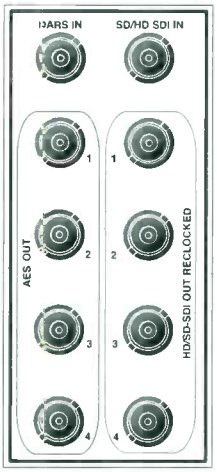
The HDX6801+ audio demultiplexers de-embed two to four AES audio signals from a single 1.485 Gb/s HD or 270 Mb/s SD video stream.

- Automatic detection of input video standard
- 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 pair
- 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



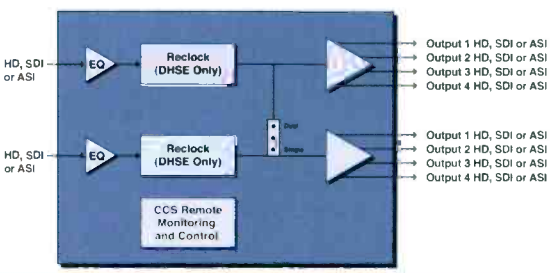
HDX6801+C4 Back Connector. Balanced (+B4) version also available

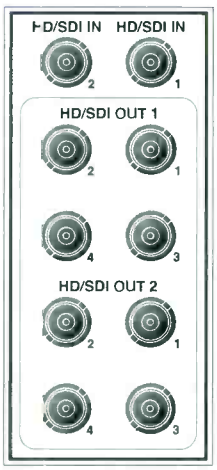
HDTV CCS SNMP

DHSE6802+ — Dual HDTV, ASI, SDI Reclocking Distribution Amplifier
DHSD6802+ — Dual HDTV, ASI, SDI Distribution Amplifier

The DHSE6802+ and DHSD6802+ dual DAs provide 2 channels of HD/SD-SDI video distribution with cable equalizing (and reclocking on DHSE only). The DHSD/DHSE6802+ 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 (270 and 1.5 Gb/s and 3 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
- FR6802+X(F) and FR6802+QXF frames





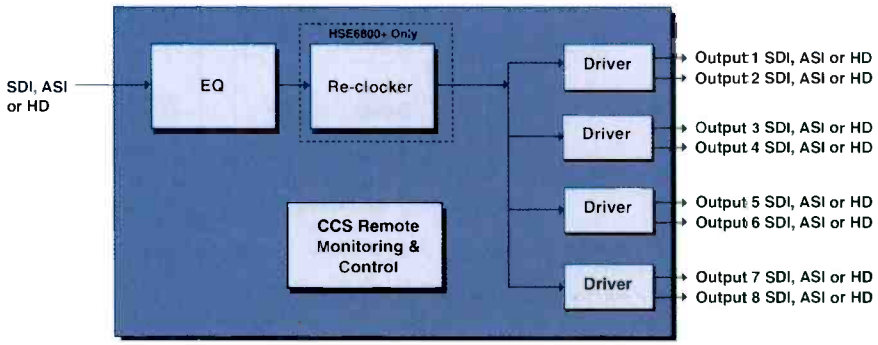
DHSE6802+ and DHSD6802+ Double-Slot Back Connector

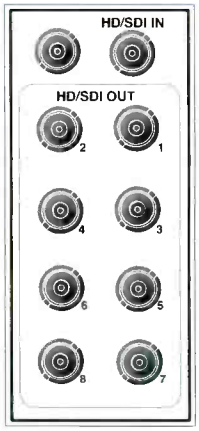
HDTV CCS SNMP

HSD6802+ — HDTV, ASI, SDI Distribution Amplifier
HSR6802+ — HDTV, ASI, SDI Reclocking Distribution Amplifier

The HSD6802+ and HSR6802+ 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 270 and 540 Mb/s; and 1.485 Gb/s (HSE6800+ only) and 3 Gb/s
- Reclocking status report and automatic/enforced bypass (HSE6800+ only)
- For use in the FR6802+X/XF and FR6802+QXF frames





HSD6802+ and HSE6802+ Double-Slot Back Connector

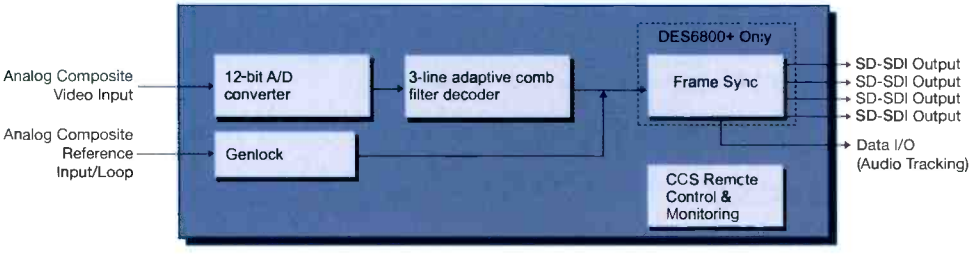
HSD6802+ and HSE6802+ Single-Slot Back Connector

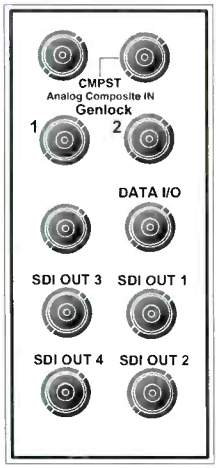
HDTV CCS SNMP

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 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

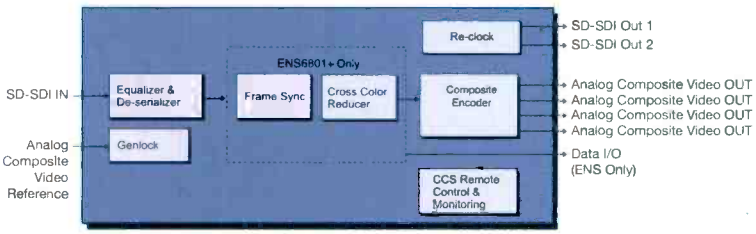
ENC6801+ — SDI Video Encoder
ENS6801+ — SDI Video Encoder / Synchronizer

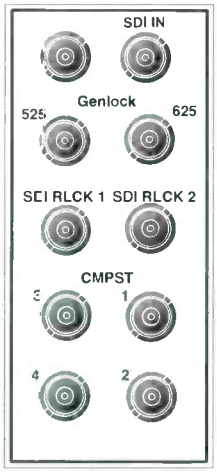
The ENC6801+ and ENS6801+ are high-precision 12-bit digital encoders that convert 4:2:2 digital video into NTSC or PAL composite video.

- NTSC, PAL-M/B with settings shadowed/restored
- 12-bit digital processing, output over-sampled at 54 MHz
- 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





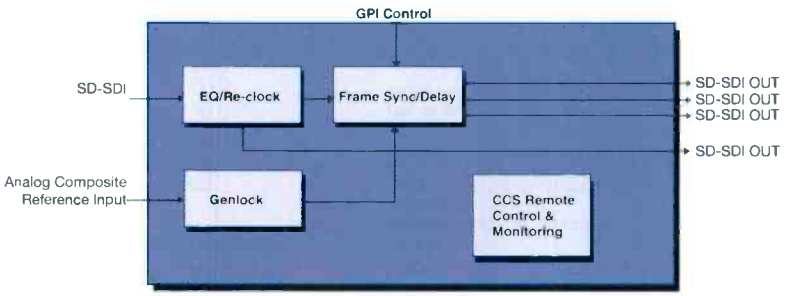
ENC6801+ and ENS6801+ Back Connector

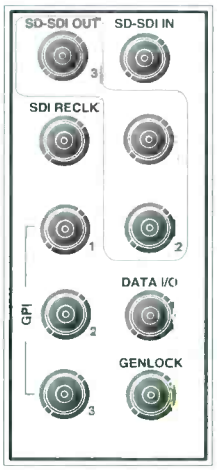
Q-SEE. CCS SNMP

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





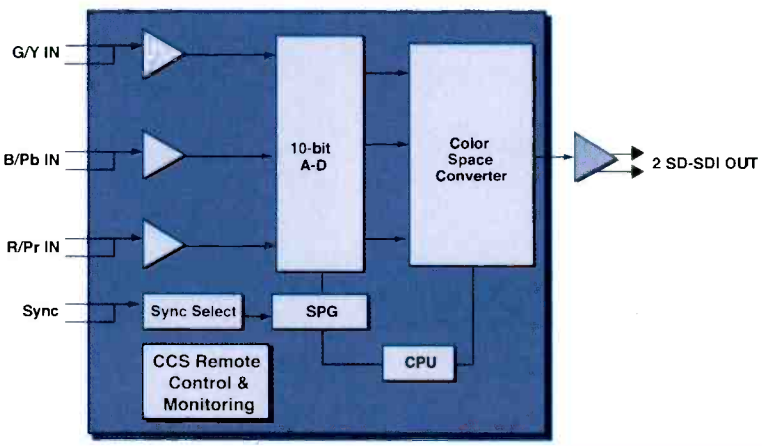
VFS6800+ Double-Slot Back Connector

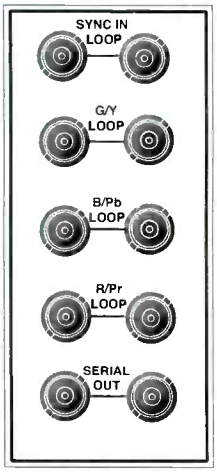
VFS6800+ Single-Slot Back Connector

CCS SNMP

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



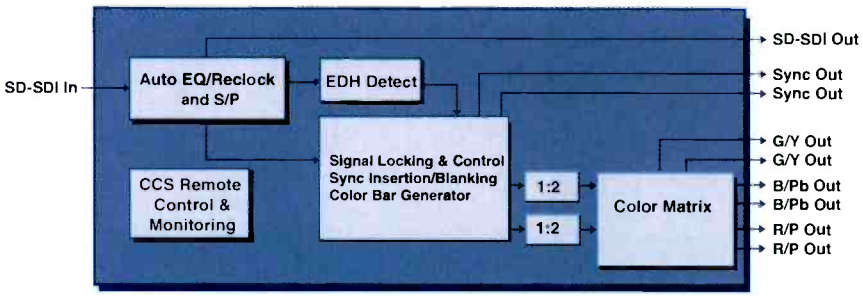


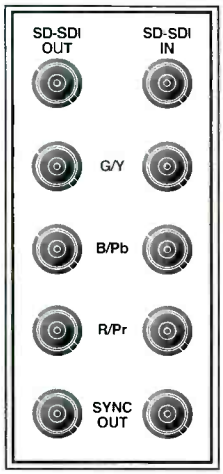
ADV6800+ Back Connector

CCS SNMP

DAV6800+ — SDI to Analog Component Video Converter

- High-performance, 12-bit digital-to-analog conversion
- Support for SMPTE/EBU, NTSC, Beta, and M-II YPbPr and RGB formats
- Supports card-edge and remote control of module (via CCSTM and third-party SNMP-based systems)
- EDH error detection
- Selective vertical blanking
- Digital Gain and Offset adjustment
- Built-in color bar test signals
- RoHS-compliant





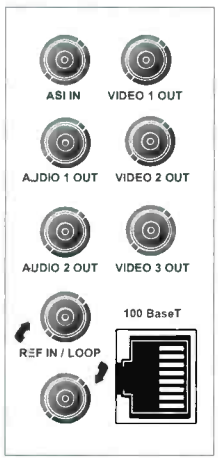
DAV6800+ Back Connector

CCS SNMP

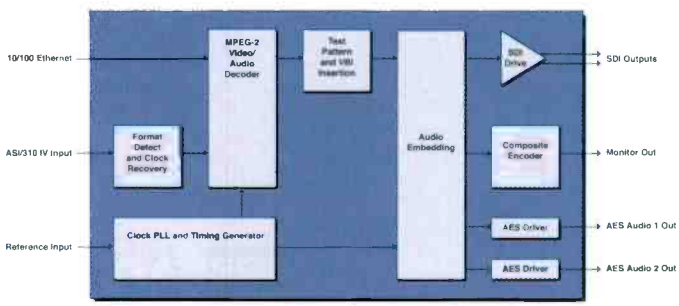
MFD6800+ — Multiformat Decoder

The MFD6800+ multi-format decoder extends the flexibility of the 6800+ platform by adding a Multiformat video decoder to the line of modules. The MFD6800+ is a single 6800+ module that decodes either H.264 or MPEG-2 HD and SD video signals and their commonly associated audio signals.

- Supported Audio Decoding/Processing Formats
  - AAC-LC 2.0
  - HE-AAC 2.0
  - Dolby® AC-3 2.0
  - SMPTE-302
- Supported Video Decoding Formats
  - HD H.264/MPEG-4 Part 10 Decoding
  - SD H.264/MPEG-4 Part 10 Decoding
  - HD MPEG-2 Decoding
  - SD MPEG-2 Decoding
- Supported Input formats
  - DVB-ASI
  - IP inputs
- Supported output formats
  - High Definition (SMPTE-292M)
  - Standard Definition (SMPTE-259M)
- Extensive VBI processing support
- External reference input



MFD6800+ Back Connector

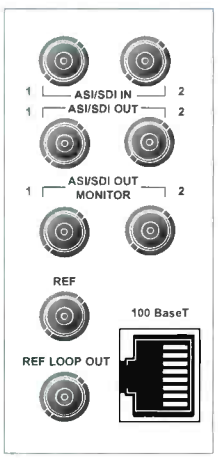


HDTV CCS SNMP

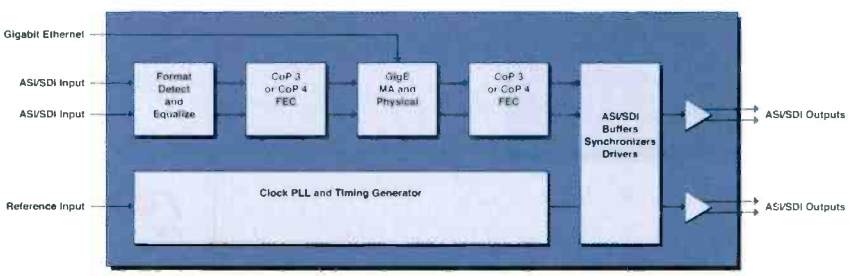
IPV6800+ — Video Gateway

The IPV6800+ IP Video Gateway module is an extension of the comprehensive set of line cards in the 6800+ series. The IPV6800+ links traditional SDI and ASI-based video plants through modern Gigabit Ethernet networks and provides a cost-effective alternative to expensive satellite-based ASI links.

- Bidirectional transmission of either ASI/SDI to IP or IP to ASI/SDI
- Two independent transmit channels
- Two independent receive channels
- All transmit and receive channels may be either ASI or SDI
- Simultaneously send or receive in either direction without interference
- Add Forward Error Correction (FEC) for robust data transmission
- Transmit or receive IP Uni-Cast or Multi-Cast video streams
- Control using CCSP and over IP
- Encapsulate up to two ASI streams or un-compressed SDI (SMPTE 259M) into RTP packets and transmits over IP
- De-encapsulate ASI streams or un-compressed SDI (SMPTE 259M) from an IP transport
- Synchronize SDI output to house reference



IPV6800+ Back Connector

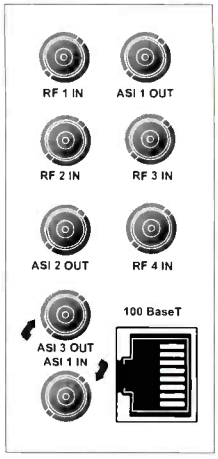


HDTV CCS SNMP

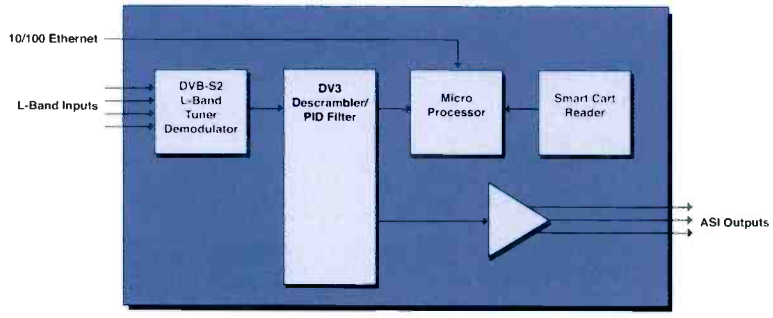
SRD6800+ — Satellite Receiver and Demodulator

The SRD6800+ Satellite Receiver and Demodulator module provides a cost-effective alternative to more expensive single-function satellite demodulation units. Packed with a rich list of features, the SRD6800+ is capable of receiving various types of satellite signals and provides an industry-standard ASI output for distribution or decoding.

- L-Band satellite tuner supports
  - DVB-S (QPSK)
  - DVB-S2 (QPSK and 8PSK)
- Four (4) active software selectable F-type inputs
- 950-2150 MHz input frequency selection
- DC power and 22 Hz tone configurable on selected input
- Conditional Access (CA) Support
  - DVB fixed-key decryption (BISS modes 0, 1, and E)
  - Integral smart-card reader (consult factory for supported CA vendors)
- PID filtering
- ASI input for CA decrypting or PID filtering
- Control using CCSP and over IP



SRD6800+
Back Connector

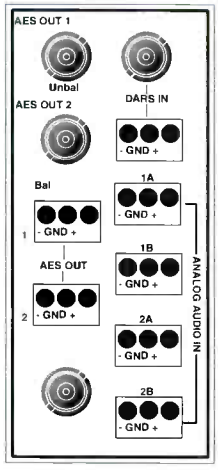


HDTV CCS SNMP

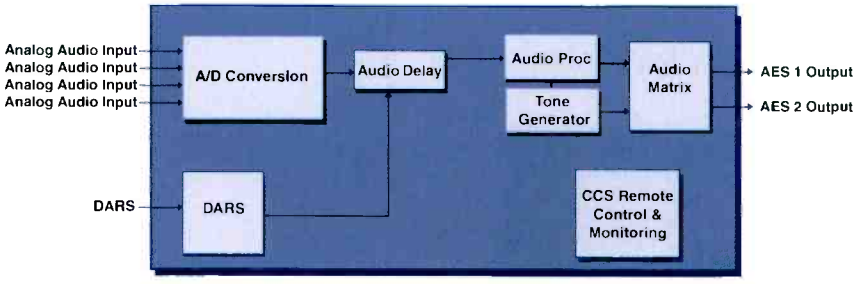
ADC6800+A4BC — Audio Analog to AES Converters

The ADC6800+ A4BC is a four-channel analog audio to AES audio converter 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



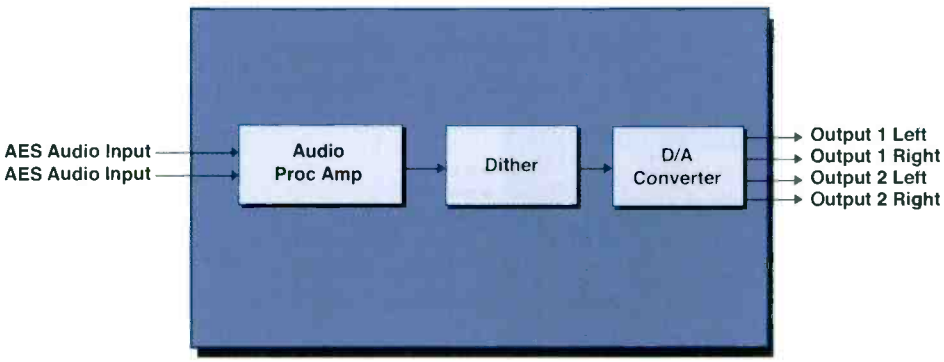
ADC6800+A4BC
Back Connector

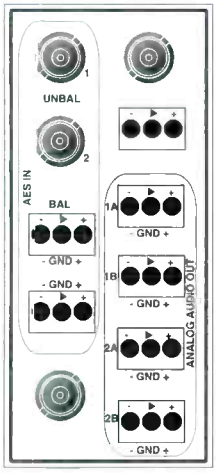


CCS SNMP

DAC6800+BCA4 — AES to Analog Audio Converters

- High-quality, 24-bit D to A conversion
- 4 analog audio outputs
- 4-channel versions
- Provides 110 ohm balanced (AES3-1992) and 75 ohm coaxial (SMPTE-276) AES inputs
- 600 ohm output impedance option available
- Supports audio sample rates from 32 KHz to 96 KHz on AES inputs





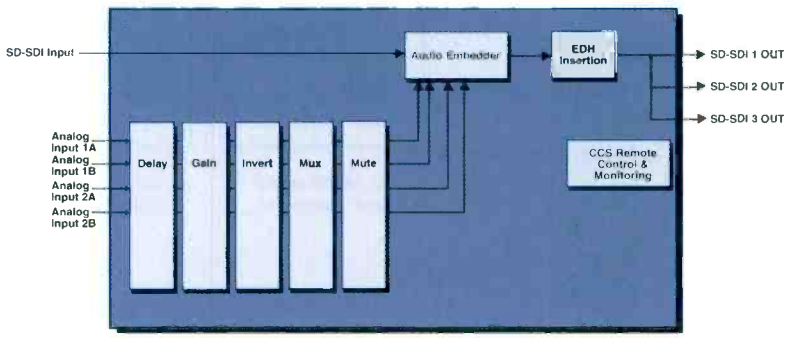
DAC6800+BCA4
Back Connector

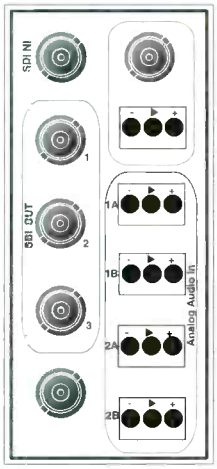
CCS SNMP

MXA6800+A4 — Analog Audio Multiplexers

The MXA6800+A4 analog audio multiplexer embeds up to two audio groups onto an SD 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





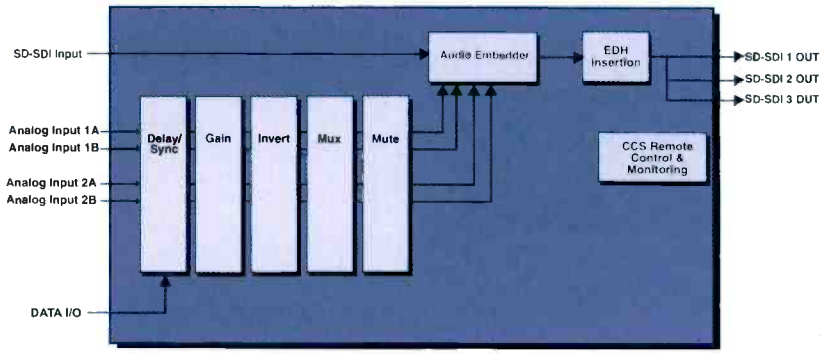
MXA6800+A4
Back Connector

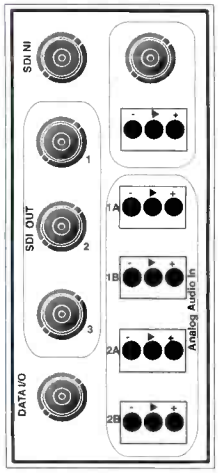
CCS SNMP

MSA6800+A4 — Analog Audio Multiplexer with Synchronizer and Delay

The MSA6800+A4 analog audio multiplexers with sync and delay combine the function of embedding one audio group onto an SD 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





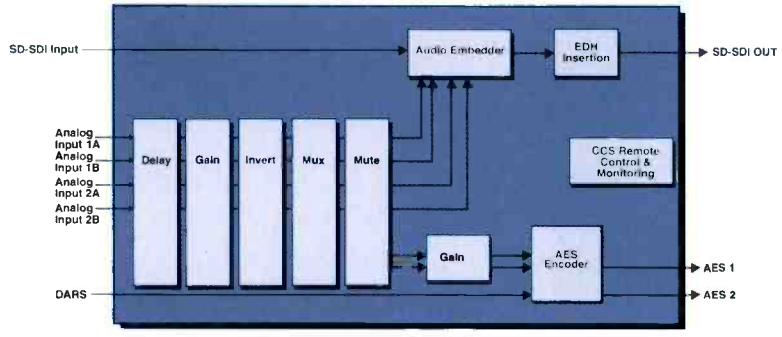
MSA6800+A4
Double-Slot
Back Connector

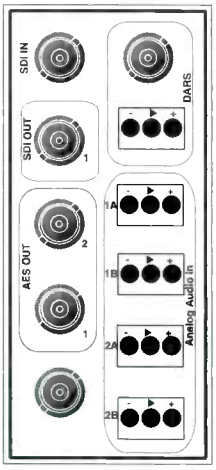
CCS SNMP

MXA6800+A4B2, A4C2 — Analog / AES Audio Multiplexers

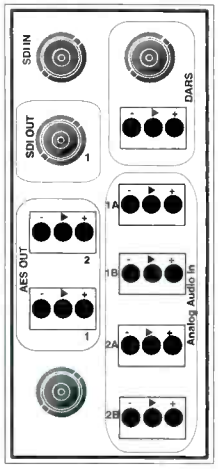
The MXA6800+A4B2 and MXA6800+A4C2 audio multiplexers provide audio embedding up to four-channel analog to a serial digital interface (SDI) output, and up to two-channel AES with outputs.

- 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
Back Connector



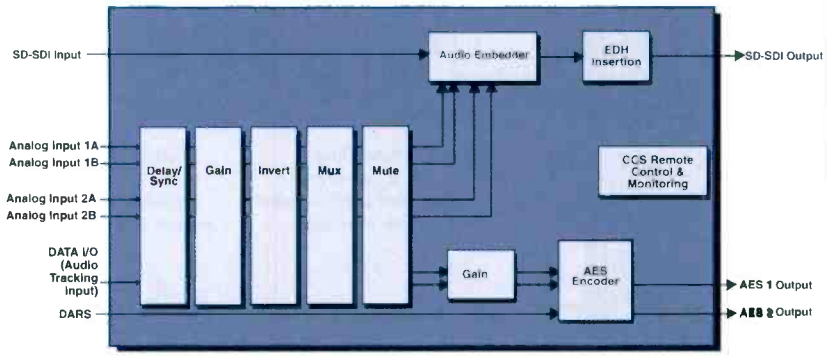
MXA6800+A4B2
Back Connector

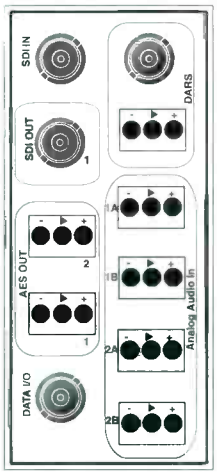
CCS SNMP

MSA6800+A4B2, A4C2 — Analog Audio Multiplexers with Synchronizer, Delay & AES Outputs

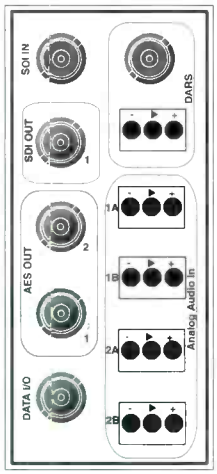
The MSA6800+ analog audio multiplexers with sync and delay combine the function of embedding one audio group onto a serial digital video stream with video synchronization, delay capabilities and AES outputs — all in one module.

