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