- 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+A4B2 Back Connector



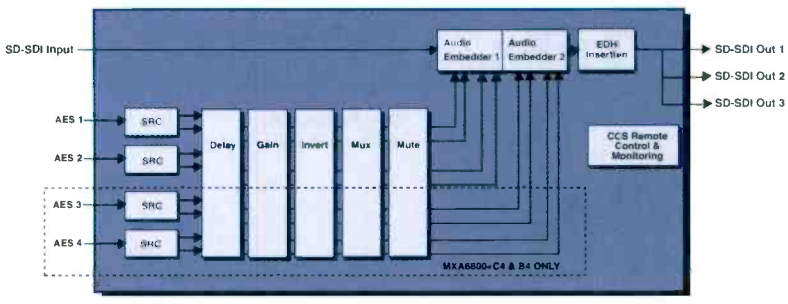
MSA6800+A4C2 Back Connector

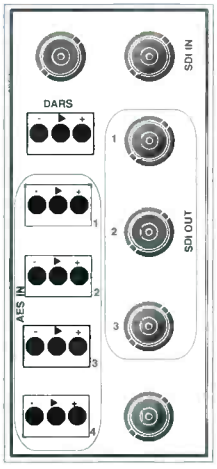
CCS SNMP

MXA6800+B2, B4, C2, C4 — AES Digital Audio Multiplexers

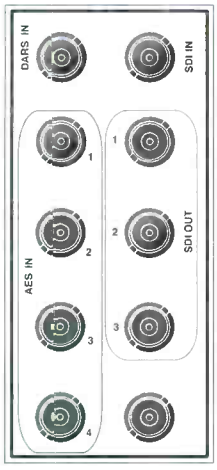
The MXA6800+ B2/B4/C2/C4 AES audio multiplexers embed up to two audio groups onto an SD serial digital video stream.

- 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



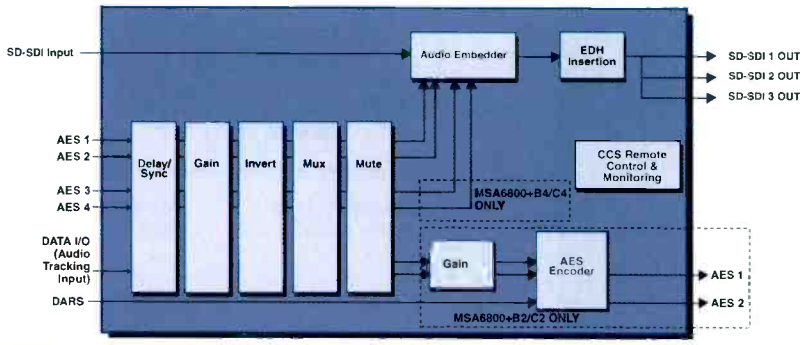
MXA6800+C2 and C4 Back Connectors

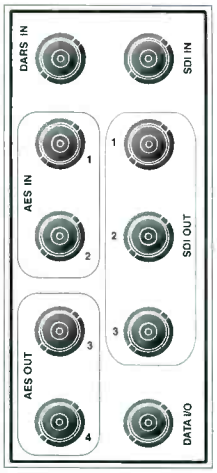
CCS SNMP

MSA6800+B2, B4, C2, C4 — AES Multiplexers with Synchronizer & Delay

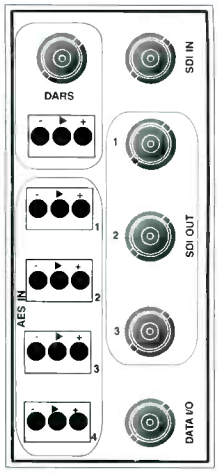
The MSA6800+ AES digital audio multiplexers with audio sync and delay combine the function of embedding up to two audio groups onto a serial digital video stream with video synchronization and delay capabilities, all in one module.

- 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 avaliable

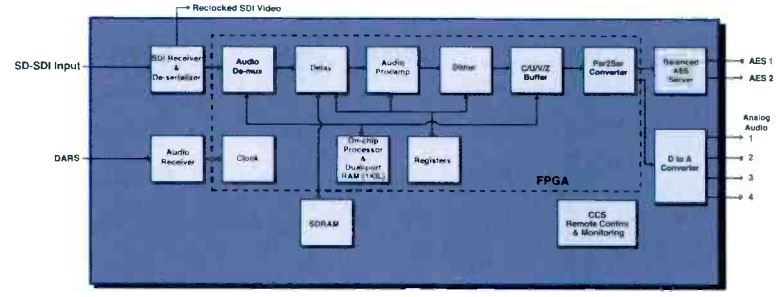


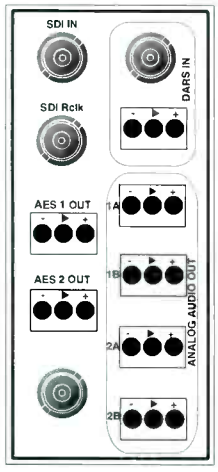
MSA6800+B4 Back Connector. Unbalanced (+C4) version also available

DMX6800+A4B2, A4C2 — Analog/AES Audio Demultiplexers

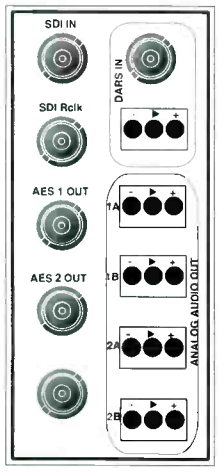
The DMX6800+ A4B2/A4C2 analog and AES audio demultiplexers provide audio de-embedding from an SDI input with up to two-channel AES and up to four-channel analog output.

- 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
- Available 600 ohm output impedance option





DMX6800+A4B2 Back Connector

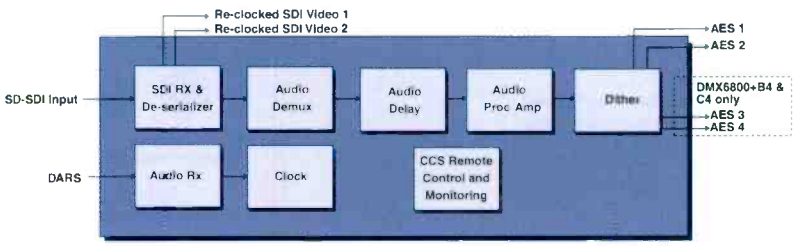


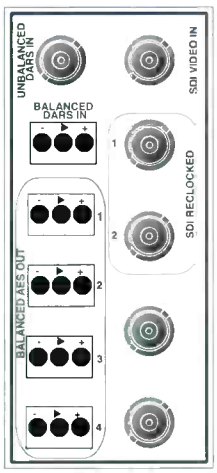
DMX6800+A4C2 Back Connector

DMX6800+B2, B4, C2, C4 — AES Audio Demultiplexers

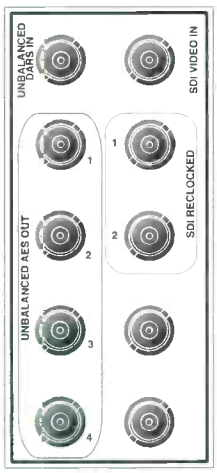
The DMX6800+ B2/B4/C2/C4 AES digital audio demultiplexers support up to four balanced or unbalanced AES audio outputs.

- 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

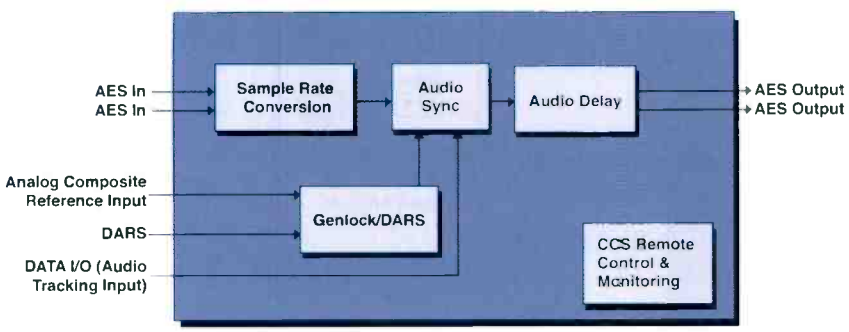


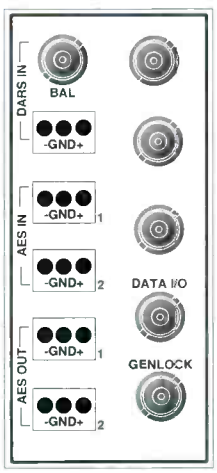
DMX6800+C2 and C4 Back Connector

ADS6800+B2, C2 — AES Audio Delay Synchronizer

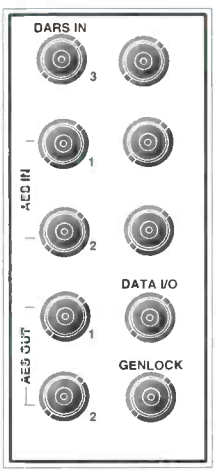
The ADS6800+ B2/C2 audio delay synchronizers support two AES inputs and outputs on either balanced or unbalanced formats.

- 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

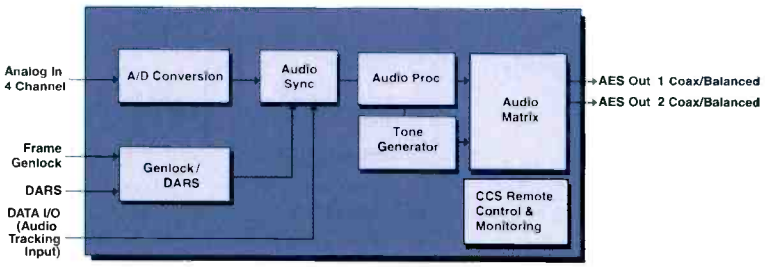


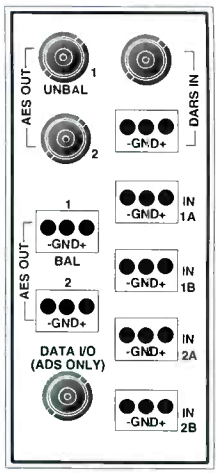
ADS6800+C2 Back Connector

ADS6800+A4BC — Audio Delay Synchronizer with A to D Conversion

The ADS6800+ A4BC is an audio delay synchronizer 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
- 32/48/96 kHz 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



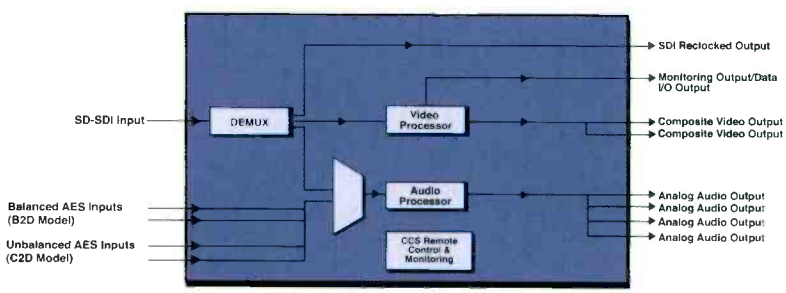


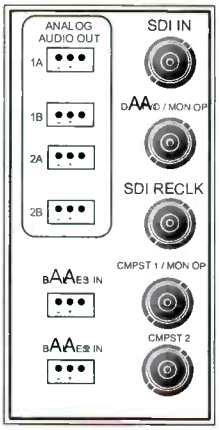
ADS6800
Back Connector

CCS SNMP

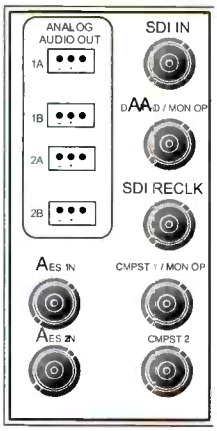
EAS6800+B2A4D,C2A4D — Broadcast-quality Digital-to-Analog, Video and Audio Monitoring

- 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 an SDI into a composite analog signal; supports NTSC, PAL-B and PAL-M output video formats





EAS6800+B2
Back Module



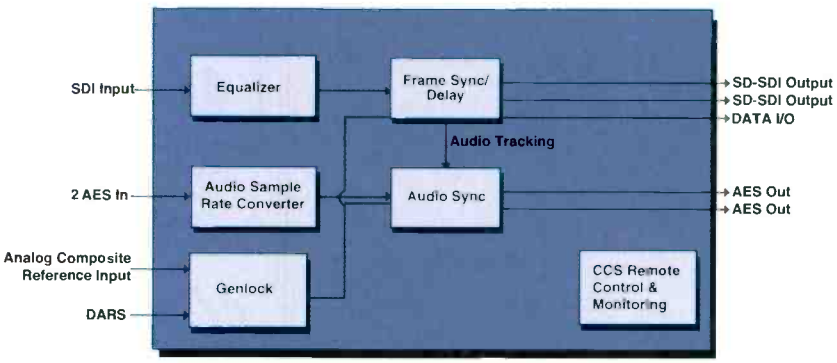
EAS6800+C2
Back Module

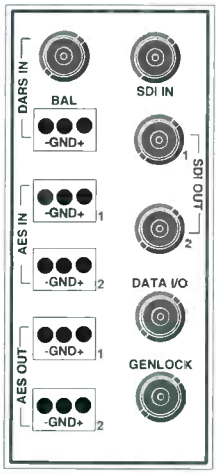
Q-SEE CCS SNMP

AVS6800+B2, C2 — SDI/AES Synchronizer/Processor

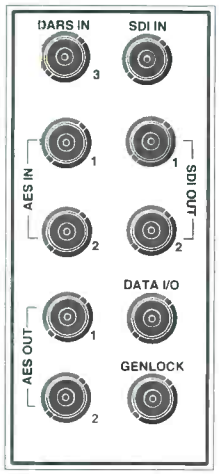
The AVS6800+ B2/C2 are single modules that combine SDI frame synchronizer and audio delay synchronizer functions.

- 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

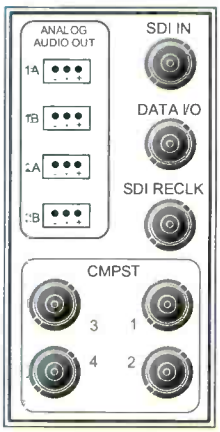


AVS6800+C2 Back Connector

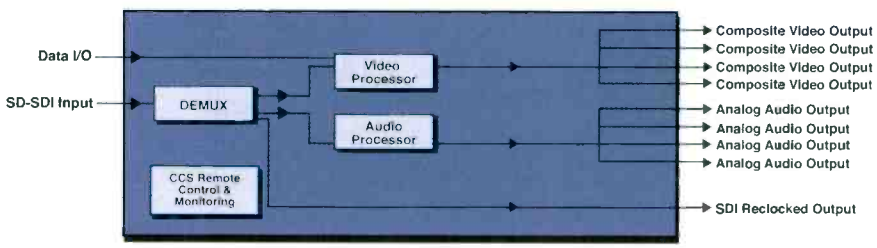
CCS SNMP

VAM6800+A4 — Digital-to-Analog Video and Audio Monitoring

- SD-SDI input SMPTE 259M-C 270 Mb/s
- Data inputs (external sync for video and audio)
- 4 composite analog video outputs
- SD-SDI re-clocked output SMPTE 259M-C 270 Mb/s
- 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 an SDI into a composite analog signal; supports NTSC, PAL-B and PAL-M output video formats



VAM6800+A4 Back Module

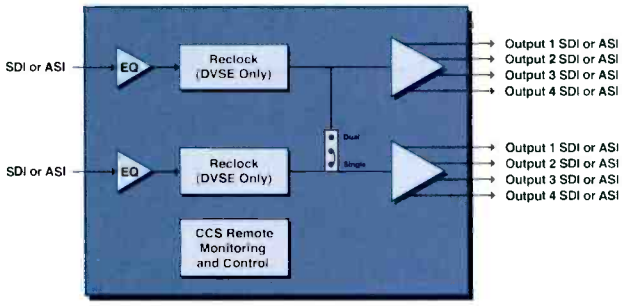


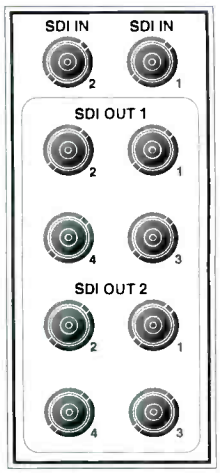
Q-SEE CCS SNMP

DVSE6802+ — SDI/ASI Video Equalizing and Reclocking Distribution Amplifier
DVSD6802+ — SDI/ASI Video Equalizing Distribution Amplifier

The DVSD6802/DVSE6802+ Dual DAs provide 2 channels of SDI/ASI video distribution with cable equalizing (and reclocking on DVSE only). The DVSD/DVSE6802+ 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 (270 Mb/s)
- Manual (force) reclock bypass option
- Alarm output
- For use in the FR6802+XF, FR6802+DM(F) and FR6802+QXF frames
- Input signal presence detection
- Automatic cable equalization
- Handles MPEG and ASI distribution on all outputs (SMPTE310 - 19.4 Mb/s to 270 Mb/s)
- Loss of input switch—guarantees input to all outputs if one of the two inputs is lost





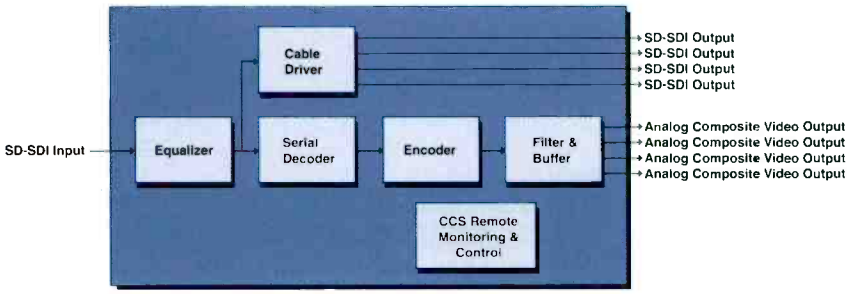
DVSE6802+ and DVSD6802+ Double-Slot Back Connector

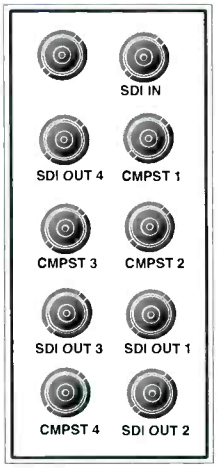
CCS SNMP

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

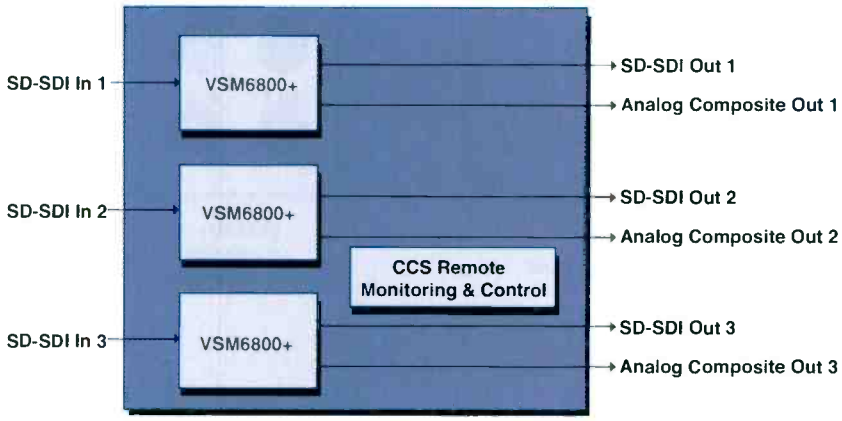
VSM6800+ Single-Slot Back Connector

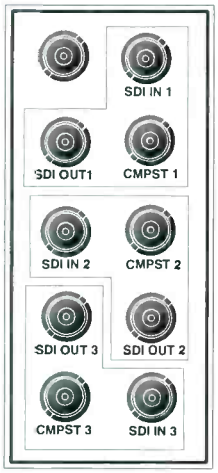
CCS SNMP

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)





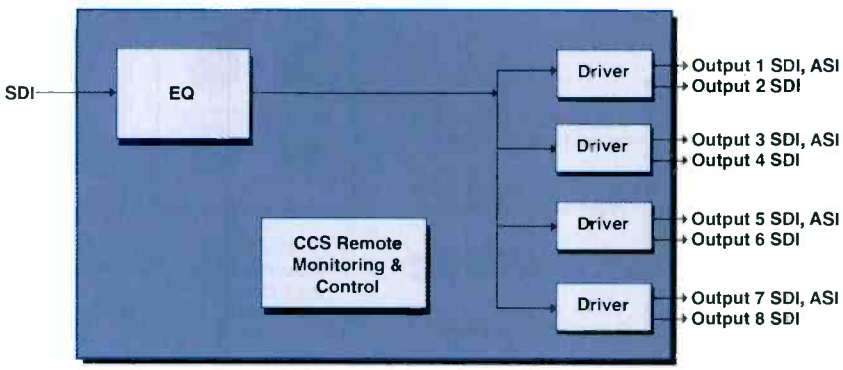
VTM6800+ Double-Slot Back Connector

CCS SNMP

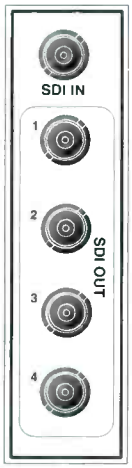
VSD6802+ — SDI Video Equalizing Distribution Amplifier

The VSD6802+ is a serial digital video distribution amplifier with cable equalizing.

- High-performance video, low cost
- Distributes any 10-540Mb/s data within the amplitude limitation
- Input signal presence detection
- Automatic cable equalization
- Alarm output



VSD6802+ Double-Slot Back Connecto·



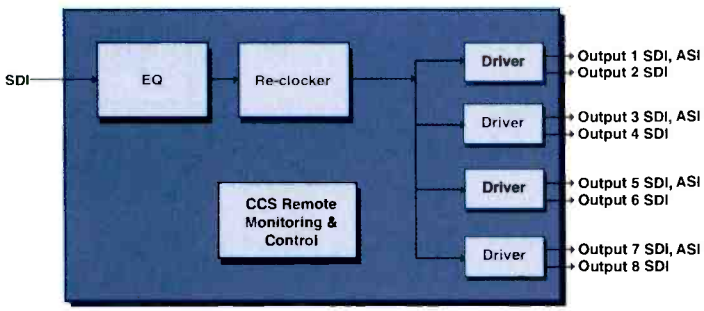
VSD6802+ Single-Slot Back Connector

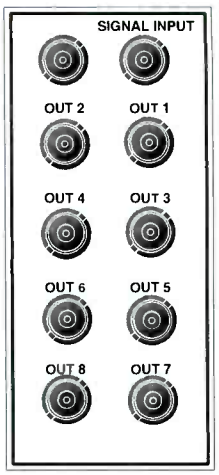
CCS SNMP

VSE6802+ — SDI Video Equalizing and Reclocking Distribution Amplifier

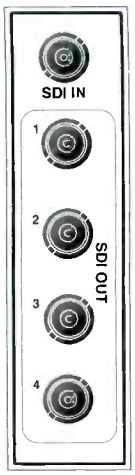
The VSE6802+ is a serial digital video DA with cable equalizing and reclocking.

- High-performance video, low cost
- Handles 143, 177, 270, 360 and 540 Mb/s SDI signals; and ASI signal (4 outputs only)
- Input signal presence detection
- Automatic cable equalization
- Alarm output
- Automatic/manual reclock rate select at 143/177/270/360/540 Mb/s
- Reclocking status report
- Automatic/manual bypass





VSE6802+ Double-Slot Back Connector



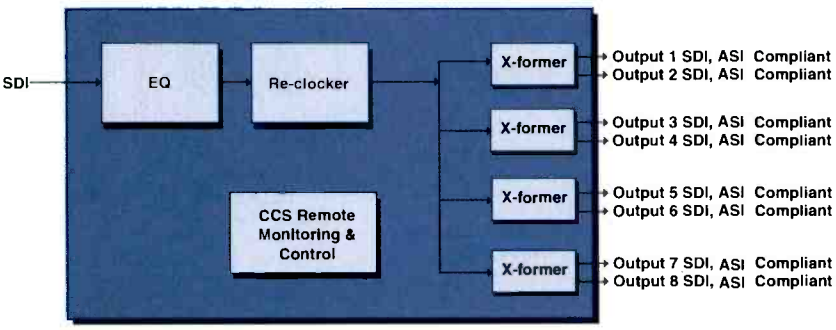
VSE6802+ Single-Slot Back Connector

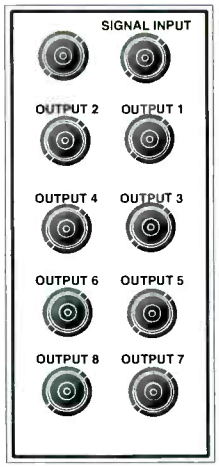
6800+™ DISTRIBUTION

VSI6800+ — SDI/ASI Equalizing Reclocking Distribution Amplifier

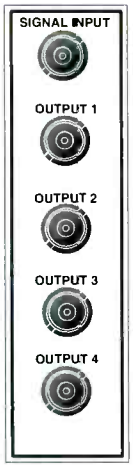
The VSI6800+ is a serial video distribution amplifier that meets the requirements of SMPTE 259ABC and DVB-ASI.

- 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

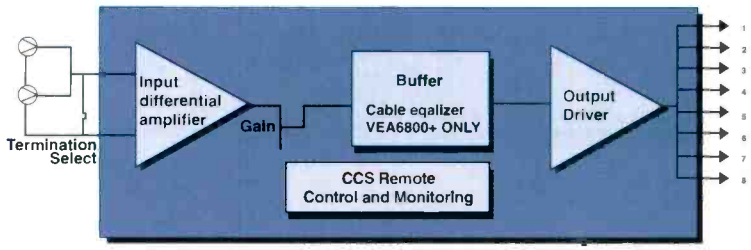
VDA6800+ — Composite Video Distribution Amplifier
VEA6800+ — Composite Video Equalizing Distribution Amplifier

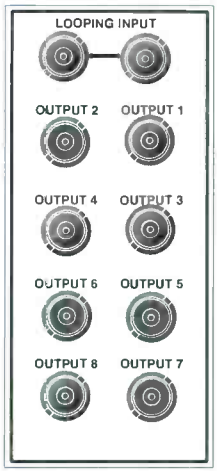
The VDA6800+ is a high-performance, high-reliability, cost-efficient, general-purpose analog video distribution amplifier. The VEA6800+ adds input video equalization.

- DC input coupling
- Looping and internal terminating selectable with double-slot back module, internal terminating with single-slot back module
- ± 3dB gain adjustable range, > 50 MHz bandwidth

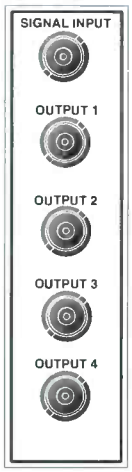
VEA6800+ adds:

- Continuous Cable Equalizing up to 984 ft (300 m) Belden 8281 cable, or equivalent





VDA6800+ and VEA6800+ Double-Slot Back Connector



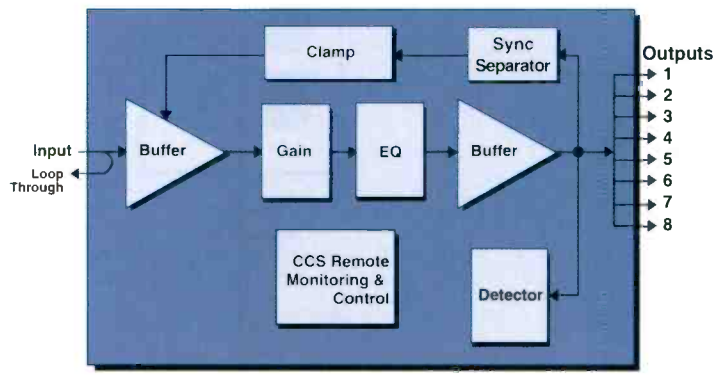
VDA6800+ and VEA6800+ Single-Slot Back Connector

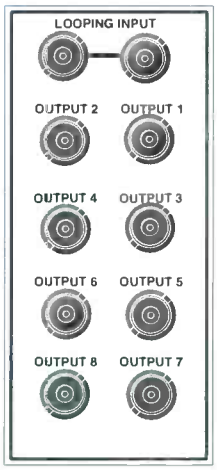
CCS SNMP

VRG6800+ — Composite Video Remote Gain Distribution Amplifier

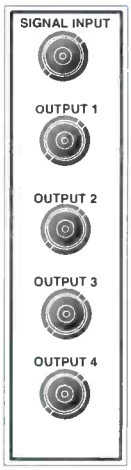
The VRG6800+ is an analog video remote gain and EQ distribution amplifier.

- 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



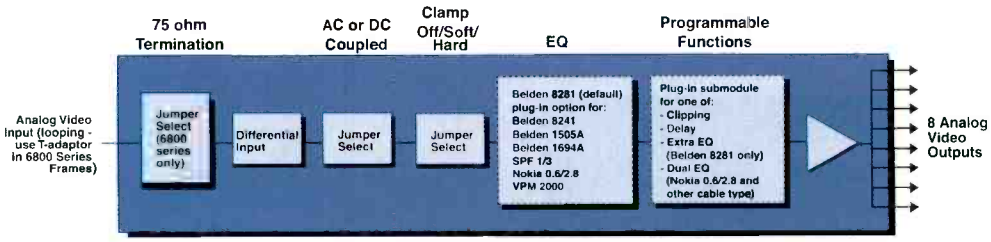
VRG6800+ Single-Slot Back Connector

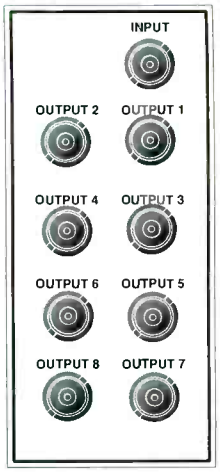
CCS SNMP

6800+™ DISTRIBUTION

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



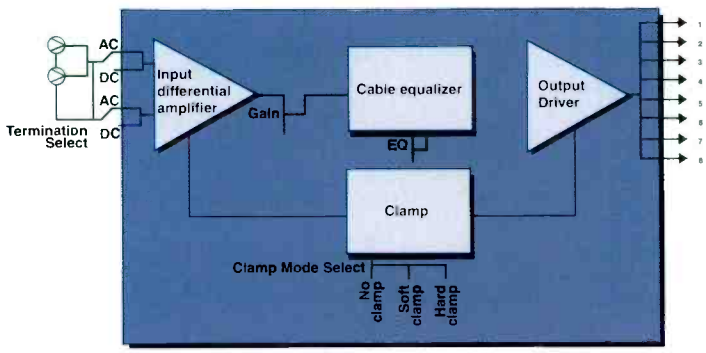


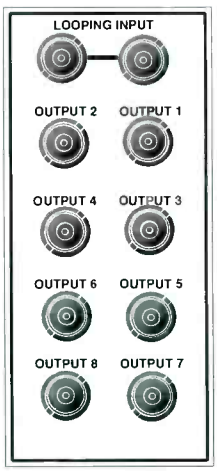
VPD-6830
Back Connector

VCA6800+ — Composite Video Equalizing and Clamping Distribution Amplifier

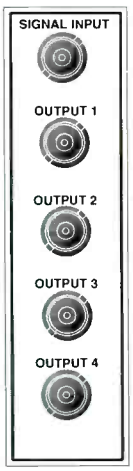
The VCA6800+ is an analog video clamping and equalizing distribution amplifier. This distribution amplifier is capable of hard and soft clamping to the composite NTSC and PAL video signal.

- 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

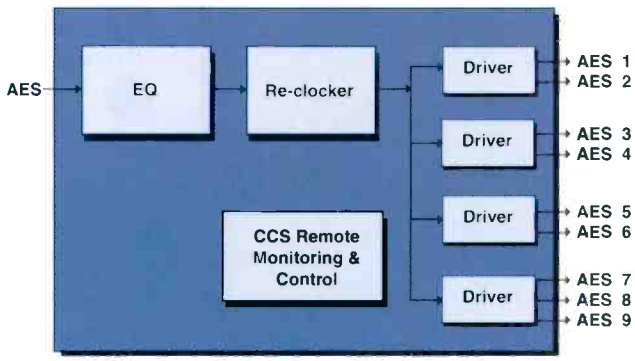


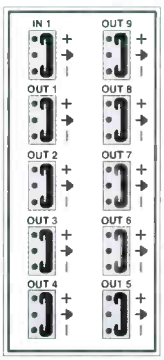
VCA6800+
Single-Slot
Back Connector

AES6800+B, C — AES Audio Distribution Amplifier

The AES6800+ B/C is a differential input, nine output AES/EBU digital audio distribution amplifier for use in balanced or unbalanced installations.

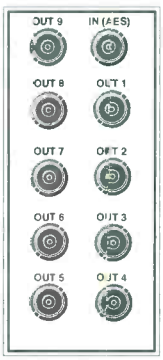
- Manual or automatic equalization modes
- Bypass mode for non-AES (non bi-phase encoded) signals up to 30 MHz 50% duty cycle
- Data reclocking provides jitter reduction
- LED indication of input lock and other important errors





AES6800+B Double-Slot Rear Connector

AES6800+B Single-Slot Rear Connector

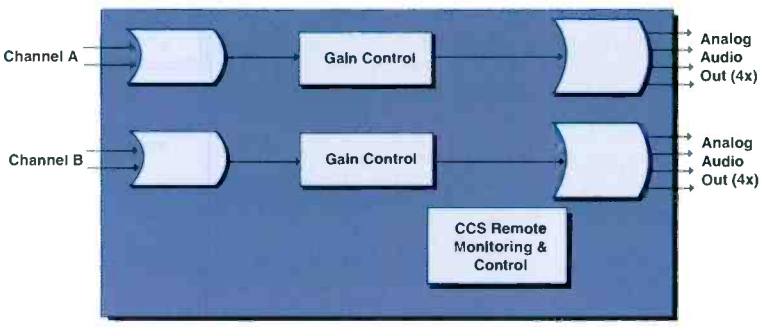


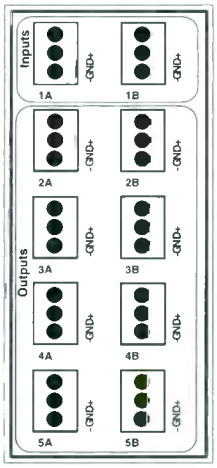
AES6800+C Double-Slot Rear Connector

AES6800+C Single-Slot Rear Connector

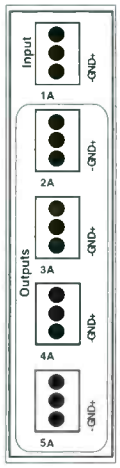
ARG6800+ — Analog Audio Remote Gain Distribution Amplifier

- 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)





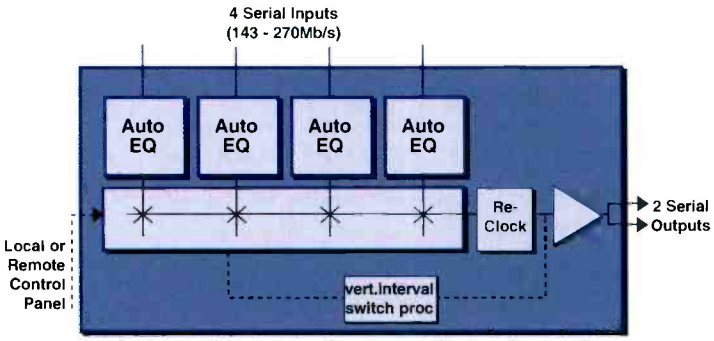
ARG6800+ Double-Slot Back Connector

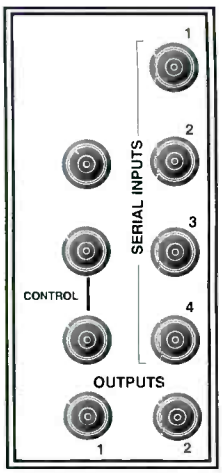


ARG6800+ Single-Slot Back Connector

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

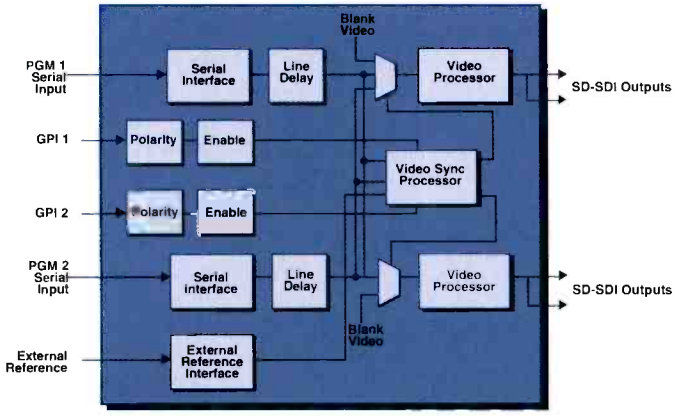


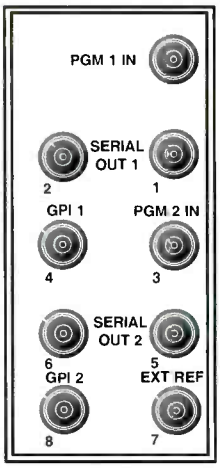


VSR-4041
Double-Slot
Back Connector

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

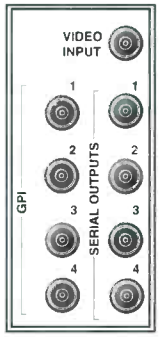




VTS-6801
Double-Slot
Back Connector

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

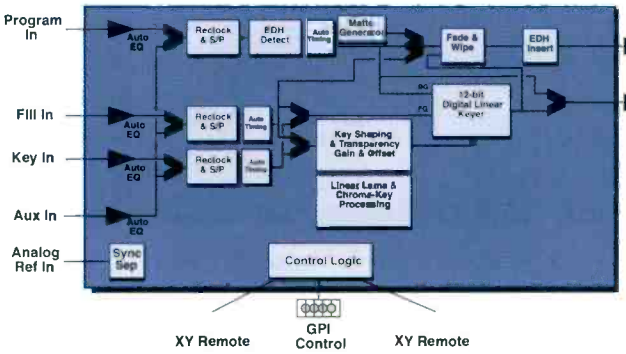
DSK-6801, DSK-6803 — SDI Downstream Keyers

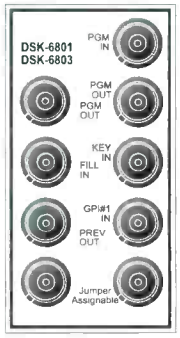
Both DSKs Feature:

- 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

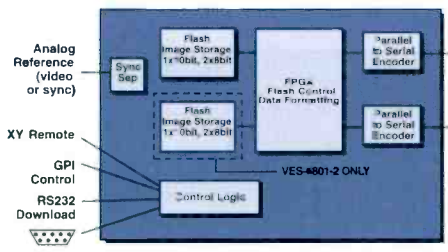


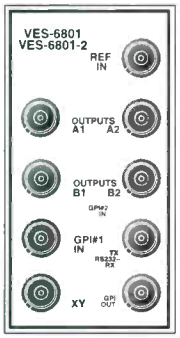


DSK-6800 and
DSK-6803 Back Connector

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 270 Mb/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



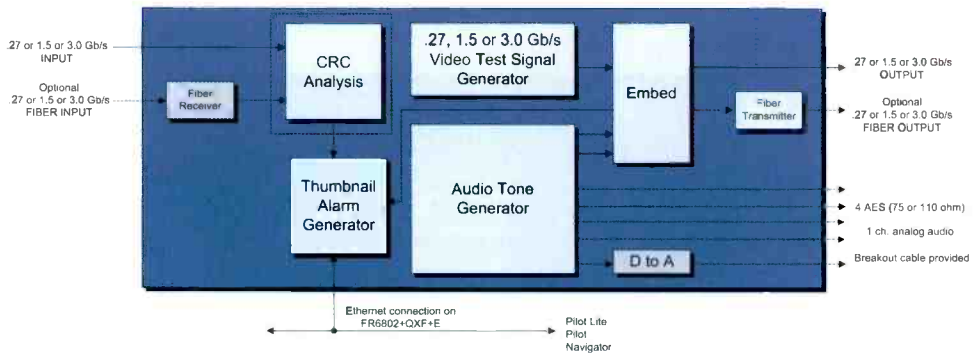


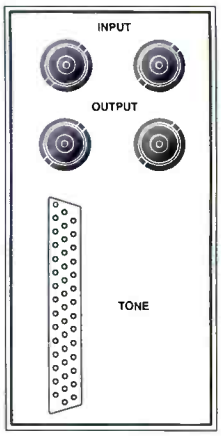
VES-6801 and VES-6801-2
Back Connector

TSG6800+ — Test Signal Generator

PRELIMINARY

- .27 or 1.5 or 3.0 Gb/s output with selectable test signals
- Color bars, pathological or black with embedded tone output
- Optional discrete AES tone (75 or 110 ohm) and analog audio output
- Industry first CRC analysis tool
- Optional CRC analysis tool on input with .27/1.5 and 3.0 Gb/s with LEDS and Pilot Lite™, CCS Pilot™ and CCS Navigator™ capability
- Optional fiber input and output
- May be used as a test generator, color bar/black generator for input to routers, production/master control switchers
- Q-SEE™-compliant thumbnail output over Ethernet
- Available in modular form or installed in the new 6800+ MIX BOX



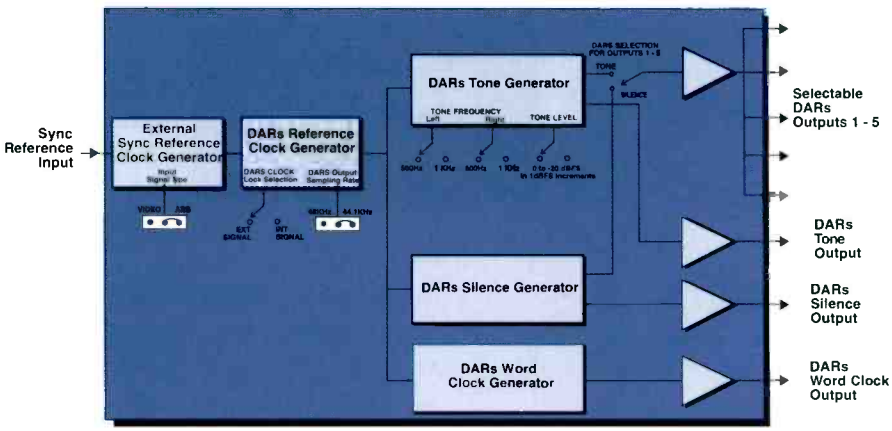


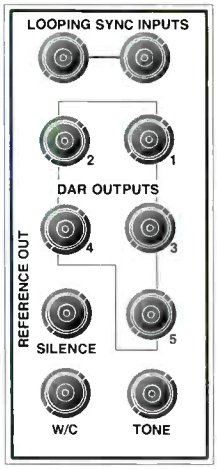
TSG6800+ Back Connector

Q-SEE™

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-clocking 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

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 NEC® 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.

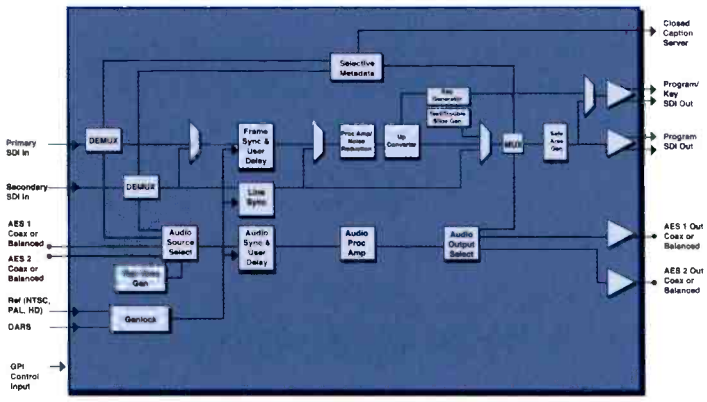
NUCLEUS™ Control Panel

FR-3901

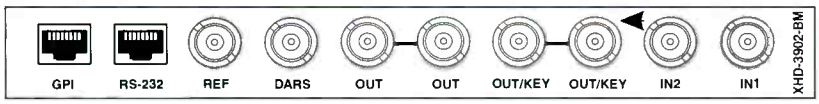
FR-3923

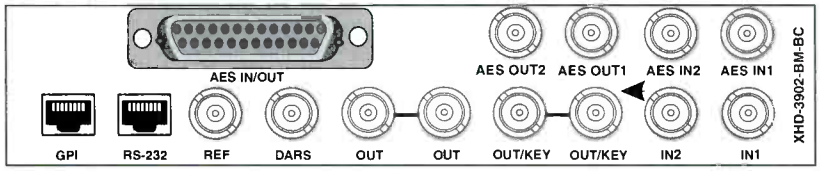
HDTV CCS SNMP

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)

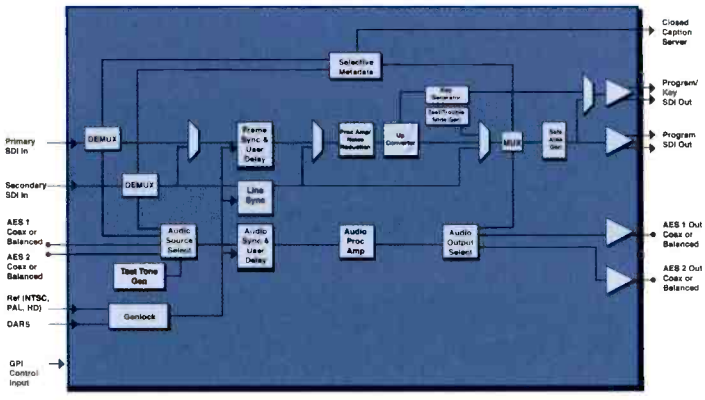




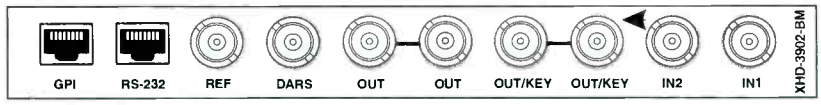
- Optional field upgrade for up/down/cross conversion functionality
- Dual SDI inputs for protection switching. Signal failure on the primary input will trigger the XHD-3902-A to switch to the secondary input

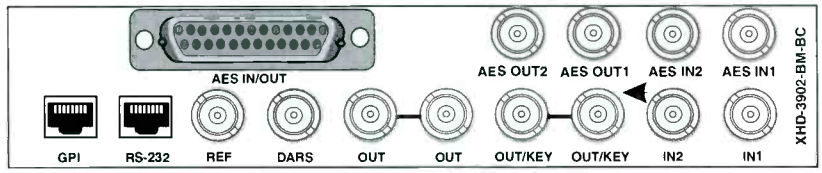
HDTV CCS SNMP

XHD-3902-U — Advanced Broadcast-quality HDTV Upconverter with Audio Processing



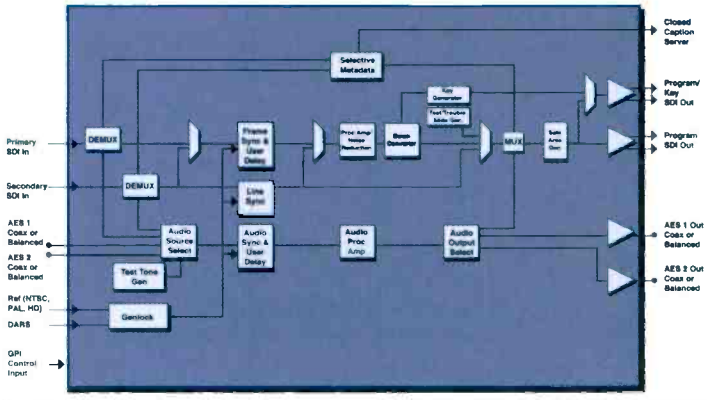
- Single-channel motion-adaptive HDTV upconverter
- Software-upgradeable down- and cross-conversion (optional)
- Supports upconversion to 1080i and 720p
- AES audio support (optional), 2 groups of embedded audio proc standard
- Integrated video proc, audio proc and noise reducer
- Transcoding of closed 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

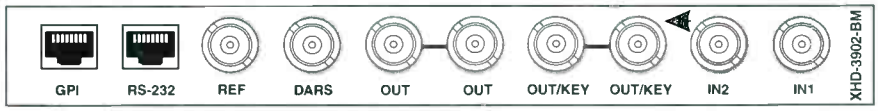


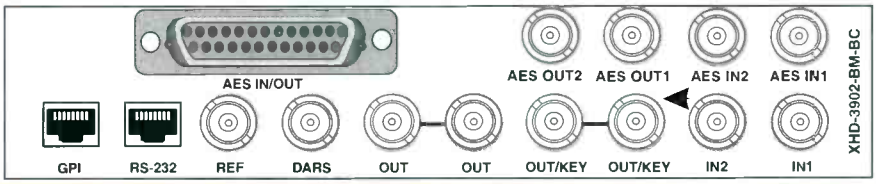


HDTV CCS SNMP

XHD-3902-D — Advanced Broadcast-quality HDTV Downconverter with Audio Processing



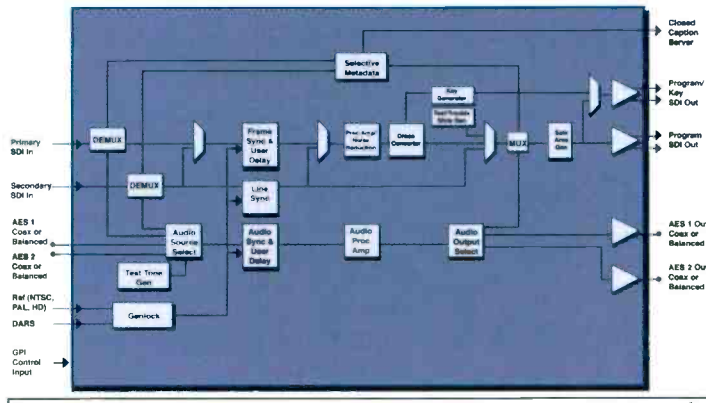


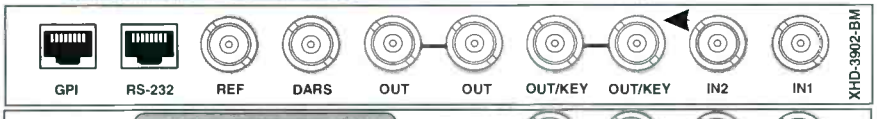


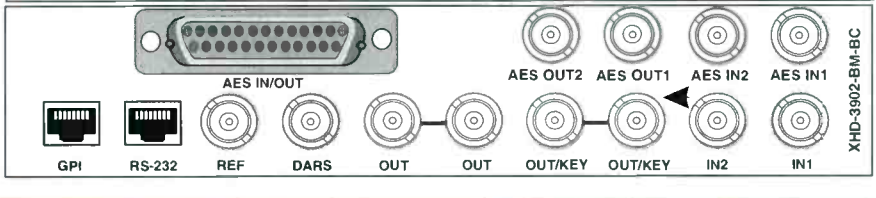
- Dual switchable SDI inputs
- Single-channel motion-adaptive HDTV downconverter
- Software-upgradeable up- and cross-conversion (optional)
- Supports down-conversion of 720p and 1080i formats
- AES audio support (optional), 2 groups of embedded audio proc standard
- Integrated video proc, audio proc 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

HDTV
CCS
SNMP

XHD-3902-C — Advanced Broadcast-quality HDTV Cross-converter and Frame/Audio Synchronizer





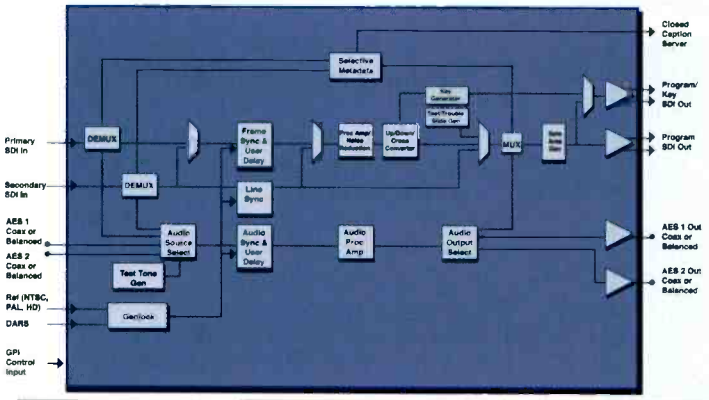


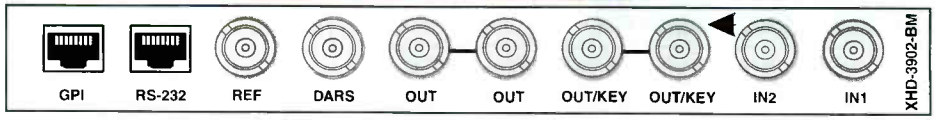
- Dual switchable SDI inputs
- Single-channel motion-adaptive HDTV cross-converter
- Software-upgradeable up- and down-conversion (optional)
- Supports cross-conversion between all 720p and 1080i HDTV formats
- AES audio support (optional), 2 groups of embedded audio proc standard
- Integrated video 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

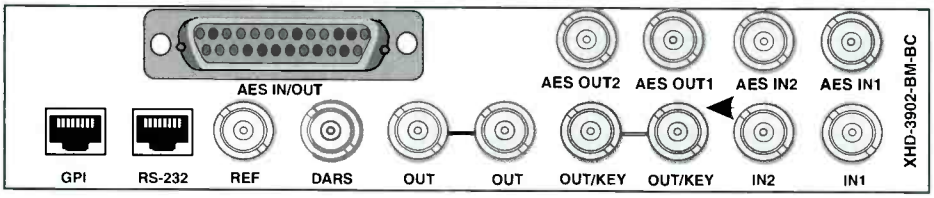
HDTV
CCS
SNMP

NEO® HDTV VIDEO

XHD-3902-UCD — Advanced Broadcast-quality HDTV Converter

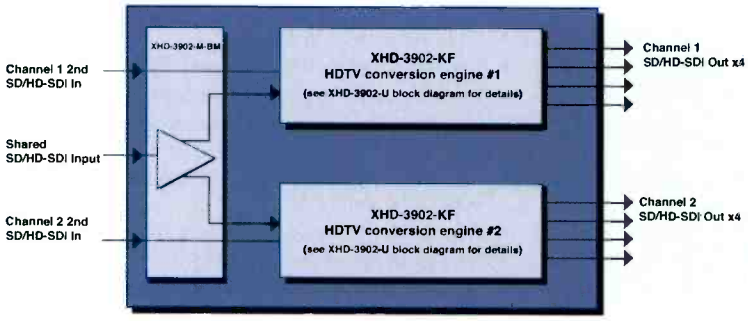


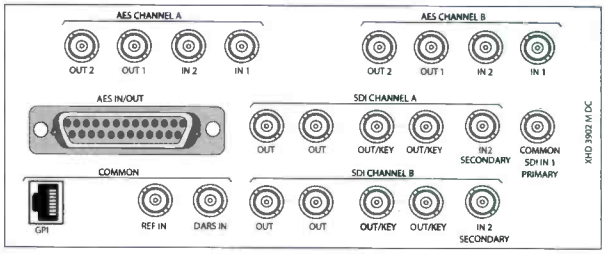




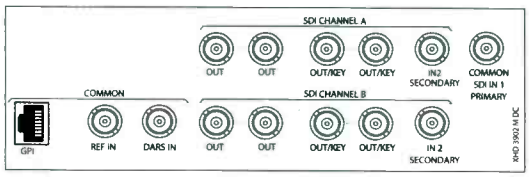
- Dual switchable SDI inputs
- Single-channel motion-adaptive HDTV up/down/cross converter
- Supports conversion between 720p,1080i and 525 and 625 formats formats
- AES audio support (optional), 2 groups of embedded audio proc standard
- Integrated video proc, audio proc and noise reduction
- Separate 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

XHD-3902-M — Advanced Broadcast-quality Multi-path HDTV Converter

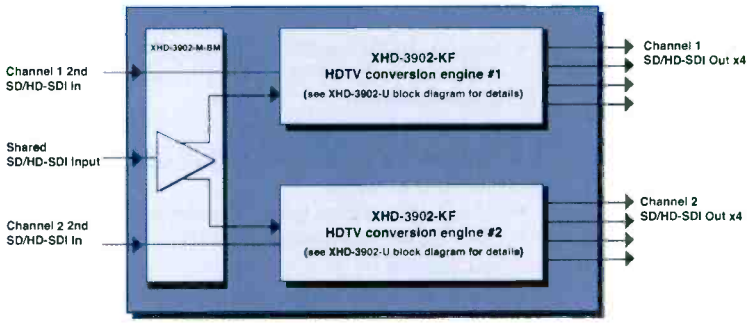




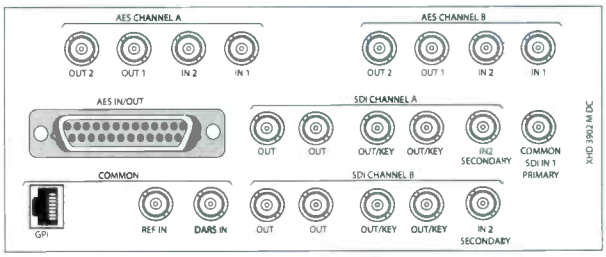
- Dual-channel motion-adaptive HDTV up/down/cross converter
- 2 X independent up/down/cross-conversion engines
- Dual SDI input protection switch for each HDTV conversion engine
- Transcoding of closed captioning between SDTV and HDTV formats
- AES audio support (optional), 2 groups of embedded audio 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

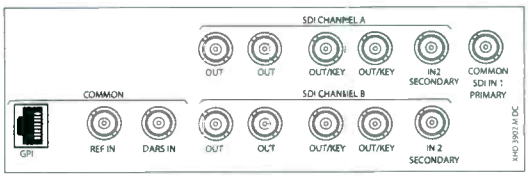


XHD-3902-KF — Advanced HDTV Key/Fill Upconverter



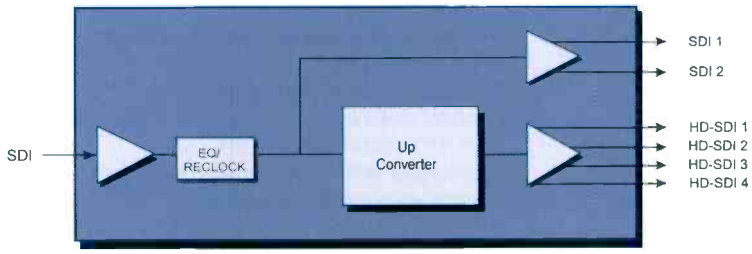
- Dual-channel HDTV upconverter
- Ideal for applications requiring upconversion of Key and Fill signals
- Automatic input format detection
- SDTV aspect ratio conversion capability
- Integrated frame sync and proc
- Integrated embedded audio sync and proc
- Optional AES support
- User-configurable ARC and picture positioning
- Transcoding of closed captioning between SDTV and HDTV formats
- Field upgradeable for additional HDTV down- and cross-conversion



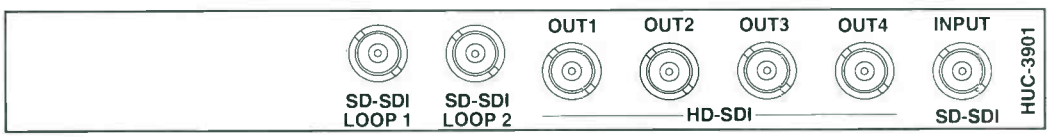


HDTV CCS SNMP

HUC-3901 — HDTV Upconverter

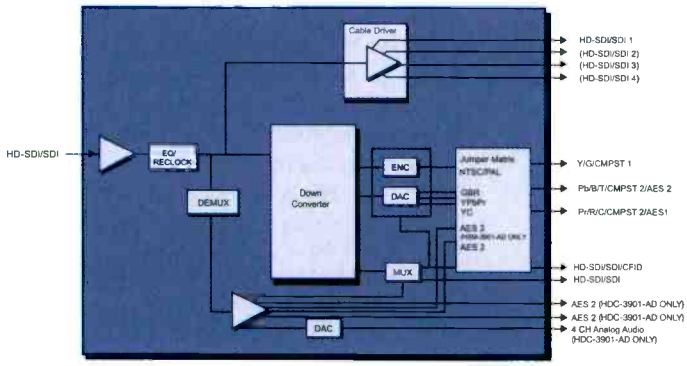


- Single-channel HDTV upconverter
- Supports 480i, 720p and 1080i formats
- Ideal for up-conversion of existing SDI content

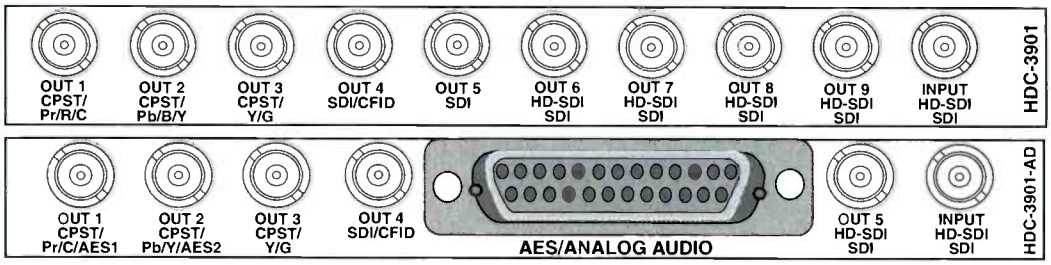


HDTV CCS SNMP

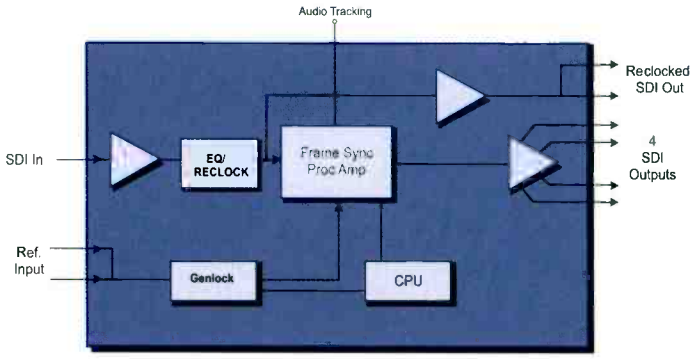
HDC-3901 — HDTV Downconverter
HDC-3901-AD — HDTV Downconverter with De-multiplexer



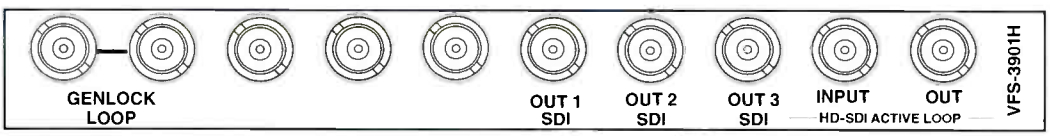
- Supports HDTV signals for 1080i/59.94, 1080i/50, 720p/59.94, 720p/50, 1080p/25 for down-conversion
- SD and HD input capability
- NTSC/PAL (3) or GBR, YPbPr (1) converted video monitoring outputs
- Supports five display types for downconverted HDTV signal: Anamorphic, Letter Box, Crop, 14:9 and Zoom 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



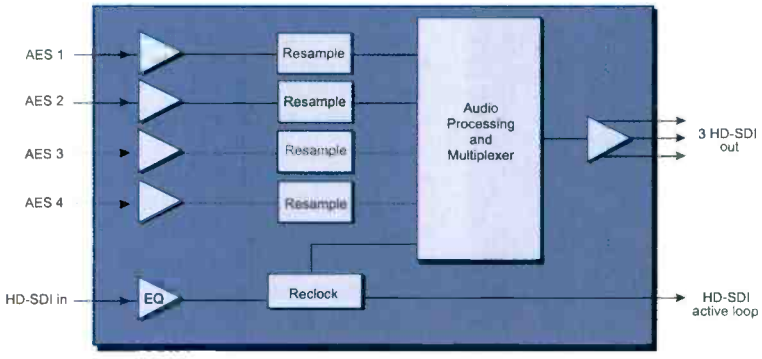
VFS-3901H-1 — HDTV Video Frame Synchronizer/Processor



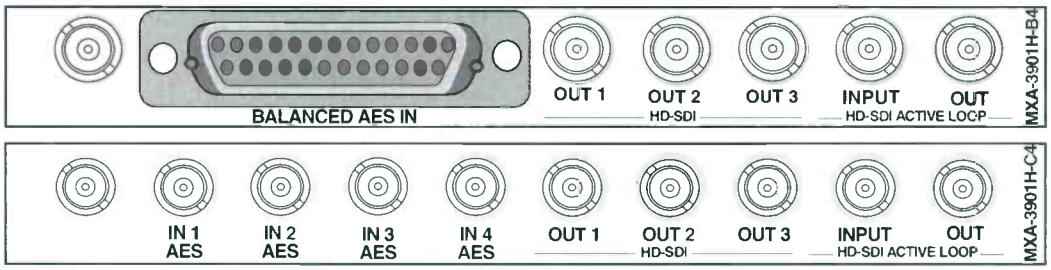
- HDTV video frame sync for 1080i-50/59.94 and 720p-59.94
- Passes entire VANC and HANC
- Provides audio tracking and hot-switching internally to a companion audio synchronizer
- Color, black or tri-level sync reference input
- Built-in video processing amplifier
- Cleanly handles hot switch on input
- Provides internal audio tracking to audio synchronizers
- Up to 16 frames of delay



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

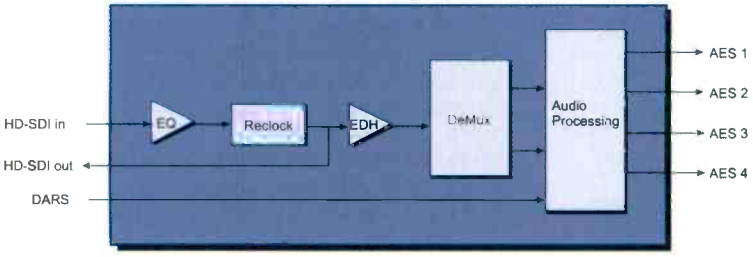


HDTV

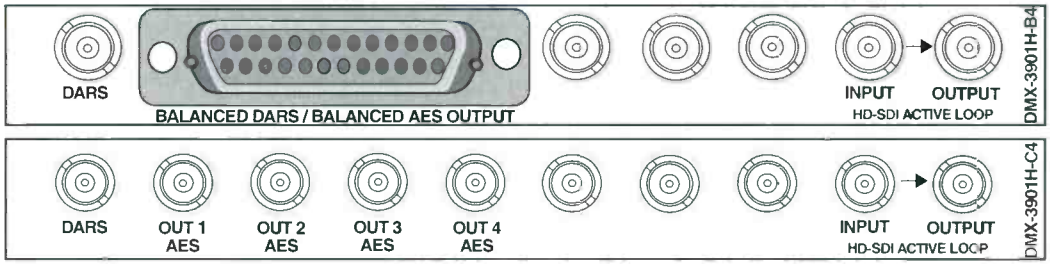
CCS

SNMP

DMX-3901H-B4, C4 — HDTV 4 AES Audio De-multiplexer



- 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



HDTV

CCS

SNMP

NEO® HDTV AUDIO

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.

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

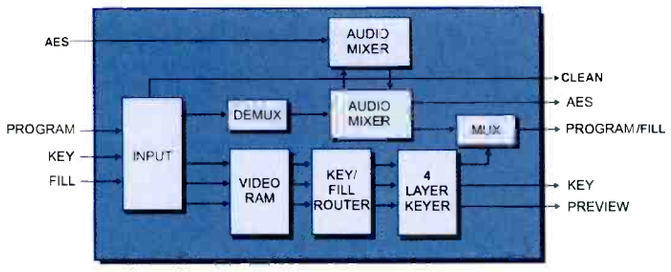
See page 119, 120 for more information.

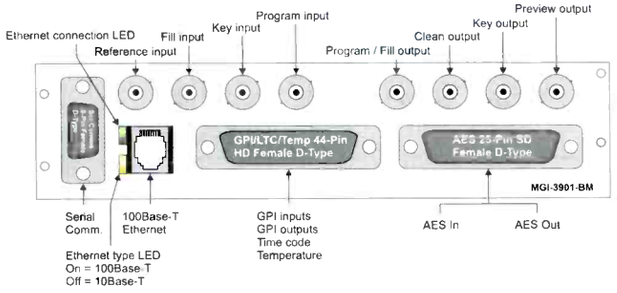
- Up to 44 inputs in 3RU frame, up to 12 inputs in 1RU frame
- Future-proof auto-format detecting HD, SD-SDI, & composite inputs
- NTSC, PAL, PAL-M, VGA & DVI inputs supported
- Outputs configurable up to 1600X1200 (4:3) and 1920 x 1080 (16:9)
- Redundant outputs standard
- Separate external graphics 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

HDTV CCS SNMP

NEO® HDTV ADVANCED APPLICATIONS

MGI-3902H — HDTV IconLogo™



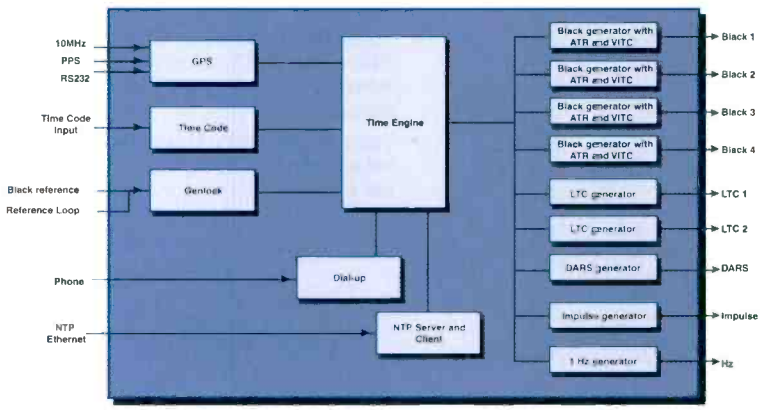


See page 76 for more information.

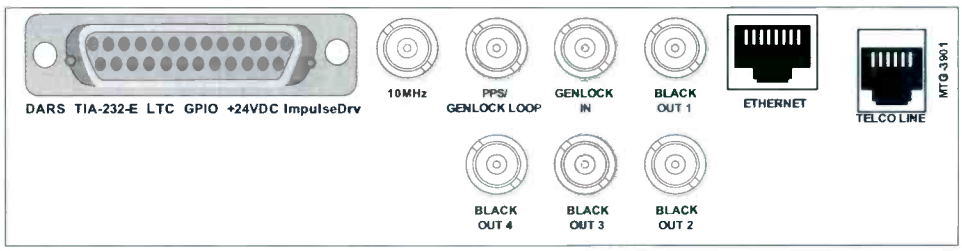
- SD IconLogo™ upgradeable to new HD IconLogo™ with four layers
- Bypass relay equipped as standard
- User-configurable "apology/trouble slide" airs automatically if loss or errors in program or reference inputs
- Up to four logos in HDTV; each layer (logo) can be:
  - Static logo, animated logo, digital 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™

HDTV CCS

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

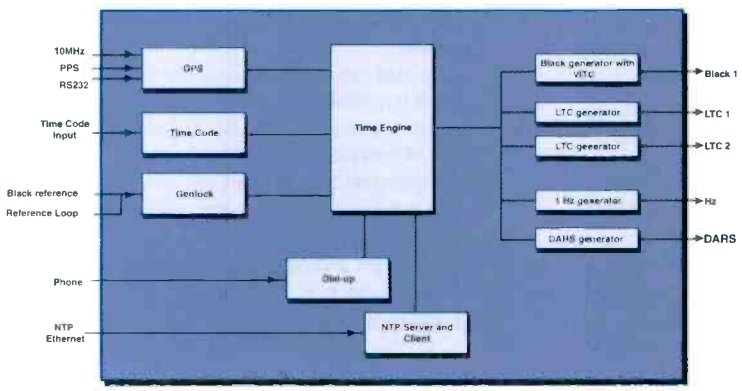


HDTV

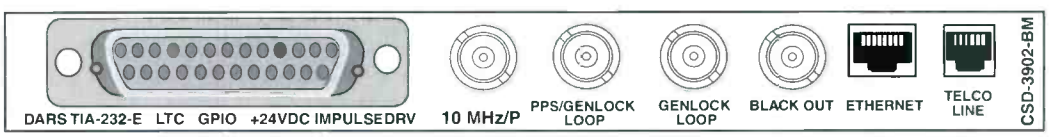
CCS

SNMP

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



HDTV

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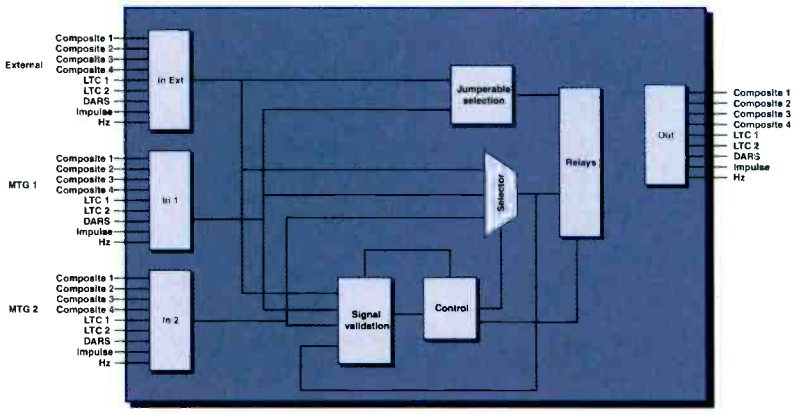
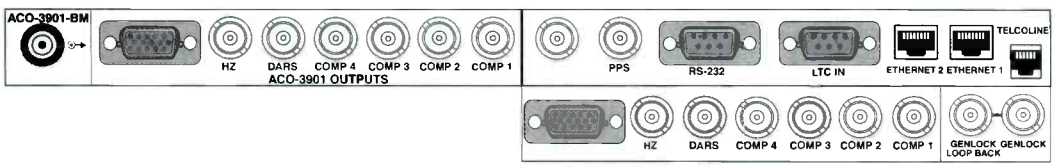
NEO® HDTV ADVANCED APPLICATIONS

ACO-3901 — Automatic Changeover Module



- Compatible with MTG-3901and 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)



HDTV

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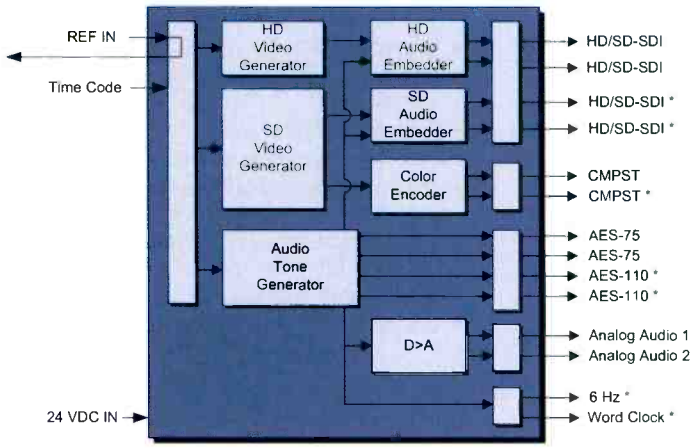
TSG-3901 — Test Signal Generator



- 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
- 10 MHz output
- 6Hz output
- Word Clock

* TSG-3901-2S and TSG-3901-SYS

HDTV

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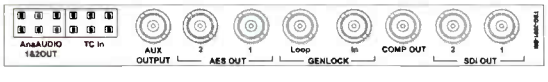
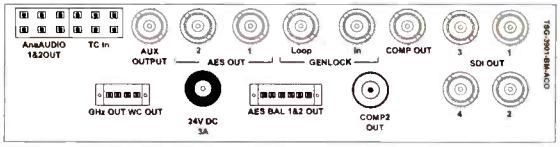
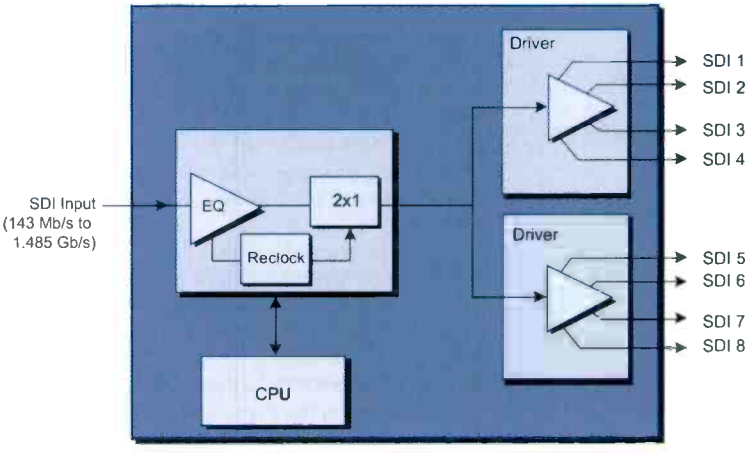
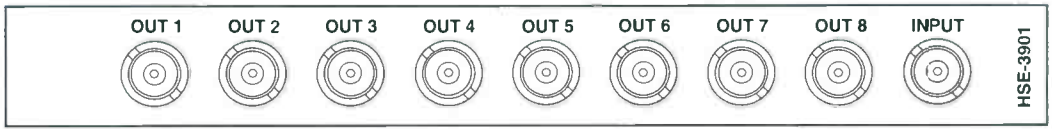




HSE-3901 — HDTV and SDI Reclocking Distribution Amplifier



- Input signal types: SMPTE 259M, 292M, 344M
- Auto EQ for 300m (983ft.) for 270 Mb/s and 159m (483 ft.) for 1.485 Gb/s
- Auto reclocking at 1.5 Gb/s, 143 Mb/s, 177 Mb/s, 270 Mb/s, 360 Mb/s and 540 Mb/s
- Auto bypass if unable to lock at the above rates
- DVB-ASI compatible (outputs 2,4,6,8)



HDTV

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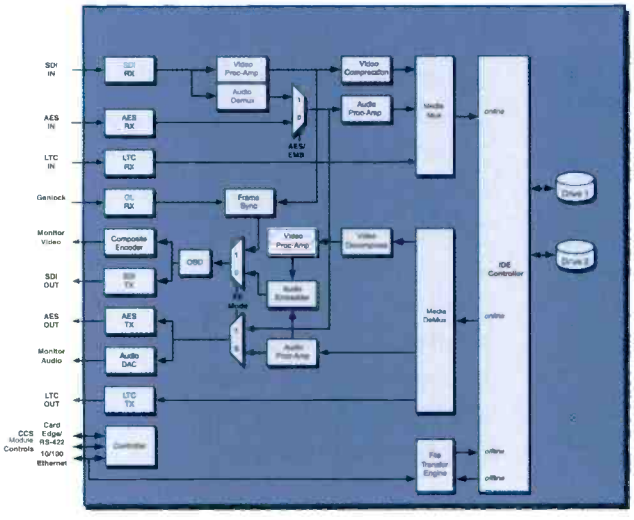
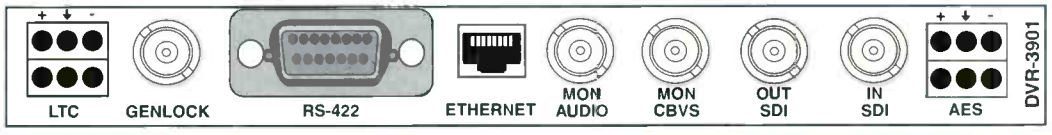
DVR-3901 — Digital Video Recorder



- 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, 40 GB 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



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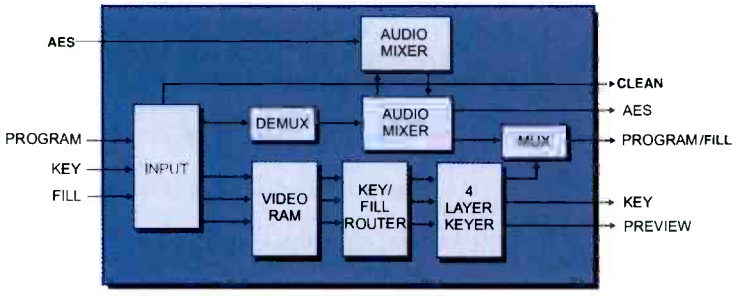
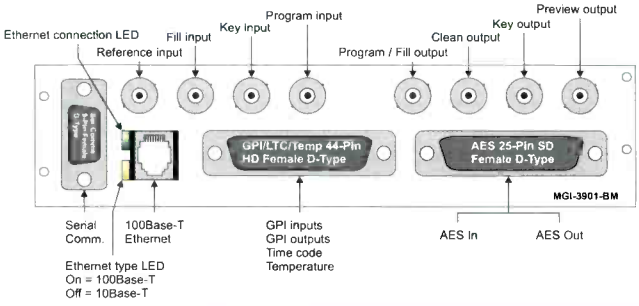
MGI-3902 — SDI IconLogo™

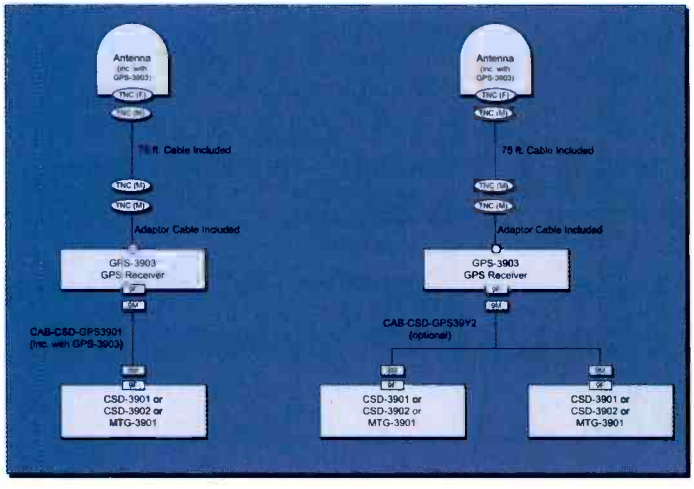




- SD IconLogo™ upgradeable to new HD IconLogo™ with four layers
- Bypass relay equipped as standard
- User-configurable "apology/trouble slide" airs automatically if loss or errors in program or reference inputs
- Up to four logos in SDI; each layer (logo) can be:
  - Static logo, animated logo, digital 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

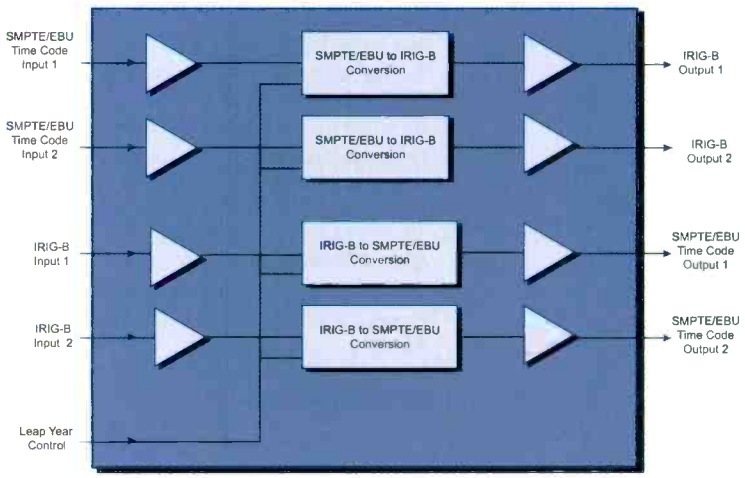
GPS-3903 — GPS Receiver and Antenna



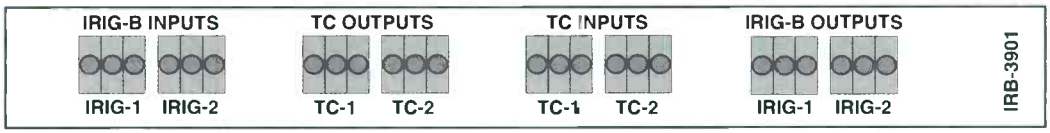
The GPS-3903 and high-accuracy GPS-1600 standalone GPS receivers/antennas allow the CSD-3901/CSD-3902 Master Clock Driver and MTG-3901 Master Timing Generator to provide outputs with great accuracy by using the most accurate source of time used in the public domain — a system of 24 satellites that provides complete coverage in any part of the world with information on time and position. This makes the CSD-3901/2 and MTG-3901 totally independent from telephone or radio receiver standards.

- Compatible with CSD-3902 and MTG-3901
- GPS provides an accurate time reference available globally
- Separate antenna and receiver for mounting flexibility
- Accurate to 10ms

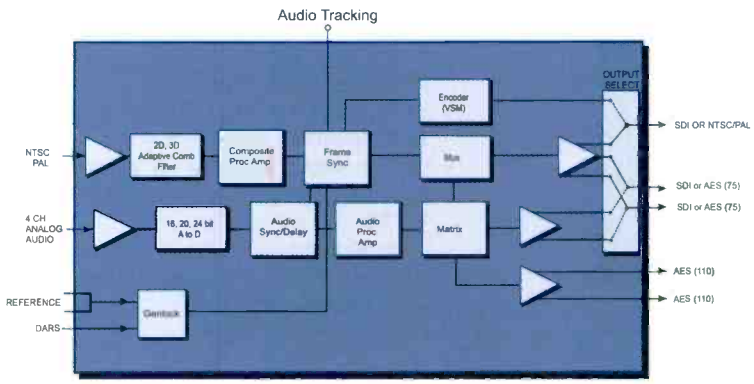
IRB-3901 — IRIG-B to/from SMPTE/EBU Timecode Converter



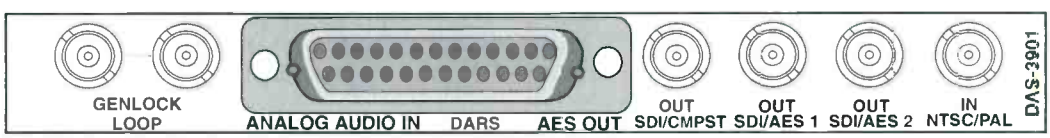
- Simultaneous conversion of IRIG-B to SMPTE/EBU timecode and SMPTE/EBU timecode to IRIG-B
- 2 IRIG-B inputs
- 2 IRIG-B outputs, each with selectable timecode inputs
- 2 SMPTE/EBU timecode inputs
- 2 SMPTE/EBU timecode outputs, each with selectable IRIG-B inputs
- Output locked to input timecode



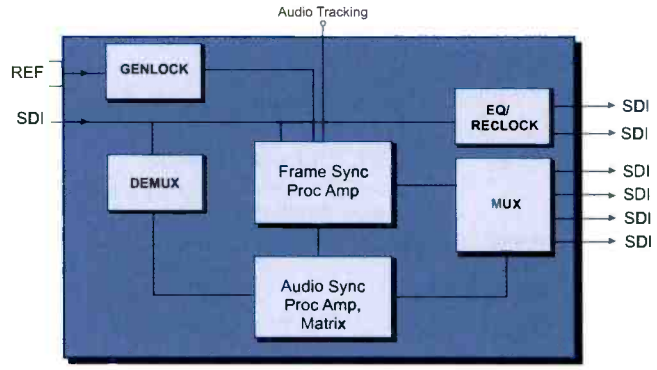
DAS-3901 — Composite Video/Analog Audio Synchronizer/ Processor/Multiplexer



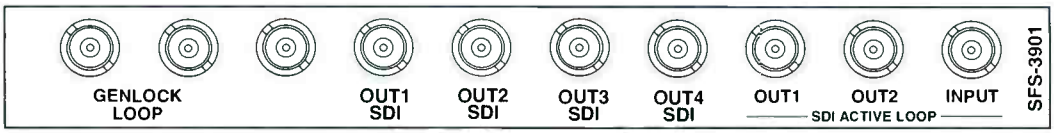
- 12-bit, fully adaptive frame/field/3-line/notch composite decoding, synchronization, processing amplifier with clipping (hue, chroma, video, setup controls)
- Line-by-line VBI handling and processing
- Selectable 16/20/24-bit A to D, synchronization, delay and processing amplifier (gain, swap, delay, invert, mix) for audio input
- Variable audio delay of up to 1.3 seconds
- Audio multiplexer
- Provides internal audio tracking to additional audio synchronizer



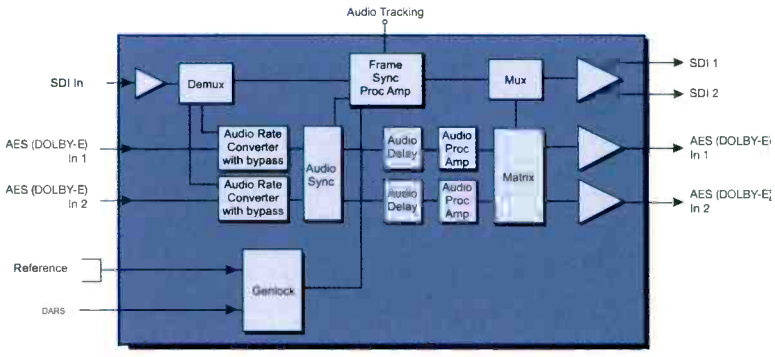
SFS-3901 — SDI and Embedded Audio Synchronizer/Processor



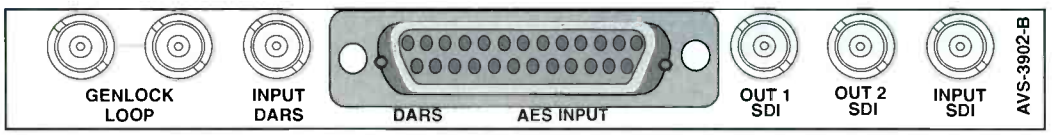
- Cleanly handles hot switch on input for video and embedded audio
- 3-color space video processing amplifier (YPrPb/Composite/GBR)
- Up to 30 frames video delay in delay mode
- Embedded audio is demultiplexed and subsequently remultiplexed to avoid audio distortion during frame drop/repeat
- 16/20/24-bit 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

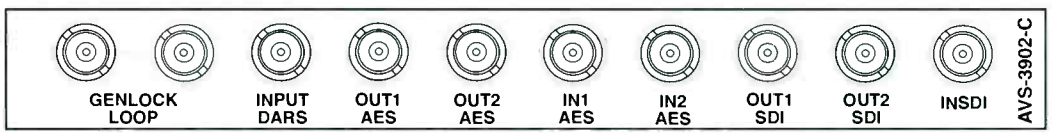


AVS-3902-B, C — SDI/AES and Embedded Audio Synchronizer/Processor

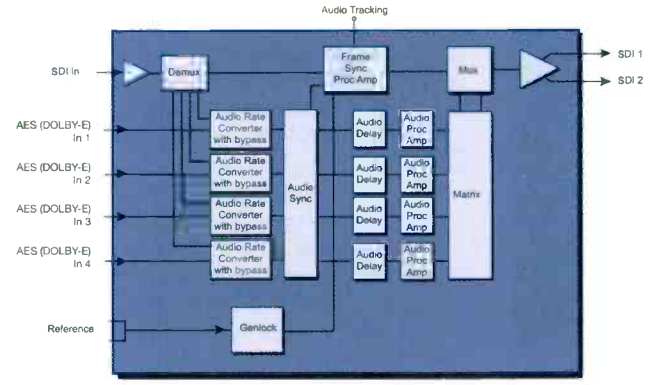


- Cleanly handles hot switch on input for video AES and embedded audio
- Embedded audio is demultiplexed and subsequently remultiplexed to avoid audio distortion during frame drop/repeat
- 3-color space video processing amplifier (YPrPb/composite/GBR)
- 16/20/24-bit AES and embedded audio synchronization/delay/processing
- 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

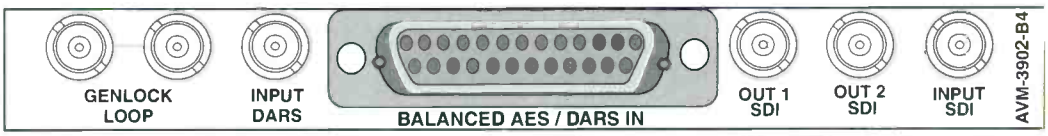


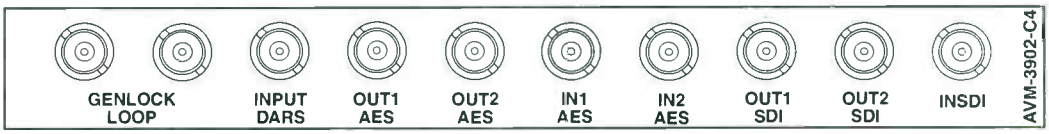


AVM-3902-B4, C4 — SDI/AES and Embedded Audio Synchronizer/ Processor and Multiplexer



- 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





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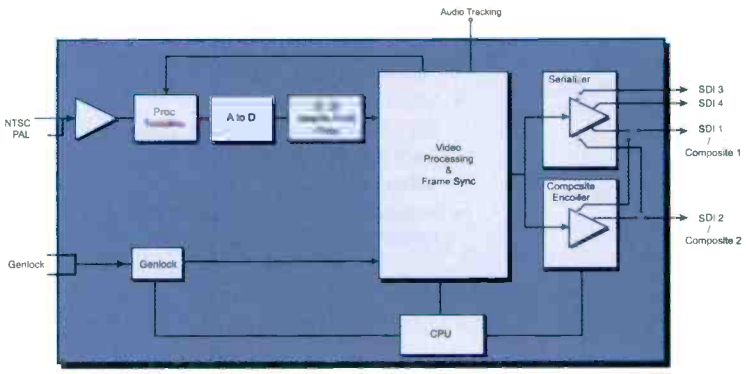
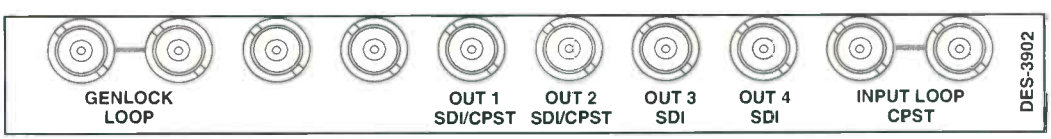
DES-3902 — Composite Video to SDI Decoder/Synchronizer



- 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



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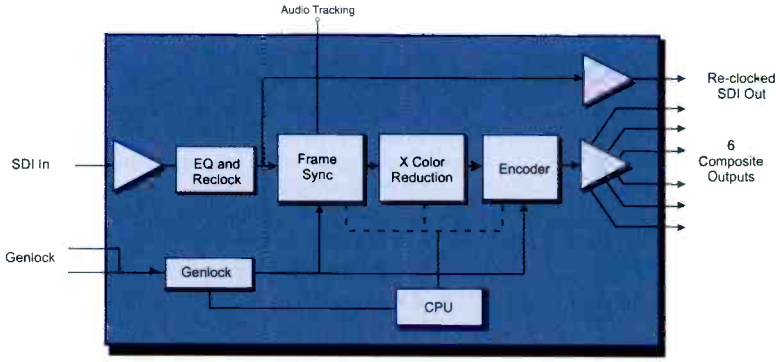
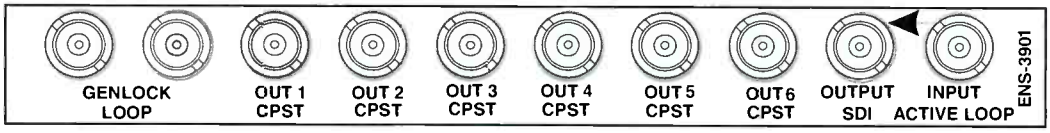
NEO® SIMPLICITY

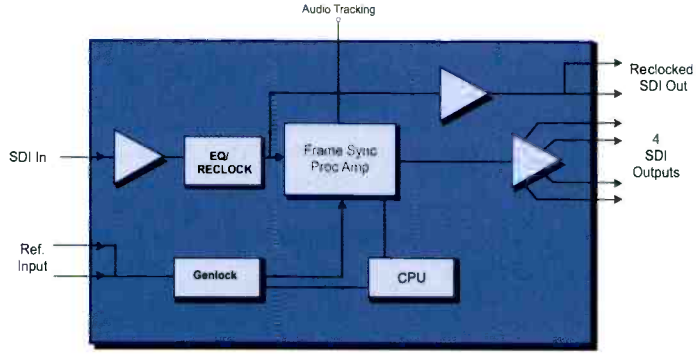
ENS-3901 — SDI to NTSC/PAL Color Encoder/Synchronizer



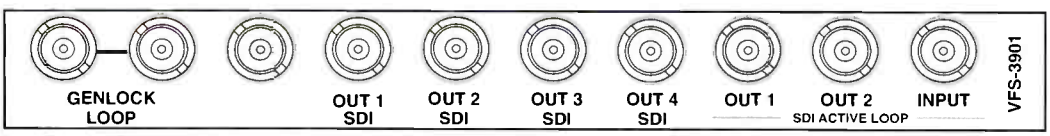
- High-quality, chroma-locked broadcast composite encoder with processing amplifier and frame synchronizer
- 12-bit signal processing
- Vertical Blanking Field/Line/Mode Control
- Timing Controls:
  Vertical, Horizontal, Fine SC (from Genlock)
- IQ or UV modulation for the composite output
- Cross Color Reduction (525) and Aperture control (2 dimensional)
- Frame sync or delay mode
- Provides internal audio tracking to audio synchronizers



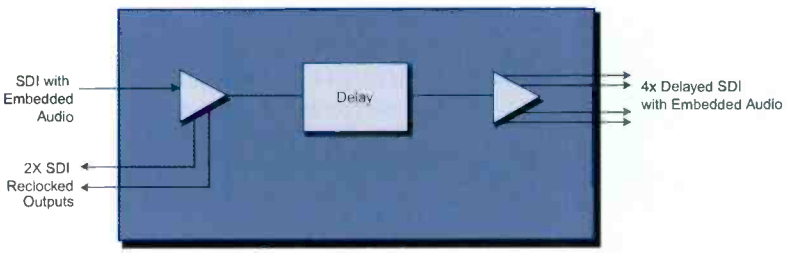
VFS-3901 — SDI Frame Synchronizer/Processor



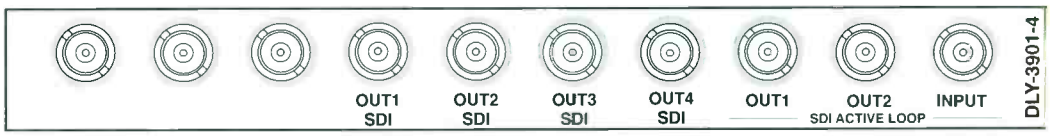
- Frame sync with infinite timing
- Video Processing Amplifier:
  black level, luminance level, chrominance level, black/white clip, hue (525 only)
- Video delay mode—up to 1 frame delay
- Provides internal audio tracking to audio synchronizers



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



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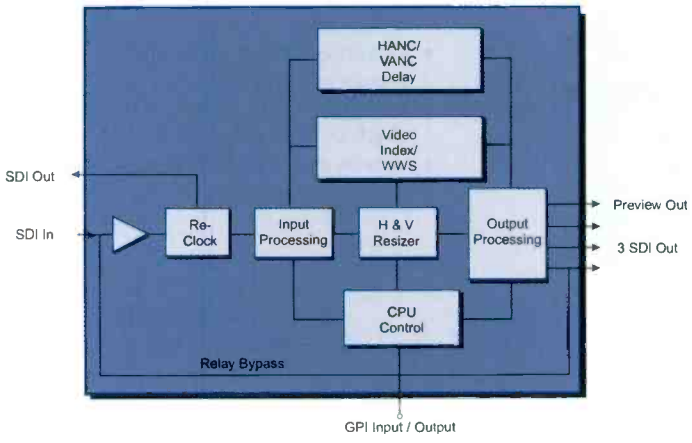
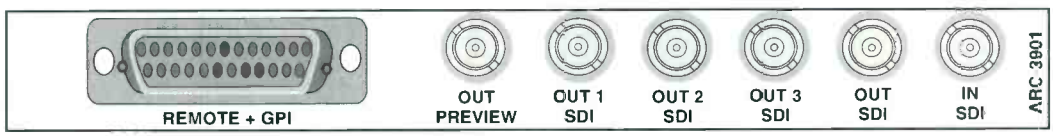
ARC-3901 — Aspect Ratio Converter



- 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



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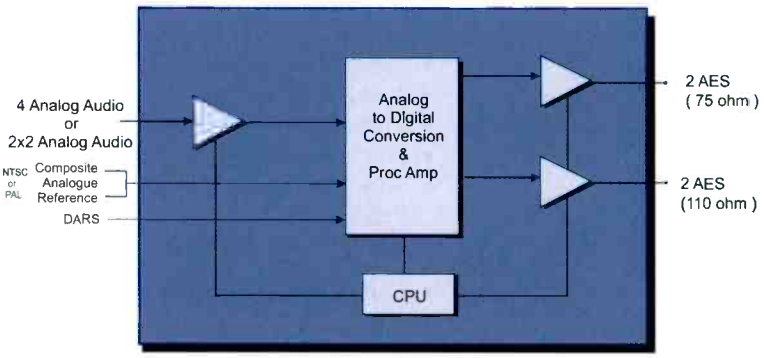
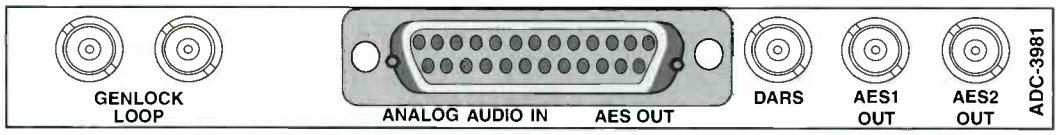
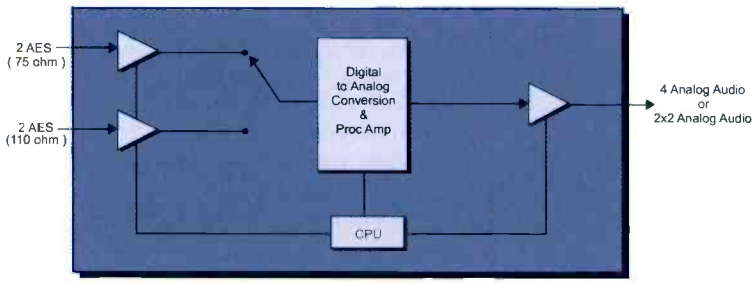
ADC-3981 — 4-Channel Analog to 2 AES Audio Converter



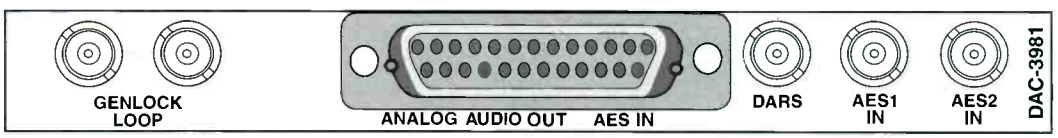
- Simultaneous balanced and unbalanced AES outputs
- 32/44.1/48/96 kHz output sampling rate
- 16/20/24-bit quantization
- Audio processing amplifier with: channel invert, channel swap, gain, delay
- Variable audio delay up to 1.3 seconds



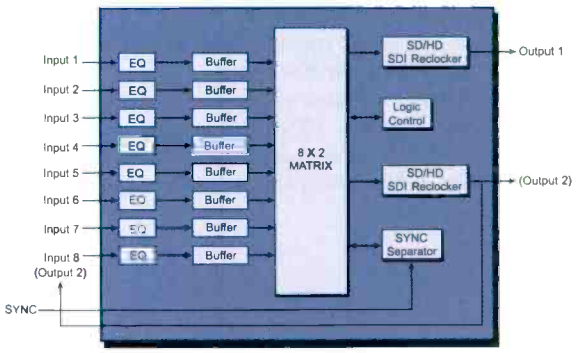
DAC-3981 (-600) — 2 AES 4-Channel Analog Audio Converter



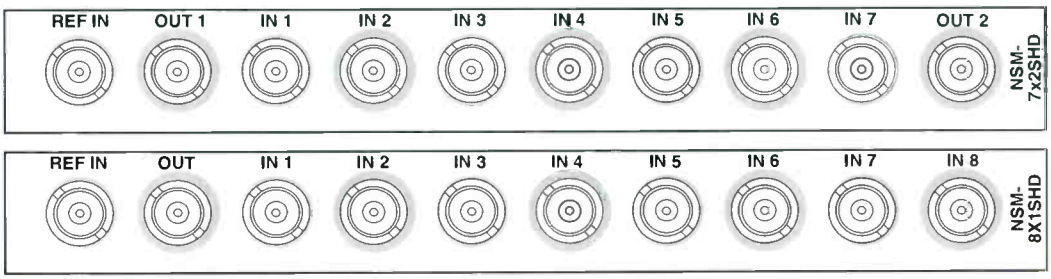
- Input signal types: 2 AES-75 or 2 AES-110 (selectable)
- 4 balanced analog audio outputs (4-channel or 2 x 2channel)
- Audio processing amplifier with: channel invert, channel swap, gain, delay
- Variable audio delay up to 1.3 seconds
- 32/44.1/48/96 kHz sampling rate support



NSM-8X1SHD, NSM-7X2SHD — HDTV and SDI Video Switches

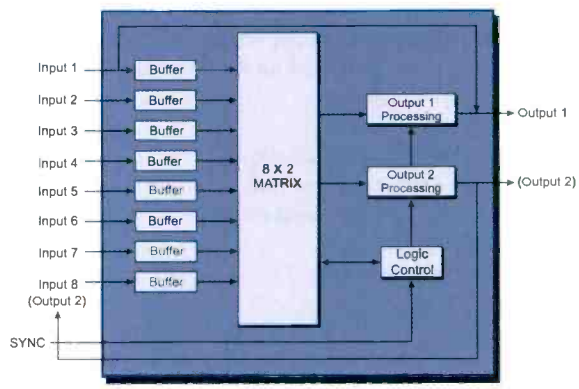


- High-quality HD/SDI wideband video routing
- 8x1 switcher with auto-detect switchover configuration or 7x2 switcher configuration
- Supported signal types (10 Mb/s to 1.5 Gb/s):
  - SMPTE 259 — 143, 177, 270, 360, and 540 Mb/s
  - SMPTE 292 — 1.485 Gb/s
- Deterministic, line-accurate switching
- Relay 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

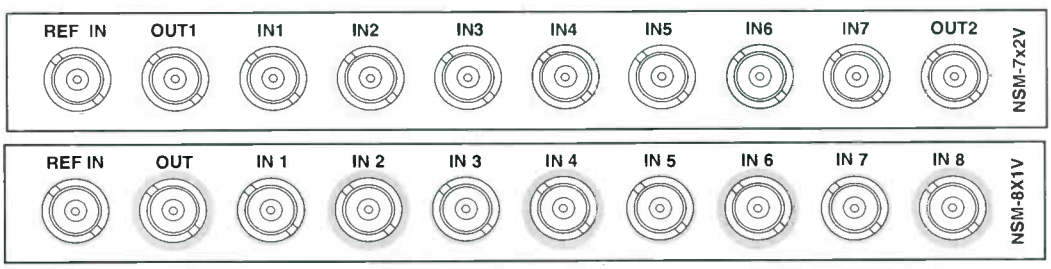


HDTV CCS SNMP

NSM-8X1V, NSM-7X2V — Composite Video Switches

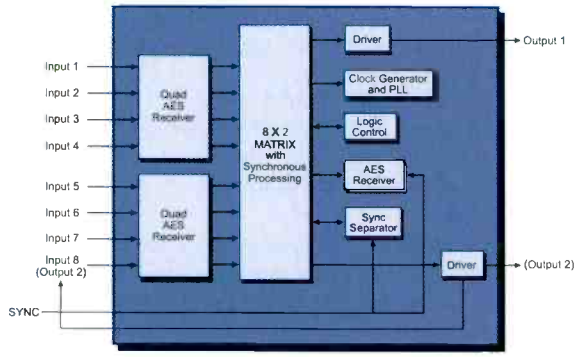


- High-quality analog video routing switcher
- 8x1 switcher with auto-detect switchover configuration or 7x2 switcher configuration
- Deterministic, line-accurate switching
- NTSC/PAL analog reference
- Relay bypass
- Bypass operation for signals at nontraditional video rates

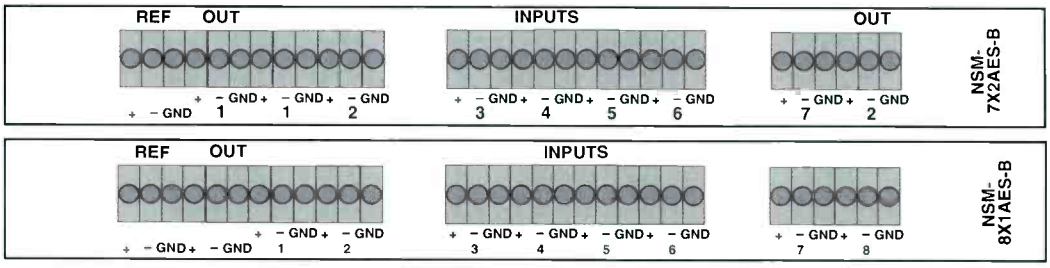


CCS SNMP

NSM-8X1AES-B, C, NSM-7X2AES-B, C — AES Audio Switches

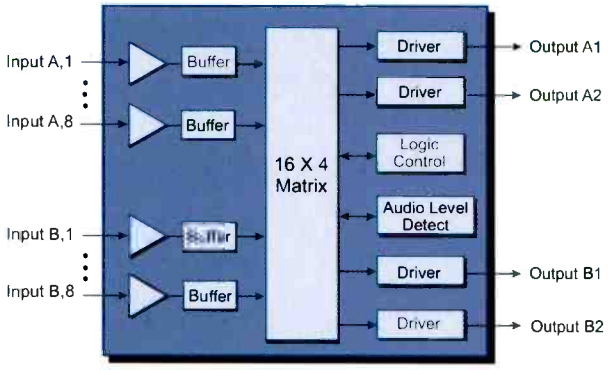


- High-quality AES audio routing switcher
- 8x1 switcher with auto-detect switchover configuration or 7x2 switcher configuration
- Supports these signal types:
  - AES3 – 30kHz – 100kHz frame rates
  - Any 50% duty cycle digital signal within the voltage and frequency range
- Relay bypass

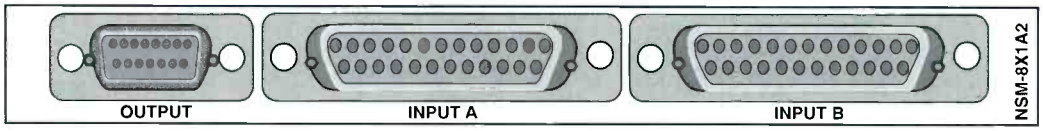


See page 66 for other back panels: NSM-7x2AES-C and NSM-8x1AES-C

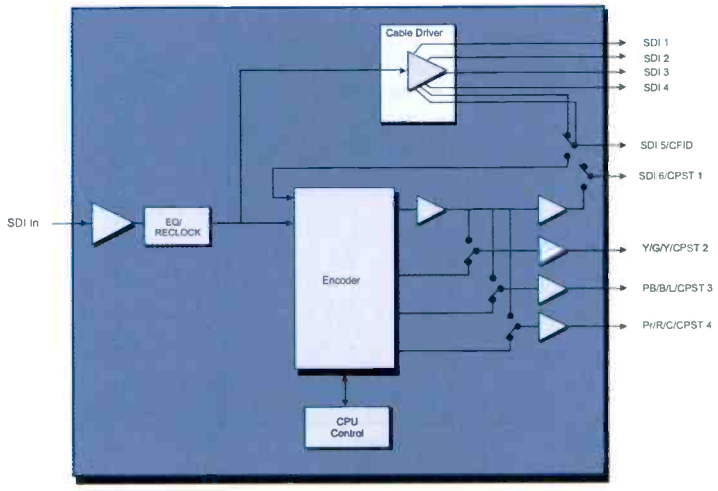
NSM-8X1-A2 — Analog Audio Switches



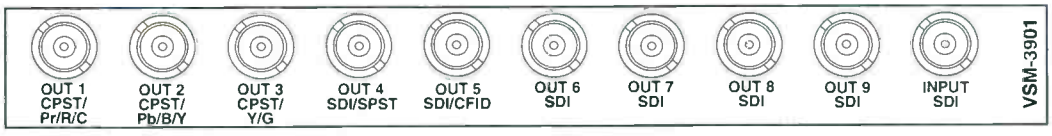
- High-quality analog audio routing switcher
- Can be user-configured for the following matrix sizes:
  - single stereo 8x2
  - single mono 16x4
  - stereo 8x1 with dual outputs
  - quad mono 4x1 (married)
  - quad mono 4x1 (breakaway)
- Relay bypass
- Swap/sum capability



VSM-3901 — SDI Monitoring Distribution Amplifier



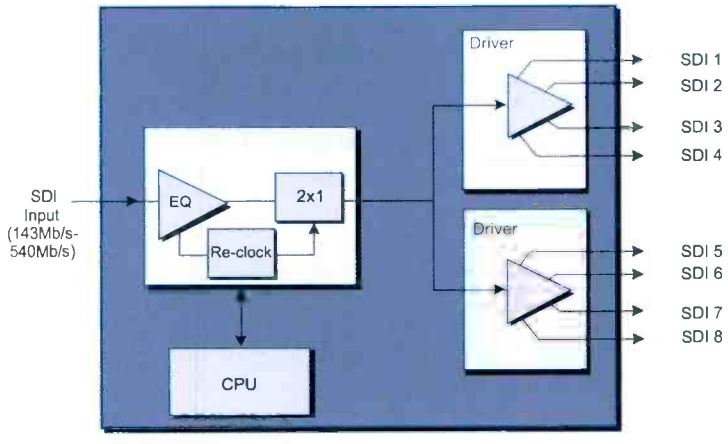
- 10-bit signal processing path
- Up to 6 reclocked, equalized 4:2:2 serial outputs
- Up to 4 NTSC/PAL-B analog composite color outputs or 1 component (GBR/Y, Pb, Pr,/YC)
- Delete, chroma on/off, setup on/off, burst on/off and chroma filter bandwidth select



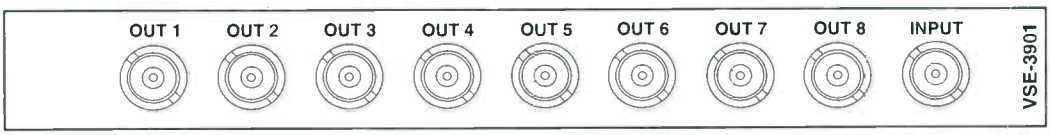
CCS

SNMP

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

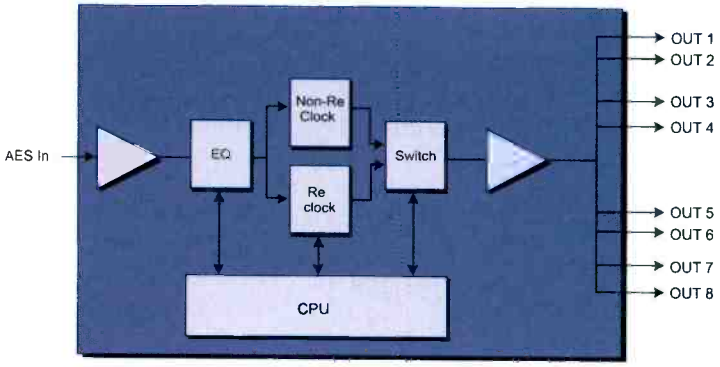


CCS

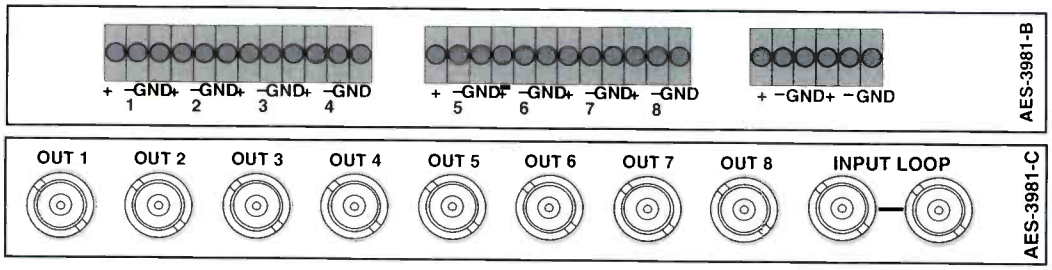
SNMP

NEO® DISTRIBUTION

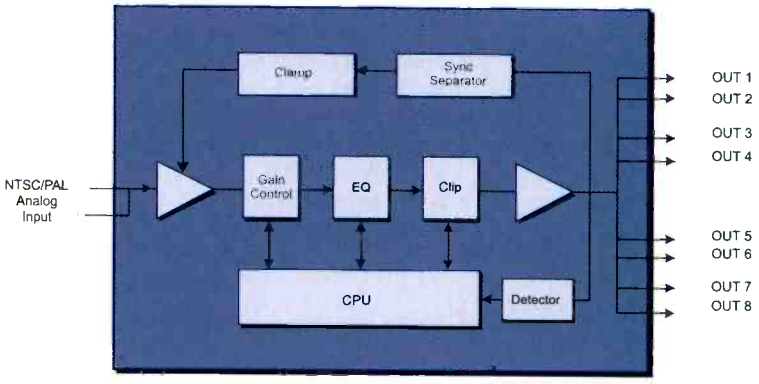
AES-3981 — AES Audio Distribution Amplifier



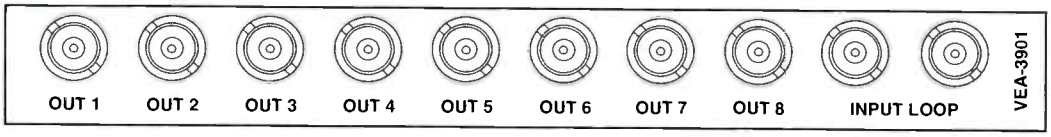
- Input signal types:
  AES 75 and 110 ohm interfaces
- Data-only mode for compressed audio signals
- AES frame rates up to 96kHz
- Auto EQ, auto reclock up to 96kHz



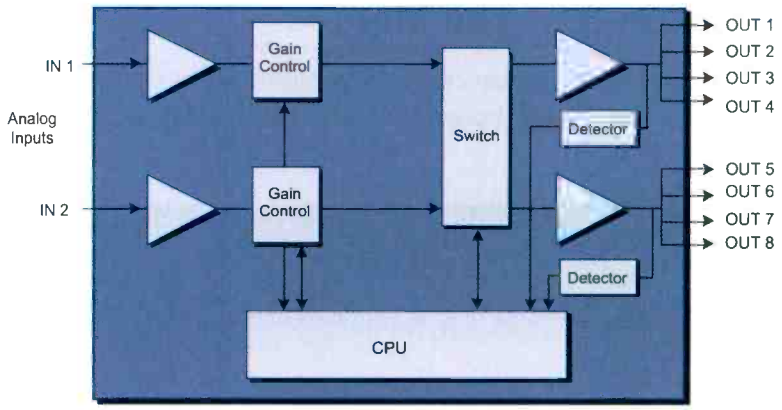
VEA-3901 — Composite Video Equalizing Distribution Amplifier



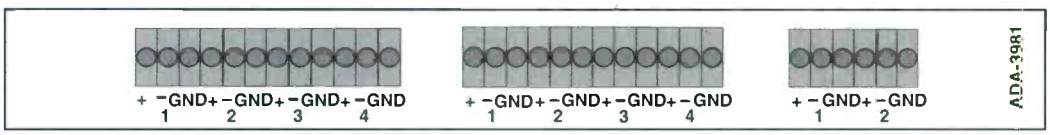
- Input signal type: passive looping 1Vp-p video
- Clamp off/soft/hard
- White clip, hard and soft
- AC/DC coupling (jumper selectable)
- Remote control of gain (-3 to + 3dB)
- Remote control of EQ (300m)



ADA-3981-66, 600 — Analog Audio Distribution Amplifier

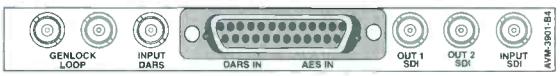


- 1 in, 8 out (mono) or 2 in, 4 out (stereo)
- 20-20kHz bandwidth
- +30Bu (66 ohm), +24dBm (600 ohm) maximum input level
- Gain range of -6 to +3EdB
- Remote gain (.5dB steps), channel swap, mute
- Channel swap and mute
- Left and right inputs can be summed to mono

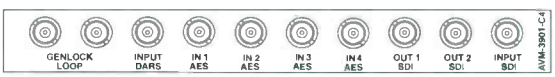


AVM-3901-C

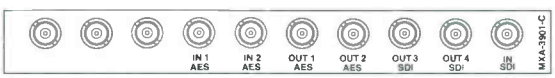
AVM-3901-B4



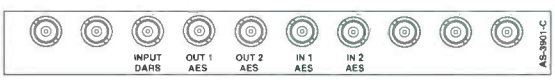
AVM-3901-C4



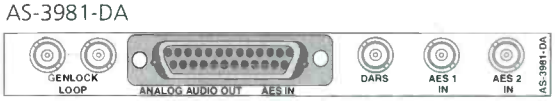
MXA-3901-C



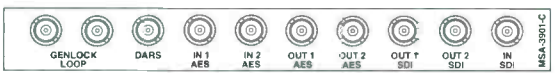
AS-3901-C



AS-3981-DA

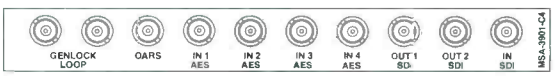


MSA-3901-C

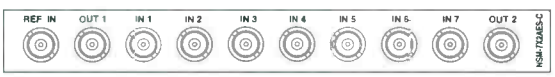


MSA-3901-B4

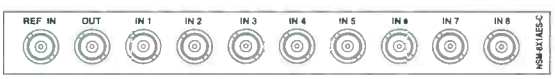
MSA-3901-C4



NSM-7X2AES-C



NSM-8X1AES-C



Additional back modules intended to complement product information provided on product pages.

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.

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

New Features in X75™

- Inputs and outputs for SD-SDI, 1.5G HD-SDI, and 3Gb/s HD-SDI
- Color correction option
- Automatic Input Detect with Simultaneous Multiple Output Format Select
- Aspect Ratio Downstream Signaling using AFD and WSS standards
- Embedding/de-embedding of Audio and Metadata for 8 AES, Dolby® E, Dolby® Digital
- Fixed Audio Metadata Insertion for Upconversion
- Simultaneous Logo and I-WINGS
- Integrated Side Panel Keying
- SD Memory Card for Graphics Storage
- Profanity Avoidance Delay option (up to 54 sec. for SD-SDI, up to 10 sec. for 1.5G HD-SDI)

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. 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.

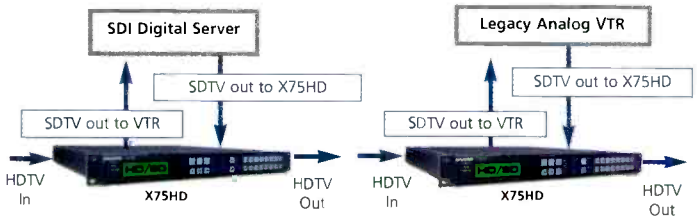
Limitless Applications

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.

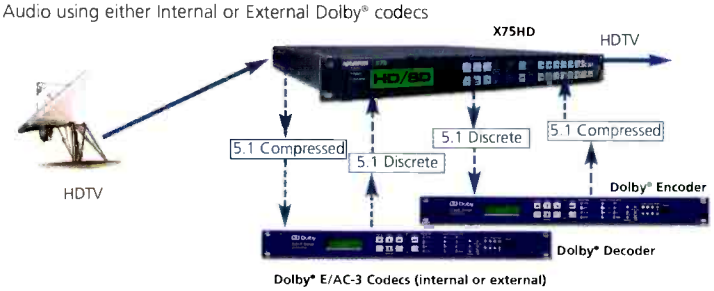
M-PATH™ Multiple-path Processing Supports Bidirectional Processing

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.

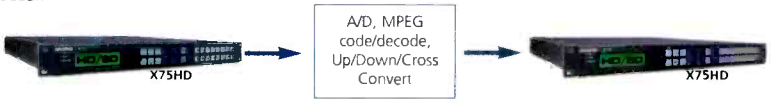
M-PATH — Simultaneous UP and DOWN Conversion Example



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.



HDTV CCS SNMP

X25-DC-1

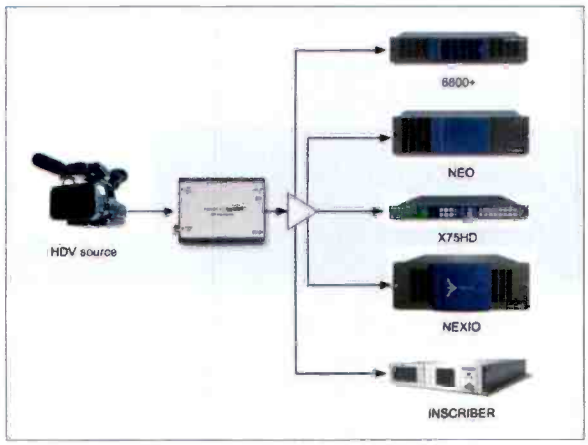
X25-DC-1 — HDV to HD-SDI Converter

HDV is becoming more popular as a consumer and pro-sumer 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
- HD-to-SD downconversion capability
- Selectable anamorphic, edge crop, or letter box down-conversion
- 1080i-to-720p cross-conversion capability
- IEEE 1394-based firmware updates
- DIP switch interface
- Color bar and tone outputs



NEURAL THX-SURROUND™

Neural THX-Surround™ eases the transition to 5.1 audio in today's television systems.

Harris Corporation is the exclusive broadcast partner of Neural Audio, offering a range of next-generation audio infrastructure products that enable surround sound over stereo audio paths and seamless audio transitions between mono, stereo and surround sound before Digital (AC-3) compression.

Neural THX-Surround™ DownMix, UpMix and MultiMerge integrate easily with Harris signal processing products — including the X75™ converter/synchronizer and 6800+™ and NEO® modular processors — to maintain proper video-to-audio timing for lip sync purposes.

Key Benefits of using Harris and Neural THX-Surround™ Audio Infrastructure Solutions:

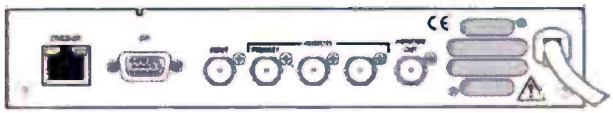
- **Economy** — enables you to move to 5.1 surround sound using your existing stereo audio infrastructure
- **Audio Upconversion** — add an "upconvert" to your audio signal while upconverting your video signal to maintain proper video-to-audio timing
- **Improved "Audio Experience"** — any audio signal can be processed to a pleasing 5.1 before compressing

Neural THX-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 (for example, voice-over) and later upmixed to 5.1 maintaining the surround sound.
Neural THX-Surround™ UpMix:	Any mono, stereo or stereo mix with encoded surround sound information is mixed up to a 5.1 surround sound.
Neural THX-Surround™ 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.

For more information, visit: http://www.neuralaudio.com/.

neural SURROUND™
THX® TECHNOLOGIES

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.

LEGALIZATION & COLOR CORRECTION

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.

ADDITIONAL DISTRIBUTION AMPLIFIERS

HARRIS

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

UDA-683	Utility Video Distribution Amplifier
VDA-683	Video Distribution Amplifier
VEA-683	Video Equalizing Amplifier
VEH-683	Video Wide Band Equalizing Amplifier

ADDITIONAL DISTRIBUTION AMPLIFIERS

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.

Icon™ Series Master Control and Branding Solutions

The Harris Icon™ series of products — IconMaster™, IconLogo™ and IconStation™ — are designed to provide all the functionality you need to capture and keep your audience's attention. The Icon series allows you to stay ahead of the competition in an environment in which high-impact, sophisticated transmission will be the deciding factor as to whether or not your audience stays tuned to your channel. With an easy-to-use interface, the Icon series also significantly reduces the time needed to create complex on-air looks.

IconMaster™, IconLogo™ and IconStation™ are designed to operate in either SD or HD, making the Icon series easily adaptable to future requirements. The Icon Series family also continues to expand its control protocol, which makes it easier for asset management and automation systems to simplify the workflow for broadcast personnel.

IconMaster™ — Feature-rich master control with a small footprint

HDTV

IconMaster™ is designed to meet the ever-changing demands of broadcasters — today and tomorrow. Key features of IconMaster™ include:

- Dynamic inputs
- Fully dynamic inputs or 12 to 22 static inputs
- Hot Punched keyers
- Transition within effects
- SD/HD capable
- Internal branding engine with 6 keyers – 2 external, 4 internal
- IconMasterNAV, auxiliary control software application

With IconMaster's wide array of features, broadcasters are often amazed to discover that IconMaster™ is a two modular card set within the NEO® advanced modular processing platform. Furthermore, IconMaster's high degree of reliability — providing superior-quality, uninterrupted transmissions — helps broadcasters preserve their revenue streams.

IconLogo™ — Setting the standard in on-air branding

IconLogo™ provides a high degree of functionality and performance at a low cost. IconLogo™ is the market leader in on-air branding. IconLogo™ offers broadcasters a reliable, full-featured, robust branding solution. IconLogo™ features four fully independent layers — SD or HD — to support:

- Stills
- Bugs
- Animations
- Crawls (RSS or ODBC feeds)
- EAS alerts
- Time
- Temperature
- Audio clips

IconLogo™ features tight integration with IconMaster™ and numerous automation systems, making IconLogo™ a "must have" in every broadcaster's on-air branding system.

IconStation™ — Design your high impact, on-air look

IconStation™ provides all the tools you need to design your high-impact, on-air look.

IconStation™ is proof that creating sophisticated, high-energy and visually pleasing branding presentations doesn't have to break the budget. IconStation™ features an easy-to-use interface that allows graphic artists to begin work within hours of receiving IconStation™, resulting in easy integration and increased productivity. IconStation™ is the branding product broadcasters cannot afford not to have.

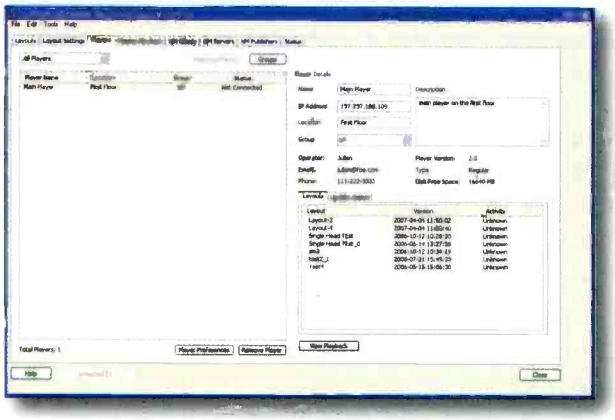
IconStation™ further protects the broadcaster's investment by being SD- or HD-capable, ensuring that the transition to HDTV goes as smoothly as possible. Key features of IconStation™ include:

- Infinite layering
- Animated, highly sequenced
  - Snipes
  - Crawls
  - Coming ups
  - Squeeze and teases
- Single- and dual-channel effects
- 2D DVE
- Simultaneous Program/Preview
- Tight integration with branding management and automation systems

Network Manager™ — Manage your branding assets

Network Manager™ — Centralized Branding Asset Management.

The Icon series is designed to provide broadcasters with a high-energy, on-air presentation as well as an easy-to-use, simplified workflow. Network Manager™, a new addition to the Icon series, greatly simplifies your unique branding workflow — from creation to playout. With Network Manager™, you can:



- Manage the playout devices, IconStation™ and IconLogo™ and the database
- Create a multi-level approval system
- Email notifications
- Perform intelligent scheduling and management

Whether you are managing only one channel or multiple channels, Network Manager™ will significantly streamline your operations.

ROUTING SWITCHERS

HARRIS

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.

Large Routing

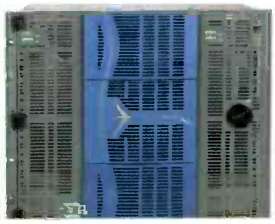
Platinum™

Innovative, large-scale routing

- Up to 256x256 in 15RU; Up to 512x512 in 28RU
- Mixed signal routing for any format from analog to digital up to 1080p (3 Gb/s)
- Highly reliable with enhanced control and monitoring
- Built-in processing with automatic conversion as required
- Modular scalability with I/Os in groups of 8 for video and 16 for audio
- Redundant controllers, power supplies and signal paths

Medium Routing

Platinum™ MX



Advanced, medium-scale routing

- Up to 128x128 in 9RU
- Mixed signal routing for any format from analog to digital up to 1080p (3 Gb/s)
- Highly reliable with even the cross-points providing full redundancy
- Built-in processing with automatic conversion as required

Integrator®

Traditional medium-scale routing

- 64x64 in 4RU, 128x64 in 6RU, 128x128 in 8RU (audio/data)
- Mixed signal routing including "true" analog, DS3/E3, digital up to SD-SDI (270 Mb/s), audio and data

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 digital up to 1080p (3 Gb/s)
- 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 (1.5 Gb/s)
- Ultra low-cost routing

Specialty Routing

Panacea™ Clean/Quiet

Industry's only dual-channel clean and quiet switch

- 16x2 with 6 auxiliary outputs; dual 8x1 with 3 auxiliary outputs each
- HD-SDI, SD-SDI or mixture with transitions on both video and audio switching

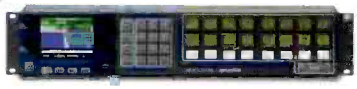
HDTV CCS SNMP

ROUTING CONTROL

Advanced Hardware Panels

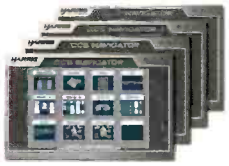
RCP-IDe
LCD buttons with downloadable text and graphics

NUCLEUS™
Customizable control of routing, processing and network equipment



See page 85 for more information on hardware control panels.

Flexible Software Applications



CCS Navigator™
System-wide control and monitoring application

Router Works®
Software-based router control panel application

See page 85 for more information on software applications.

Protocol Support

EDGE Gateway

1RU external gateway device providing protocol translation between native Harris and third-party protocols

- Harris protocols supported include: Thomson/GVG, Utah Scientific, NVision, Pro-Bel
- Other protocols continually being added—please call for more information
- As we are a market leader, many vendors support our native protocol directly as well

Built-in / Native Protocol Support

Platinum™ and Panacea™ have built-in/native support for:

- Harris CCS Protocol™ over serial and Ethernet
- Harris XY Pass-Through Protocol serial and Ethernet
- Optional software license support for SNMP

Legacy SPT (Serial Protocol Translator)

Small, third-party protocol conversion for small to medium size systems:

- Thomson/GVG 20-TEN & Horizon; Pro-Bel System 2; Sandar, Tandberg, Panasonic MARC II, TSL
- Also useful as a simple serial port expansion and/or router simulator

Other Interfaces

Automation Vendor Support

AMX, Crestron, Crispin, Florical, Harris, Leightronix, MATCO, Micro-First, Sundance, etc.

Tally / UMD Control Systems

Image Video, Television Systems Limited (TSL), Videoframe Systems, etc.

Master Control Systems

Harris, Miranda, NVision, Pro-Bel, Thomson/GVG, Utah Scientific, etc.

PLATINUM™

HARRIS

Innovative Large-Scale Routing

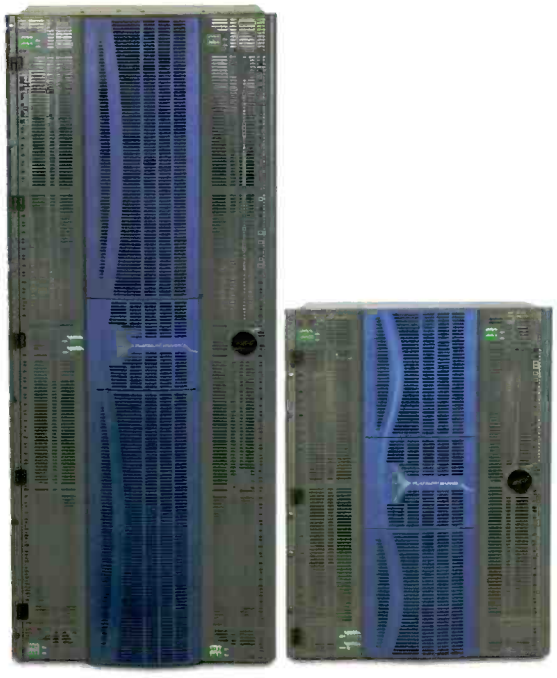
World's Only Embedded Audio Processing Router

Platinum™ combines the best of both high-bandwidth video signal routing and an internal TDM architecture to provide the world's only embedded audio infrastructure router. The combination of these technologies into a single frame enables Platinum™ to provide functionality not possible before. Not only can Platinum™ route video and audio signals within the same frame, it can now synchronize your HD/SD video, demux up to 16 channels of embedded audio per signal, perform phase reversal, swap, sum and "quiet" break-away switching of the audio between any embedded and discrete inputs, provide gain/level adjustments on a per-channel basis and then re-synchronize and mux your selected audio channels back into each outgoing HD/SD signal.

This combined capability provides significant savings in space, power, cost and complexity. System designs can reduce the number of modules, frames, wiring and system integration, while providing enhanced functionality.

Platinum™ Routing Switchers

The Platinum™ line of routing switchers combines 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 24/7 operation, 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.



Key Features

- Mixed-signal routing
  - Up to 256x256 in 15RU (NOTE: up to 512x512 audio)
  - Up to 512x512 in 28RU (NOTE: up to 1024x1024 audio)
- Modular I/O in groups of 8
- Front loading, hot-swappable modules for 24/7 operation
- Redundant power supplies, controllers and signal paths
- Enhanced control and monitoring
  - Wide range of hardware control panels
  - Software and Web-based applications with user configurable GUI's
  - Protocol support for CCS™, SNMP and third-party vendors
  - Secure access rights with restrictions by level, source and destination
- Video routing support
  - 1080p (3 Gb/s) signal routing (any size)
  - Almost any digital video signal from 3 Mb/s to 3 Gb/s including:HD-SDI, SD-SDI, ASI, SMPTE 310, SMPTE 305, etc.
  - Analog video supported via conversion to/from SD-SDI on I/O NOTE: Certain low quality analog video signals require TBCs (ie. VHS)
- Audio routing support
  - Digital audio signals including balanced and unbalanced AES
  - Analog stereo audio via conversion to/from AES on I/O modules
  - Embedded audio including up to 16 channels
  - "Quiet switch" with transitions

HDTV CCS SNMP

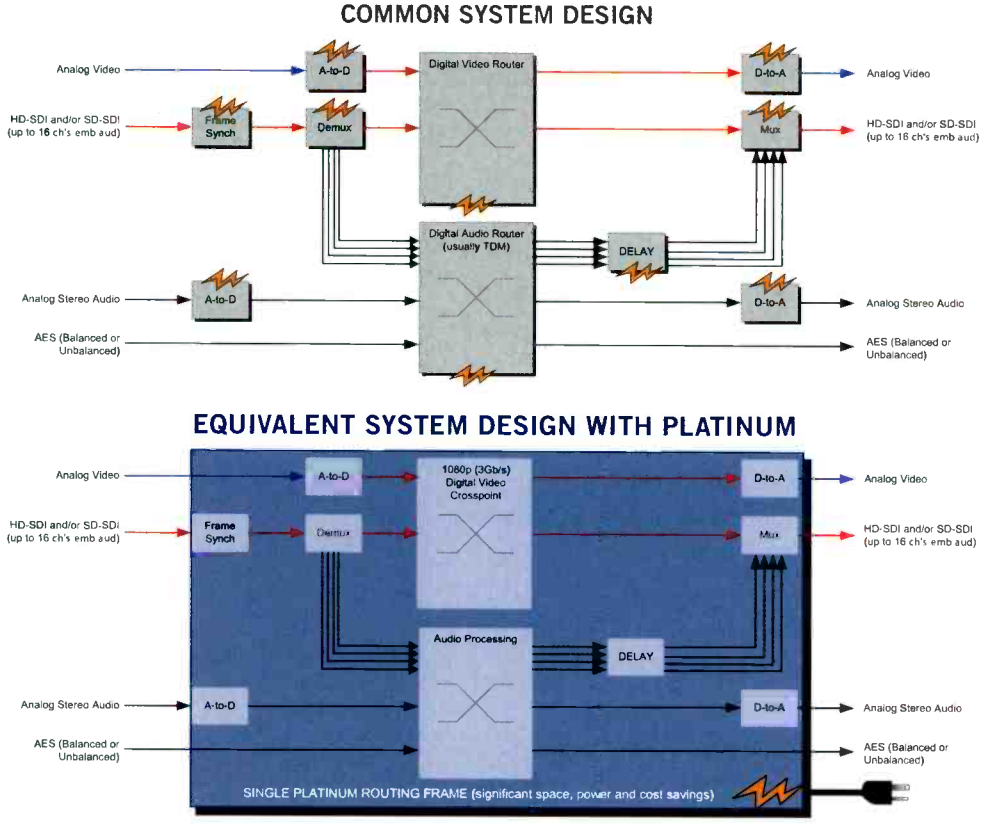
Higher Reliability

Platinum™ routing frames are designed for harsh 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. For further reliability, Platinum™ I/O modules support either eight inputs or eight outputs, thereby limiting the number of signals affected by any one module. Each Platinum™ frame supports redundant control and redundant cross-points are available in most configurations.

Enhanced Control and Monitoring

The distributed control system used in Harris routing switchers is unique in the industry in that it does not require a separate, centralized controller. Each Platinum™ frame features redundant control modules that store configuration information related to that frame in non-volatile memory. While every frame in the system can be used to store and retrieve a full copy of the complete system configuration, a complete failure of both modules —or of the complete frame—would only affect the signals in that frame. The rest of the system would continue to operate. In addition, communications from control panels can be distributed throughout a facility removing yet another single point of failure.

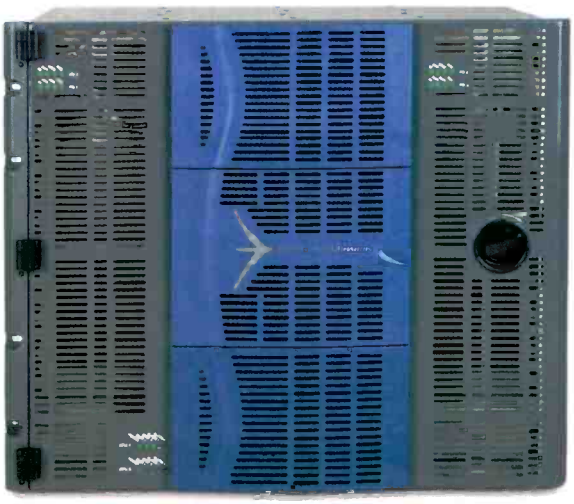
Platinum™ Router Architectural Advantages



PLATINUM™ MX

HARRIS

Advanced Medium-scale Routing



Higher Reliability

Platinum™ MX routing frames are designed for harsh operation (including mobile truck environments), and feature front-loading, hot-swappable modules for ease of serviceability. Employing the latest technology, Platinum™ MX 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. For further reliability, Platinum™ MX I/O modules support either eight inputs or eight outputs, thereby limiting the number of signals affected by any one module. Each Platinum™ MX frame supports redundant control, power and redundant cross-points.

Platinum™ Routing Switchers

The Platinum™ line of routing switchers combines 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 24/7 operation, 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 moderate number of signals.

Enhanced Control and Monitoring

The distributed control system used in Harris routing switchers is unique in the industry in that it does not require a separate, centralized controller. Each Platinum™ MX frame features redundant control modules that store configuration information related to that frame in non-volatile memory. While every frame in the system can be used to store and retrieve a full copy of the complete system configuration, a complete failure of both modules —or of the complete frame — would only affect the signals in that frame. The rest of the system would continue to operate. In addition, communications from control panels can be distributed throughout a facility removing yet another single point of failure.

Key Features

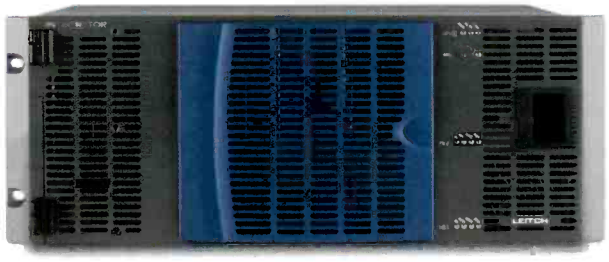
- Mixed-signal routing up to 128x128 in 9RU
  NOTE: Up to 256x256 audio
- Modular I/O in groups of 8
- Front loading, hot-swappable modules for 24/7 operation
- Redundant power supplies, controllers and cross-points
- Enhanced control and monitoring
  - Wide range of hardware control panels
  - Software and Web-based applications with user configurable GUI's
  - Protocol support for CCS™, SNMP and third party vendors
  - Secure access rights with restrictions by level, source & destination
- Video routing support
  - 1080p (3Gb/s) signal routing (any size)
  - Almost any digital video signal from 3 Mb/s to 3 Gb/s including: HD-SDI, SD-SDI, ASI, SMPTE 310, SMPTE 305, etc.
  - Analog video supported via conversion to/from SD-SDI on I/O
  NOTE: Certain low-quality analog video signals require TBCs (for example, VHS)
- Audio routing support
  - Digital audio signals including balanced and unbalanced AES
  - Analog stereo audio via conversion to/from AES on I/O modules
  - Embedded audio including up to 16 channels
  - "Quiet switch" with transitions

HDTV CCS SNMP

Traditional Medium-scale Routing

Integrator® Routing Switchers

The Integrator® line of routing switchers allows you to switch multiple signal formats within the same 4RU, 6RU or 8RU frame. With expansion in groups of 32 inputs or 32 outputs, Integrator® provides cost-effective scalability for analog video, SD-SDI and many telco formats up to 64x64 in 4RU or 128x64 in 6RU. Analog audio can be expanded up to 128x128 in 6RU with balanced and unbalanced AES audio supported up to 128x128 in 8RU. Even data routing (such as RS-422/232) is supported with up to 64 ports in 4RU and 128 ports in 8RU frame. As Integrator routing switchers support "true" analog video and analog routing, they are especially well-suited to the routing of composite signals (including lower quality signals such as VHS), telco signals such as DS3 or E3 and time-code. Combining these capabilities with excellent SD-SDI, ASI and AES routing, the Integrator family of routing switchers are widely used in network, local broadcaster, mobile production, cable, telco, military, government and corporate applications.



Key Features

- Mixed-signal routing:
  - 4RU frame: Single 64x64; Dual 32x32
  - 6RU frame: Single 128x64; Triple 32x32
  - 8RU frame: Single 128x128 (audio only); Dual 64x64
- Modular I/O in groups of 32
- Front-loading, hot-swappable modules for 24/7 operation
- Redundant power supplies and controllers
- Enhanced control and monitoring
- Video route support:
  - True analog video routing up to 100 MHz
  - Telco formats such as DS3 and E3
  - SD-SDI, ASI, SMPTE 310, SMPTE 305
- Audio route support:
  - True analog audio routing
  - Time-code routing
  - Balanced or unbalanced AES

Robust Architecture with Proven Reliability

Integrator™ routing frames are designed for harsh operation (including mobile truck environments), and feature front-loading, hot-swappable modules for ease of serviceability. Integrator frames support redundant, load-sharing power supplies. Redundant controllers/logic cards are also supported providing seamless transition in the event of a failure. All I/O modules, power supplies and controllers/logic cards are front loading and hot swappable for 24/7 operation.

Enhanced Control and Monitoring

The distributed control system used in Harris routing switchers is unique in the industry in that it does not require a separate, centralized controller. Each Integrator frame features redundant control modules that store configuration information related to that frame in non-volatile memory. A complete failure of both modules —or of the complete frame — would only affect the signals in that frame. The rest of the system would continue to operate. In addition, communications from control panels can be distributed throughout a facility, removing yet another single point of failure.

HDTV CCS SNMP

PANACEA™

HARRIS

Panacea™

The affordable, compact Panacea™ routing switcher line is 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
- 3 Gb/s capability standard on all HD-SDI routers
- 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. Optional 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
- Compact 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

HDTV CCS SNMP

CONTROL PANEL OFFERINGS

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.

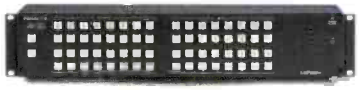
RCP-IDe

Harris RCP-IDe routing control panels combine the ease of operation of a button-per-crosspoint control panel, the clarity of LCD display buttons and the flexibility of downloadable text and graphics, allowing for fast and easy changes and setup. With the ability to communicate over coaxial XY or Ethernet, the panel also includes the ability to page up/down through sources and destinations, configure buttons to show current source and/or destination status, and notify users of alarms on displayed sources and destinations.

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 128 x128 or smaller.

Programmable Pushbutton



The RCP-PB series of customizable button-per-source panels is available as both local panels on the front of Panacea routers and as remote control panels. Almost every size from 4x1 to 64 x1 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

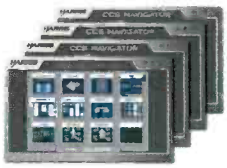
RouterWorks®—Advanced Software Control

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. With a simple Wizard set-up, RouterWorks® has the ability to limit access by sources, destinations and levels, and has the ability to configure the number of and size of buttons, icons, etc.

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™—System-wide Control and Monitoring Application



CCS Navigator™ is an innovative software application that provides advanced tools for creating customizable GUIs (Graphical User Interfaces) that simplify your operations. With real-time control and monitoring of a wide range of applications including routing, master control, processing, and networking, and third-party SNMP equipment, CCS Navigator™ reduces the complexity of everyday actions to simple point-and-click operations.

Third-Party Interfaces

Edge Gateway

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)

HARRIS

NetVX™—Integrated High-Speed Video Networking Platform

The NetVX™ Video Networking System is a modular video networking device. NetVX™ modules combine standards-compliant audio, video, and data networking interfaces to integrate with any video plant and expand its reach to broader, even global, data networks.

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 Generation and re-Generation

Video [and Data and Voice] Networking Platform

- Encoding/Decoding, MPEG-2, H.264, 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

The AUD-D14 Audio Processing Module extends the audio capabilities of NetVX™ by providing up to four additional channels (stereo pairs) of audio I/O. Audio codecs include MPEG Layer II and Dolby® AC-3. SMPTE 302 is also provided to support Dolby® E pass-through processing.

The ATM-X11 module provides a full-duplex 155 Mb/s SONET/SDH optical interface and a full-duplex 35/45 Mb/s PDH electrical interface. These interfaces support Asynchronous Transfer Mode (ATM) circuit connections. A building integrated timing supply (BITS) master clock interface is also provided for either sending or receiving Stratum clock timing signals.

The NetVX™ ENC-A11 builds upon the legacy of our industry-leading ENC-S11 real-time MPEG-4 Part 10/H.264 encoder. With full 720 resolution, professional-grade SDI video input and +24 dB audio inputs, the ENC-A11 delivers what professionals need in a real-time, high-quality, low bit-rate MPEG-4 Part 10/H.264 encoder.

The ENC-H11 uses the latest in VLSI technology to bring stunning high-definition video to the NetVX™ platform. The H11 is the smallest, lowest power, full-featured professional MPEG-2 HD encoder on the market today and is suitable for a broad range of applications including post-production, surveillance, contribution, distribution and final emission.

NETWORKING

The ENC-S11 MPEG-2 encoder module can encode both Main Level/Main Profile 4:2:0, CIF and Main Level/Professional Profile 4:2:2 video and accepts analog composite as well as SMPTE 259M SDI component video. The ENC-S11 also encodes two stereo pairs of audio using Dolby® AC-3 or MPEG-1 Layer 2 compression, SMPTE 302 or pre-compressed pass through audio. Primary and secondary stereo audio is accepted as AES3, balanced analog or embedded.

The GBE-C11 brings unparalleled data support to the NetVX multi-service platform. In addition to supporting video over IP, the GBE-C11 may be used to aggregate voice and data traffic more efficiently using private or leased facilities.

The ENC-S21 is an ultra low bit-rate MPEG-2 SD encoder incorporating the latest filtering, multi-pass technologies and statistical multiplexing* achieving bit-rate performance like no other.

The TMX-M12 makes it easy to de-multiplex and re-multiplex transport streams, enabling incoming programs to be repurposed into new programs, local content (commercials, news, and more) to be added, and new transport streams to be generated. Further enhancing system versatility, the TMX-M12 features two independent inputs and outputs and can handle either the DVB-ASI or the SMPTE 310M protocols.

The DEC-S11 MPEG-2 decoder module handles both Main Level/Main Profile 4:2:0, CIF and Main Level/Professional Profile 4:2:2 video and provides both analog composite as well as SMPTE 259M SDI component video. The DEC-S11 also decodes Dolby® AC-3 or MPEG1 Layer 2 and supports SMPTE 302 and pre-compressed audio formats. Primary and secondary stereo audio outputs are provided as AES3, balanced analog or embedded audio.

The NetVX's SYS-A22 System Controller Module provides control and management functionality to the entire NetVX system. SYS-A22 functions include provisioning, status, fault management, and supervisory control. The SYS-A22 is designed to provide redundant system control. Systems configured for redundant system control use two SYS-A22s installed in slots one and two. A SYS-A22 can also perform redundant functions to a SYS-A12 System Controller.

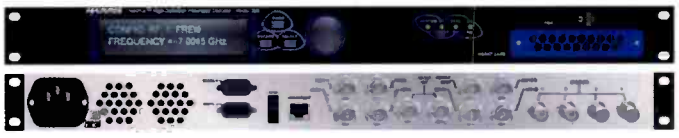
Broadcast Video and Audio Compression

New compression modules are now available for the 6800+ platform.

- IPV6800+ Video Gateway links traditional SDI and ASI-based video plants through modern Gigabit Ethernet networks and provides a cost-effective alternative to expensive satellite-based ASI links. See page 26 for more details.
- MFD6800+ Multiformat Decoder is a single 6800+ module that decodes either H.264 or MPEG-2 HD and SD video signals and their commonly associated audio signals. See page 26 for more details.
- SRD6800+ Satellite Receiver and Demodulator is capable of receiving various types of satellite signals and provides an industry-standard ASI output for distribution or decoding. See page 27 for more details.

NetPlus™ —High-Definition Decoder

The NetPlus™ Model 300 High-Definition decoder builds upon the industry renowned Model 200 High Definition Integrated Satellite receiver/decoder. This MPEG-2 receiver/decoder provides contribution-quality audio and video performance over the widest variety of signals and formats.



The NetPlus™ High-Definition receiver/decoder features compact packaging, while packing in industry standard transport stream interfaces and an L-Band DVB-S2-capable tuner/demodulator with up to four inputs. The NetPlus™ HD-IRD also includes options for DVB compliant descrambling, integrated Dolby® E audio decoding, and multiple methods of system configuration and control. NetPlus™ is the industry-proven solution for high-performance distribution and delivery.

Features

- Decodes a range of worldwide video industry formats (1080i and 720P at 50 Hz* and 59.94 Hz) in both the 4:2:0 and 4:2:2 formats
- L-Band satellite tuner and decoder supports DVB-S (QPSK) and DVB-S2 modes
- Supports industry standard DVB fixed-key decryption (BISS modes 0, 1, and E)
- Support for DVB Conditional Access systems including integral smart-card reader (consult factory for supported CA vendors)
- Dual HD-SDI SMPTE-292M video outputs each with embedded audio and VANC data reinsertion
- Video and audio outputs optionally resynchronized to house reference input
- Two streams internal audio decoding supporting Dolby® AC-3 and MPEG audio formats
- Optional integrated Dolby® E decoding capability for four stereo pairs, including timebase correction to local reference and re-embedding the decoded audio into the HD-SDI output

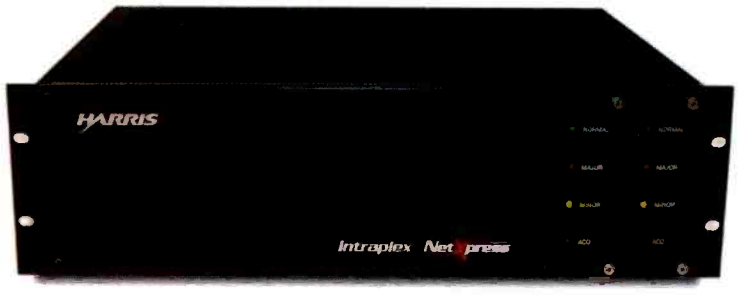
Model DTP-300 Digital Turnaround Processor

The Harris Digital Turnaround Processor (DTP™) line represents the latest generation in the Harris all-H.264 and all-MPEG-2 processing family of broadcast products, leveraging years of development and on-air experience. The DTP-300 helps television broadcasters avoid decoding and re-encoding DVB- and ATSC-encoded programs at the local station level, thereby saving capital and operational costs, while still allowing the broadcaster to offer locally relevant content and services. Broadcasters can offer the following localization services through deployment of the DTP™:

- Local station branding through logo overlays
- Local Emergency Alert Systems
- Per-program splicing from local stored content to allow local promos and advertisements within network feeds
- Overlay advertising — via animated graphics
- Community outreach with localized message crawls

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
- Support for voice signaling and echo cancellation
- 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
- SynchroCast3™ Compatible

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 bidirectional 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

Intraplex® SynchroCast3™ — Single Frequency Simulcasting with Multiple Transmitters

Intraplex® SynchroCast3™, the latest simulcasting solution from Harris, provides a dynamic, scalable solution for single frequency networks of overlapping transmitters. The system uses the proven Intraplex T1/E1 multiplexer with the precision of GPS digital timing to enable a network of transmitters to work together to increase coverage areas and reduce interference. This simulcasting solution serves both the radio broadcast and public safety industries.

The SynchroCast3 system will automatically adjust for any link delays that occur. Link delay changes can result from network rerouting, signal path fade, and other network conditions. The delay received at the transmitter is continuously sampled. If a change in delay persists, SynchroCast3 will initiate a delay correction at the transmitters. Once the delay correction is started, the shift in delay time is done seamlessly without interruption to system operation and at a controlled rate to prevent overshooting the desired delay.

The Harris simulcasting product provides reference signals to the base station for precise control of channel frequencies. The system uses either T1 or E1 transmission lines now readily available from Telco carriers or via private networks. These can be traditional land based, microwave, or fiber optic links. In fact, these systems can include a combination of public and private network links and still precisely control the necessary parameters to achieve peak simulcast performance.

Features

- **Optimizes the Use of Available Frequencies**
  Allows the use of a limited number of radio frequencies to cover a wider geographical area, often with the existing infrastructure.
- **Third-generation Product Improves on Industry-leading Performance**
  Improves on earlier generations of the SynchroCast product with increased time sampling, new alert/alarm reporting features, simplified installation and management, and the ability to be integrated into existing SynchroCast installations.
- **Dramatically Improves Coverage Areas**
  Gives users easy control of the system functions critical to adjusting the coverage area to achieve desired performance.

VIDEOTEK® QUIC™

Videotek® QUIC™ Media Analysis Server

The Videotek® QUIC™ Media Analysis Server is a fully automated, file-based test and measurement server platform that verifies the quality of compressed digital content. With QUIC™, broadcasters have a more efficient, consistent and cost-effective method of analyzing a long list of parameters in many different formats — before the content is distributed.

Unmatched Speed, Flexibility and Reliability

QUIC™ can automatically detect, report and repair audio and video content files within the server network without human intervention, providing measurable, improved quality standards.

Unique in the marketplace, QUIC™ uses the Microsoft Windows® XP operating system in conjunction with measurement acceleration modules to perform the processing — faster than real time. And, since the quality control process progresses so fast, broadcasters have tremendous flexibility in managing the workflow of their digital assets.

With QUIC™, the content verification process can be initiated manually via the intuitive graphical user interface (GUI), or automatically, using a "drop box" or file folder to place content into the analysis queue. Scalability through optional parallel processing (QUIC™ MA 1100 SLV) allows QUIC™ to meet any network's quality control requirements by reducing throughput time.

Well-suited for Various Environments

QUIC™ is designed for use in any workflow environment, from production to broadcast operations to satellite and cable distribution networks.

- Ingest servers
- Playout servers
- Archive systems

File Correction — Not Just Analysis

QUIC™ Media Analysis Server not only performs quality analysis, it can also repair identified faults found during the quality analysis process. By utilizing the optional file correction tool package, including the Videotek® hardware-based legalizer technology, QUIC™ Media Analysis Server enables the correction of out-of-spec audio and video content, without requiring the file to be returned to the content provider for re-editing.

Future-Proofed Scalability

The QUIC™ Media Analysis Server system hardware is highly scalable, and additional servers can be added to the primary system to increase analysis throughput times. Two kinds of View Stations are provided. The View Station is created with software, allowing a remote view of the primary QUIC™ server's database. The Advanced View Station option can also be added to provide traditional views of waveform, vector, audio level meter, gamut and picture display — all on one display device.

VTM SERIES™

Monitor Optional

Harris' Videotek® VTM Series™ features the world's first user-configurable, field-upgradeable, Multiformat 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 multiformat environment.

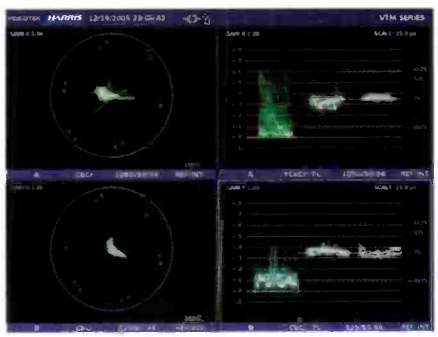
Start with the number of signals that can be monitored. When fully equipped, the VTM Series™ is the only test instrument of its kind that monitors and displays as many as four inputs simultaneously. Videotek's proprietary graphic display engines enable multiple input configurations to accommodate any 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.

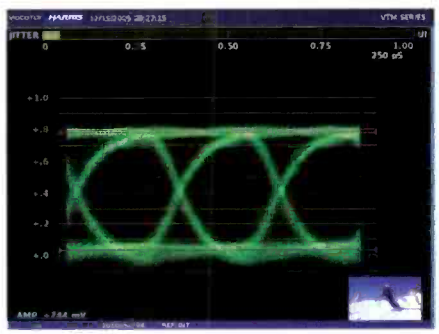
The VTM Series™ is also loaded with features designed to enhance the user's experience: illuminated controls, simple and intuitive navigation and a compact 1RU console. Favorite display configurations are instantly recalled using the assignable one-touch presets.

Whether customized with specially selected options or preconfigured by Harris' experts, the VTM Series™ is the optimal choice for any facility.

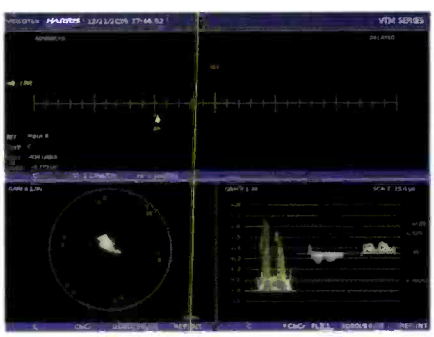
VTM Series™ Display Versatility Featuring Q-SEE™ Technology



Vector and Waveform Display of HD and SD signals.



HD Eye Pattern Waveform and Jitter Display with Amplitude Cursors and Picture Thumbnail.

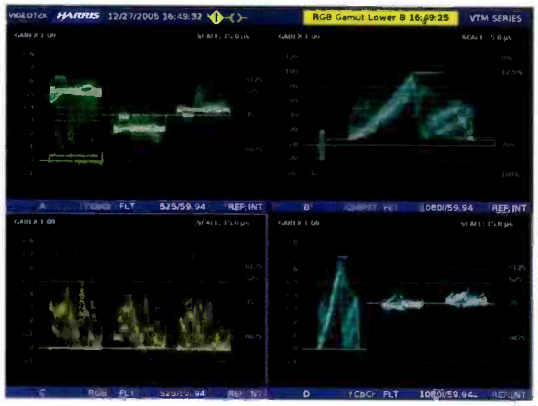


MULTI Mode Display showing Relative Timing with Waveform and Vector.

VTM SERIES™

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.

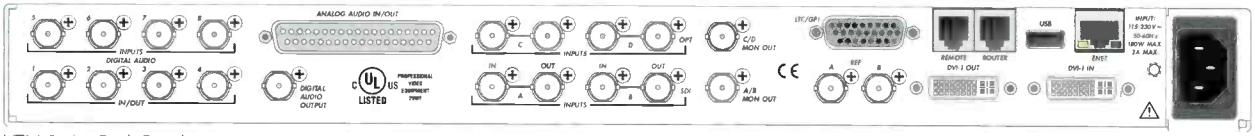
Q-SEE™ is just one more way the VTM Series™ proves it is the most versatile instrument in its class. When equipped with the proper input options, the VTM Series™ can output four different waveforms to the Q-SEE™ display, from four distinct signals — in essence, handling a job that used to require four 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
- A^3, 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

VTM Series Preconfigured Packages and Options

Package	Standard Inputs	Optional Inputs	Looping Inputs	WFM	Gamut	Eye Pattern	Vector	Pixel Locator/Data Word Analyzer	Line Select	Relative Timing	Closed Caption	Alarm Log	Audio	Output Type	Size
VTM-4100 PKG	2 HD/SD	2	YES, Passive	YES	YES	Option	YES	Option	YES	YES	YES	YES	Option	XGA/DVI	1RU
VTM-4100 PKG-E	2 HD/SD with Eye	2	YES, Active	YES	YES	YES	YES	Option	YES	YES	YES	YES	Option	XGA/DVI	1RU
VTM-3100 PKG	2 SD	2	YES, Passive	YES	YES	Option	YES	Option	YES	YES	YES	YES	Option	XGA/DVI	1RU
VTM-3100 PKG-E	2 SD with Eye	2	YES, Active	YES	YES	YES	YES	Option	YES	YES	YES	YES	Option	XGA/DVI	1RU
VTM-3100 PKG-A	2 Composite	2, Composite	YES, Passive	YES	No	Option	YES	NO	YES	YES	YES	YES	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, 2rd 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 to VTM-OPT 10.

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 DLK, Expands the Dual Link capability of the VTM-OPT EYE-2 and VTM-OPT HD/SD to include 10-bit RGB (4:4:4) and RGB+A (4:4:4:4) formats (Requires VTM-OPT 40.)

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, 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 ACV-2, Dual Composite Analog Input module. Two passive looping connections (NTSC/PAL) with auto-detection and Line Select.

VTM-OPT ASI, Dual DVB-ASI/SMPTE 310 Input Module. Two passive looping connections with auto detection. ATSC/DVB table analysis.

RCU-1000, Remote Control Panel for VTM Series instruments. Replicates all of the Front-panel controls. 1RU.

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. Decoce	Dolby 8-ch. Decode	Alarms	Dolby Metadata Display
VTM A³-Opt. 2	NO	100dB	8	YES	8	8	4	4*	4	NO	NO	NO	NO	YES	NO
VTM A³-Opt. 3	YES	100dB	8	YES	8	8	8	Standard	4	YES	NO	NO	NO	YES	NO
VTM A³-Opt. 5	YES	100dB	8	YES	8	8	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.

VTM MULTIFORMAT ON-SCREEN MONITORS

VTM-2400 Multiformat On-Screen Monitor

PRELIMINARY

The **VTM-2400** Multiformat On-Screen Monitor continues the Videotek® tradition of cost-effective monitoring of HD-SDI. Based on the technology developed for the VTM Series™, the VTM-2400 is an easy-to-operate tool to monitor and measure HD-SDI (1080 and 720) and optionally SD-SDI (525 and 625) signals on any XGA-capable monitor. The output display includes video picture, waveform, vector and alarm status or optional audio — each in one quadrant of the screen or any element in a full-screen view.

The VTM-2400 also optionally accepts four AES/EBU stereo pairs, four mono or two stereo analog inputs and embedded audio from the SDI inputs. Audio can be displayed as two- or four-channel bar graph meters with a phase bar and Lissajous readout for each meter pair.

Alarms include RGB Gamut, Loss of Signal, Loss of Video, EDH (SD) and CRC (HD) for video and Peak audio and Loss of Sound for audio. Four presets store user setups for convenience.

Features

- Two Looping HD-SDI inputs with auto detection of input format
- On-screen display of picture, waveform, vector and audio/alarm
- XGA display output
- Alarms include Loss of Signal, Loss of Video, EDH (SD), CRC (HD), RGB Gamut, Peak Audio and Loss of Sound
- Four user presets
- Standards supported SMPTE 292M and SMPTE 259M-C

Options

- Audio option for monitoring of analog digital and embedded audio
- Remote control

VTM-2000 Multiformat On-screen Monitor

The Videotek® **VTM-2000** Multiformat, On-screen Monitor continues the Videotek tradition of cost-effective monitoring of SD-SDI and analog composite signals. Based on the technology developed for the VTM Series™, the VTM-2000 is an easy-to-operate tool to monitor and measure SD-SDI (525 and 625) and analog composite (NTSC and PAL) signals on any XGA-capable monitor. The output display includes video picture, waveform, vector and alarm status or optional audio. The display can be configured to enable the viewing of each element in one quadrant of the screen or any element in a full-screen view. The VTM-2000 also optionally accepts four AES/EBU stereo pairs, four mono or two stereo analog inputs and embedded audio from the SDI inputs.

Audio can be displayed as two- or four-channel bar graph meters with a phase bar and Lissajous readout for each meter pair. Alarms include RGB gamut, loss of video and EDH for SDI; loss of signal (sync or carrier) for composite and SDI; peak video and SC/H phase for composite; and peak audio and loss of sound for audio. Four presets store user setups for convenience.

Features

- Two looping SD-SDI inputs with 525/625 auto detection
- Two looping composite inputs with NTSC/PAL auto detection
- On-screen display of picture, waveform, vector and audio/alarm
- Standards supported — NTSC, PAL, 525 and 625 SMPTE 259M-C
- XGA display output
- Four user presets
- Alarms include Loss of Signal (sync or carrier), Loss of Video (SDI), EDH (SDI), RGB Gamut (SDI), Peak Video (composite) and SC/H (composite)

Options

- Audio option for monitoring of analog, digital and embedded audio
- Remote control

VTM TELEVISION SIGNAL MONITOR

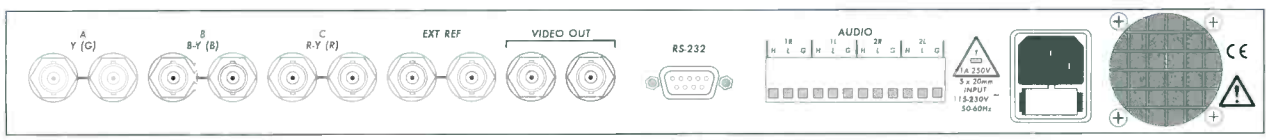
Monitor Optional

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



HD-STAR™ — HANDHELD HD-SDI, SD-SDI GENERATOR AND MONITOR

Features

- Multiple functionality
- Color Monitor
- Vectorscope
- Waveform Monitor
- Test Signal Generator
- Embedded Audio Monitor
- Serial Data Analyzer

Multiformats

- HD-SDI
- SD-SDI
- Portable, handheld - PDA-sized
- Weighs under one pound with battery
- Integrated 320 x 240 color LCD Display
- Touch Screen Operation

Harris' Videotek® HD-STAR™ portable, battery powered, handheld HD-SDI and SD-SDI video and embedded audio generator and video and audio monitor provides multiformat functionality and versatility that set it apart from other handheld test and measurement products on the market.

With a powerful array of features and functions that include a Video Test Signal Generator, Color Monitor, Waveform Monitor, Vectorscope, Serial Data Analyzer and an Audio Analyzer/Monitor, the lightweight HD-STAR™ is ideal for monitoring field production camera setup, equipment installation, or troubleshooting signal path issues related to high-definition and standard-definition digital formats.

This PDA-sized test monitor was designed to offer the convenience of portability without sacrificing function and performance. To enhance the user's experience, the HD-STAR™ features an integrated 320 x 240 color LCD display, utilizing touch-screen technology and the provided stylus to control and configure each operation. Maintaining power in the field won't be a problem - the HD-STAR™ runs on a Li-Ion battery pack or on the optional alkaline "AA" batteries.

The HD-STAR™ includes one looping video input for monitoring HD-SDI and SD-SDI signals formatted in SMPTE 292 M or SMPTE 259 M-C with embedded audio. The test signal generator has two outputs selectable as HDSDI or SD-SDI. The stereo headphone output may be used to monitor embedded audio from the SDI source.

Standard accessories include a sunshield, stylus, rechargeable Li-Ion battery pack, AC power adapter, serial communications cable, and a belt-style pouch.

PERSONAL TEST MONITOR

The Harris Videotek® **PTM-305** portable, battery powered, personal test monitor provides multiformat 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
- Multiformats
  - 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

OPTO TEST™

OTM-20 Optical Test Meter

The Harris OTM-20 series are integrated testers for fiber optic networks, providing convenient, handheld, intelligent testing. Boasting a large memory capacity, the OTM-20 can transfer the testing data to a PC by associated software for analyzing, reporting and printing. Its multifunctional kitbag enables field use and laboratory testing.

Features

- Supports quick test, intelligent operation
- Graphic interface, large easy-to-read LCD display
- Measurement units in dB, dBm and W (or mW)
- Large memory capacity (4000 measurements)
- Support auto test of optic fiber loss
- Draw changing curve of power value
- Support the optical power alarm function
- Automatical 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 PC software for data analyzing, graphic drawing and reporting
- Low-battery indicator and auto recharging display
- Dual-way powering system
- Auto-off function conserving battery life
- CE, FCC, FDA certificate

OFI-20 Optical Fiber Identifier

The Harris OFI-20 is a handheld optical test instrument that identifies optical fibers by detecting the optical signals being transmitted through the fibers — without having to open the fiber. By utilizing nondestructive, macro-band detection technology and a unique clamp mechanism, there's no need to create a splice point or interrupt service.

The OFI-20 accurately detects the optical signals, signal directions and the presence of modulated tones. It can test many types of fibers, including 250 µm, 900 µm, and Ribbon as well as 2mm and 3mm jacketed fibers.

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

OLT-20 Optical Loss Tester

The Harris OLT-20 is a multi-functional testing instrument for fiber optic networks, which handles installation, routine inspection and daily maintenance of MAN, WAN and CATV systems.

The OLT-20 integrates a laser source module and power meter module in one set, conveniently offering power testing and link loss testing. By efficiently performing multiple functions, the OLT-20 helps avoid file mistakes caused by mismatched laser source and power meter.

Features

- Multi-wavelength measurement
- Direct loss measurement units in dB
- Link loss testing
- Absolute power measurement units in dBm or uW
- Modulation in CW and modulated frequencies
- Optional 270/1K/2K Hz Modulated frequencies
- Dual-wavelength output in single optic
- Dual-way powering system including a 9V battery and AC adapter
- Low-power indicator
- Auto-off function
- CE, FCC, FDA certificates

OPM Optical Power Meter

The pocketsize Harris Optical Power Meter series can support accurate testing of single-mode and multimode optical fiber systems, with a large LCD display, moisture- and shock-proof design and dual-way powering system. The internal microprocessor and linear amplifier technology ensure accuracy for the life of the unit.

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
- Moisture-, dust- and shock-proof design
- Auto-off function conserving battery life
- CE, FCC certificates

SLS Stabilized Laser

The Harris SLS is a lightweight, easy-to-use stabilized laser source. Based on advanced precision laser control technology, the SLS models have been designed to provide a high-capability laser source for engineering, R&D and equipment manufacturers.

Features

- Fast response, no warm up
- Moisture-, 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

The Harris palmOTDR series are optical fault locating and analyzing tools for optical fiber networks. With its excellent performance and higher user value, it offers an innovative test method for telecommunication networks. As a fault locating and analyzing tool that is much more economical than traditional OTDRs, the palmOTDR series is handheld, lightweight and easy-to-use. The unique hot key design makes it faster and more convenient to review and analyze the event. It has powerful functions, such as supporting averaging and real-time test mode. And it can be used in single-mode (1310/1550nm) fiber applications.

Features

- Lightweight, portable and ideal for FTTx
- Full functions, optional single-mode fiber application
- High precise measurement, large memory capacity (300 test curves)
- Without hard desk 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 support, 4 hours continuous operations
- Low-battery annunciator
- CE, FCC, FDA certificates
- Drop tested up to 1 meter

VLS-20A Visable Laser Source

The Harris VLS-20A is a visible red laser source for identifying breaks and tight bends in optical fibers. By generating a red laser and that escapes from optical fibers, finding breaks in LANs, verifying continuity, checking the validity of patch cables or looking for cracked fiber in splices is made simple.

Features

- CW/1 Hz modulation
- One meter drop test
- CE, FCC, FDA certificates

TVM MULTIFORMAT SIGNAL ANALYZERS WITH INTEGRAL LCD

Case Optional

Harris' Videotek® **TVM-950** is the flagship of our multiformat 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, 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, dual Analog Composite and dual ASI inputs; RGB Dual Link; Advanced Audio Analysis with CineSound Surround display and comprehensive Dolby® decoding.

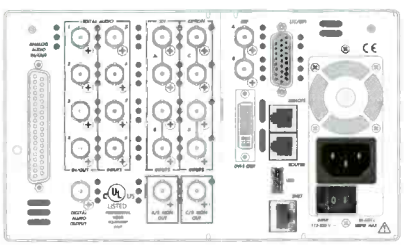
The TVM-950HD integrates seamlessly into any broadcast, post-production, telecine, satellite, or cable facility. It's the ultimate choice for quality control, troubleshooting, and compliance check applications.

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 with 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

TVM MULTIFORMAT SIGNAL ANALYZERS WITH INTEGRAL LCD

Case Optional

Harris' Videotek® **TVM-900** Multiformat 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
- A^3, 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** Multiformat 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
- A^3, 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

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	Option	DVI/XGA	3RU, ½ rack
TVM-950	2 HD/SD	2	Passive	Yes	Yes	Option	Yes	Option	Option	DVI/XGA	3RU, ½ rack
TVM-950-SD	2 SD	2	Passive	Yes	Yes	Option	Yes	Option	Option	DVI/XGA	3RU, ½ rack
TVM-950-A	2 Composite	2	Passive	Yes	Yes	Option	Yes	Option	Option	DVI/XGA	3RU, ½ rack
TVM-900-E	2 HD/SD with Eye	2	Active	Yes	Yes	Yes	Yes	Option	Option	DVI/XGA	3RU, ½ rack
TVM-900	2 HD/SD	2	Passive	Yes	Yes	Option	Yes	Option	Option	DVI/XGA	3RU, ½ rack
TVM-900-SD	2 SD	2	Passive	Yes	Yes	Option	Yes	Option	Option	DVI/XGA	3RU, ½ rack
TVM-900-A	2 Composite	2	Passive	Yes	Yes	Option	Yes	Option	Option	DVI/XGA	3RU, ½ rack
TVM-850-E	2 SD with Eye	2	Active	Yes	Yes	Yes	Yes	Option	Option	DVI/XGA	3RU, ½ rack
TVM-850	2 SD	2	Passive	Yes	Yes	Option	Yes	Option	Option	DVI/XGA	3RU, ½ rack
TVM-850-A	2 Composite	2	Passive	Yes	Yes	Option	Yes	Option	Option	DVI/XGA	3RU, ½ rack
TVM-840-E	2 SD with Eye	2	Active	Yes	Yes	Yes	Yes	Option	Option	DVI/XGA	3RU, ½ rack
TVM-840	2 SD	2	Passive	Yes	Yes	Option	Yes	Option	Option	DVI/XGA	3RU, ½ rack
TVM-840-A	2 Composite	2	Passive	Yes	Yes	Option	Yes	Option	Option	DVI/XGA	3RU, ½ 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 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 DLK, Expands the Dual Link capability to include 10 bit RGB (4:4:4) and RGB+A (4:4:4:4) formats (TVM-950 only).

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 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 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.

TVM-OPT AAP, Advanced Analysis Package adds Data Analyzer functions in quadrant or full-screen views to the TVM-900 and TVM-840.

TVM MULTIFORMAT SIGNAL ANALYZERS WITH INTEGRAL LCD

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-821D and TVM-821D/DC — Serial Digital Waveform Monitor/Vectorscope

Case Optional

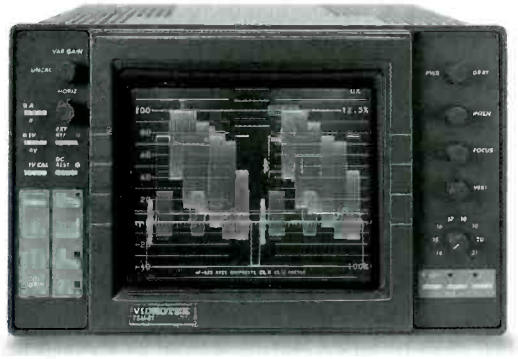
The **TVM-821D** serial digital waveform monitor/vectorscope brings the most commonly needed functions within quick, easy and affordable reach. Button per function design provides simple operation. With two serial digital inputs A/B Parade and Overlay modes provide for level comparison and easy system 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.

TSM-61 — Waveform Monitor with Line Select



Case Optional

The **TSM-61** is 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
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

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 multiformat, multichannel scenarios. The unit draws many of its features from the value packed VTM series of multiformat 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.

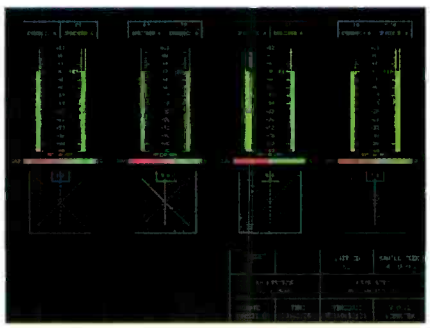
The unique Videotek® CinePhase™ display designed for intuitive viewing of surround sound levels is coupled with a new multichannel phase display that presents all critical interchannel relations at a quick glance. A loudness ballistic selection coupled with Metadata readout provides valuable information 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

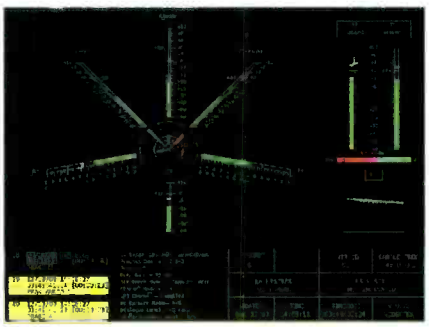
- Audio inputs include 8 analog, 8 AES/EBU, 2 embedded sources HD or SD
- Real-time chart recording of data samples
- Eight channel plotting of phase and level with average value display
- Analog, AES/EBU, Dolby® Digital (AC-3™), Dolby® E from external or embedded sources
- CinePhase™ multi-channel Level 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 multichannel Phase Display

AUDIO MONITORING

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 of space. High-quality, low-distortion volume levels are output through two five-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 monarual 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.

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. It is 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 Widescreen 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 and 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 widescreen 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

DEMODULATORS

Harris Videotek® Demodulators — 8VSB, 64 QAM, 256 QAM and NTSC

For nearly three decades, the Harris Videotek® brand name has been 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-840	1	NO	NO	YES (shared)	YES (shared)	NO	YES	YES (shared)	YES	YES	Web Browser SNMP, Serial, GPI	Stereo/ AES/Dolby	1RU
DDM-800	4*	NO	NO	NO	NO	NO	NO	NO	NO	NO	Web Browser SNMP, Serial, GPI	NO	1RU
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	NO	Synchronous	< 5%	< 5.0°	1RU
DM-141A	2 - 99	NO	2	> 49dB	Stereo	NO	NO	NO	NO	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-840 — Frequency Agile Digital Demodulator/Decoder

PRELIMINARY

The **DDM-840** is a compact, one rack-unit Frequency Agile Digital Demodulator with an MPEG-2 HDTV/SDTV decoder capable of demodulating 8VSB, 64 QAM and 256 QAM modulated signals, and converting them to DVBASI output format. The DDM-840's MPEG-2 HDTV decoder presents the MPEG-2 program streams in either HDTV (main profile at high level) or SDTV (main profile at main level) format. While generating a multitude of signals including RGB and YPBPR analog Component Video, NTSC analog composite video, and Serial Digital for monitoring the video program selected, the DDM-840 also decodes the transport stream's audio programs to two analog stereo pairs and two digital audio outputs as Dolby® Digital (AC-3 TM) pass through or PCM. External SMPTE-310 or DVB-ASI transport streams may be connected to the DDM-840 for decoding as well. The DDM-840 front-panel interface enables quick setup through a direct entry keypad and navigation keys. Front-panel indications for the current channel number, output format, received short channel name, program number and the received programs available up to 3 programs are included.

Features

- 12 HD/SDI or SD-SDI selectable output
- Closed Caption decoded and displayed on the output video
- Transport stream PSIP table display
- Signal to Noise Ratio and Bit Error Rate
- Auto programming of available channels
- SMPTE 310M or DVB-ASI selectable transport stream inputs
- CAV, SDI, and NTSC outputs
- Dolby® Digital (AC-3™) or PCM and Analog Stereo Audio outputs
- Standards available: ATSC

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 more than 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

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

CCS™

HARRIS®

The Harris network monitoring and 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—Harris NetVX™ networking products 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. Whenever possible, both the CCS™ Protocol definition and the SNMP MIBs are posted.

CCS NAVIGATOR™

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.

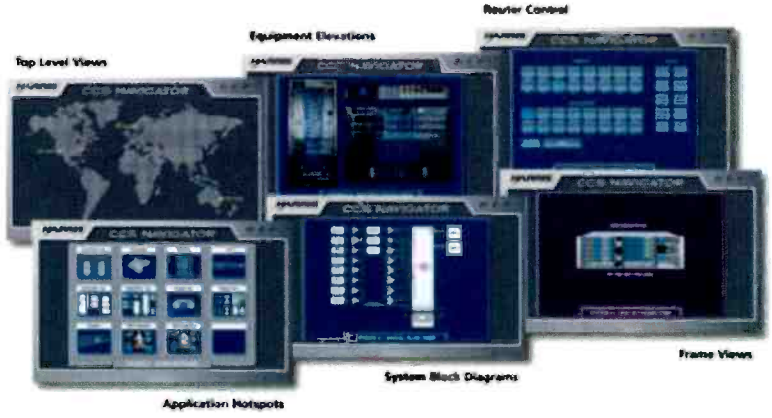
CCS Navigator™ is an innovative, Windows®-based software application that enables users to easily monitor both Harris and third-party devices within any facility. Operators experience immediate familiarity with the CCS Navigator™ on-screen GUIs, as they are representations of the user's facility and 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.

Thumbnails and Streaming Video

The newest 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 maximized.



Key Features

- Quickly display network alarms on any page
- Monitor SNMP-enabled third-party equipment
- Integrate Q-SEE™ thumbnails and MPEG-4 streaming video images into CCS Navigator™ pages
- Create customized control pages that combine multi-device controls into simple point-and-click operations
- Launch multiple actions on different devices with a single button push
- Allows browsing (backward and forward) across CCS Navigator™ pages
- Rendering of events across multiple pages

NUCLEUS™

HARRIS

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.

Processing Control

Routing Control

Q-SEE™ Thumbnail Display

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, branding systems, NetVX™ networking products and more. Customers will be able to control additional products as the drivers become available through software upgrades.

Configuration services: 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.

Q-SEE™ CUSTOMIZABLE MONITORING TECHNOLOGY

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 17 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.

CENTRIO™ — Transforming Multiviewer Expectations

Today's multiformat, multi-resolution, multichannel broadcast environments present a new set of challenges in video and audio monitoring.

Now there's a better solution. CENTRIO™

CENTRIO™ is a breakthrough multi-image processor built to streamline today's complex A/V monitoring workflow and make complicated installations a thing of the past. Combining a superior graphics engine, a robust broadcast-quality router and integrated, precise test and measurement tools, CENTRIO™ is a landmark development in multiviewer design and value.

With multi-image processing, routing, superior graphics, and an unrivaled monitoring toolkit all in one chassis, CENTRIO™ delivers a lower cost solution, simpler system design and a more efficient use of space for broadcast multi-video and audio monitoring, master control rooms, broadcast trucks, and events and staging.

CENTRIO™ Graphics

Award-winning Harris® Inscriber® graphics are built right in, powering customizable, state-of-the-art image layouts that allow users to create a cutting-edge monitoring and control tool based on individual needs. Layouts can be customized for each output using sharp, striking visual elements that result in a more effective, efficient control environment.

CENTRIO™ Design

Based on the robust, world-class Harris® Platinum™ router architecture, CENTRIO™ supports systems with up to 512 inputs (high-definition, standard-definition, analog or graphic) in a single frame. The Harris routing infrastructure delivers access to every video and audio signal without the need to cascade multiple frames. And because the CENTRIO™ multiviewer resides in a router, users enjoy simplified design, easy scalability, rack space savings and streamlined operation.

CENTRIO™ Display

To maximize a facility's display potential, CENTRIO™ drives multiple displays with varying resolutions. By driving up to 32 independent DVI outputs or 64 independent HD-SDI outputs from one chassis, CENTRIO™ is an ideal solution for controlling multiple wall applications in multiple rooms, in multiple layouts.

CENTRIO™ Monitoring

CENTRIO™ provides unprecedented access to a vast toolset that enables users to have more information at a glance and more control at their fingertips so they can respond faster to operational needs. CENTRIO™ goes well beyond traditional offerings by supplying built-in A/V test and measurement capabilities, user rules creation (Rules Designer) and on-screen controls (Heads Up).

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 51 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 for up to 1600x1200 (4:3) or 1920x1080 (16:9) 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

HDTV

CCS

SNMP

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.

- 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 1600x1200 (4:3) or 1920x1080 (16:9) 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

SuiteView™

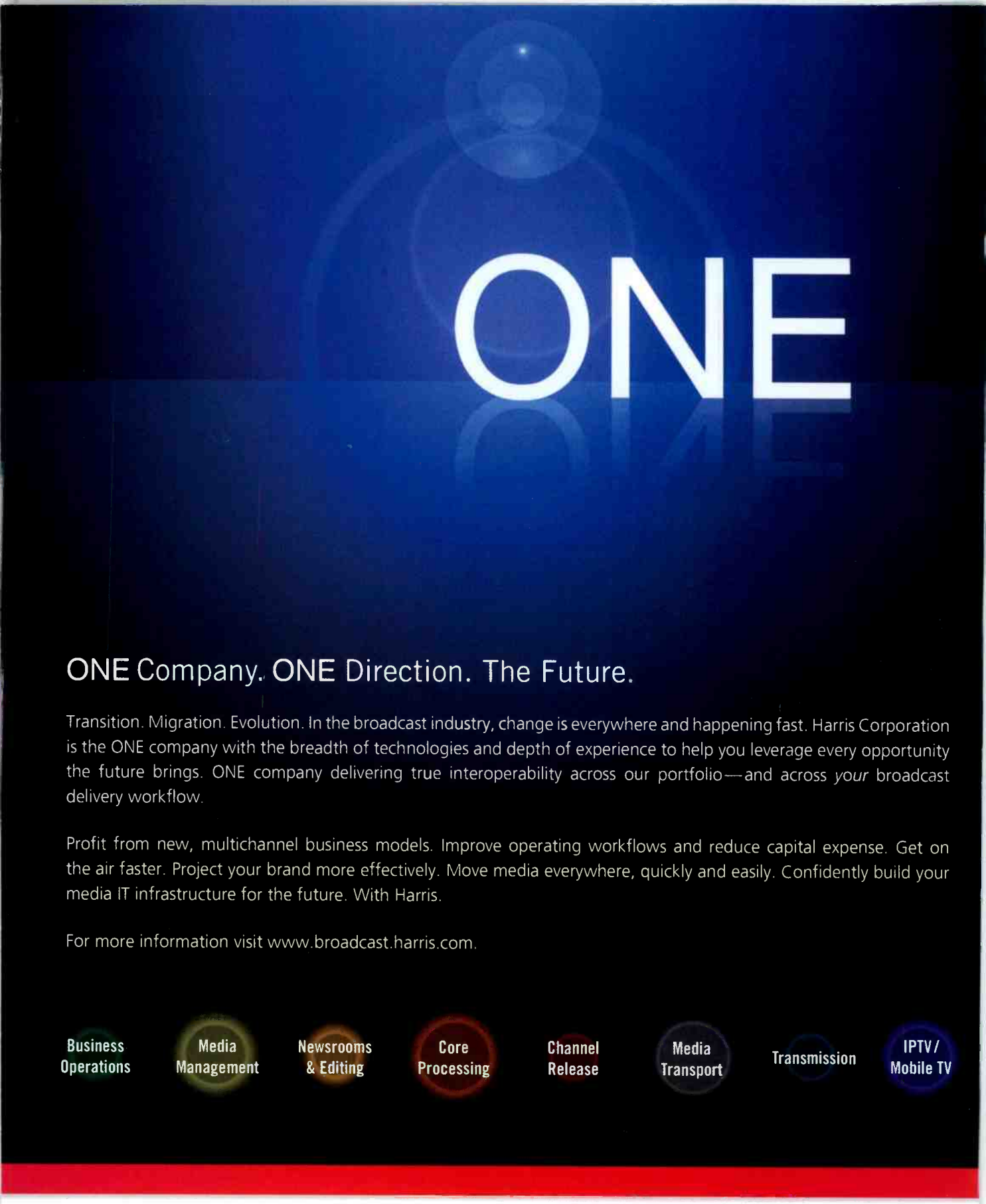
A simple yet versatile multi-source display processor offering from 4 to 16 inputs in 1RU. Supporting a wide range of video outputs simultaneously, SuiteView™ provides an extremely cost-effective monitoring solution for use with video-based displays.

- Compact and 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, compos te 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

FUNCTIONAL INDEX



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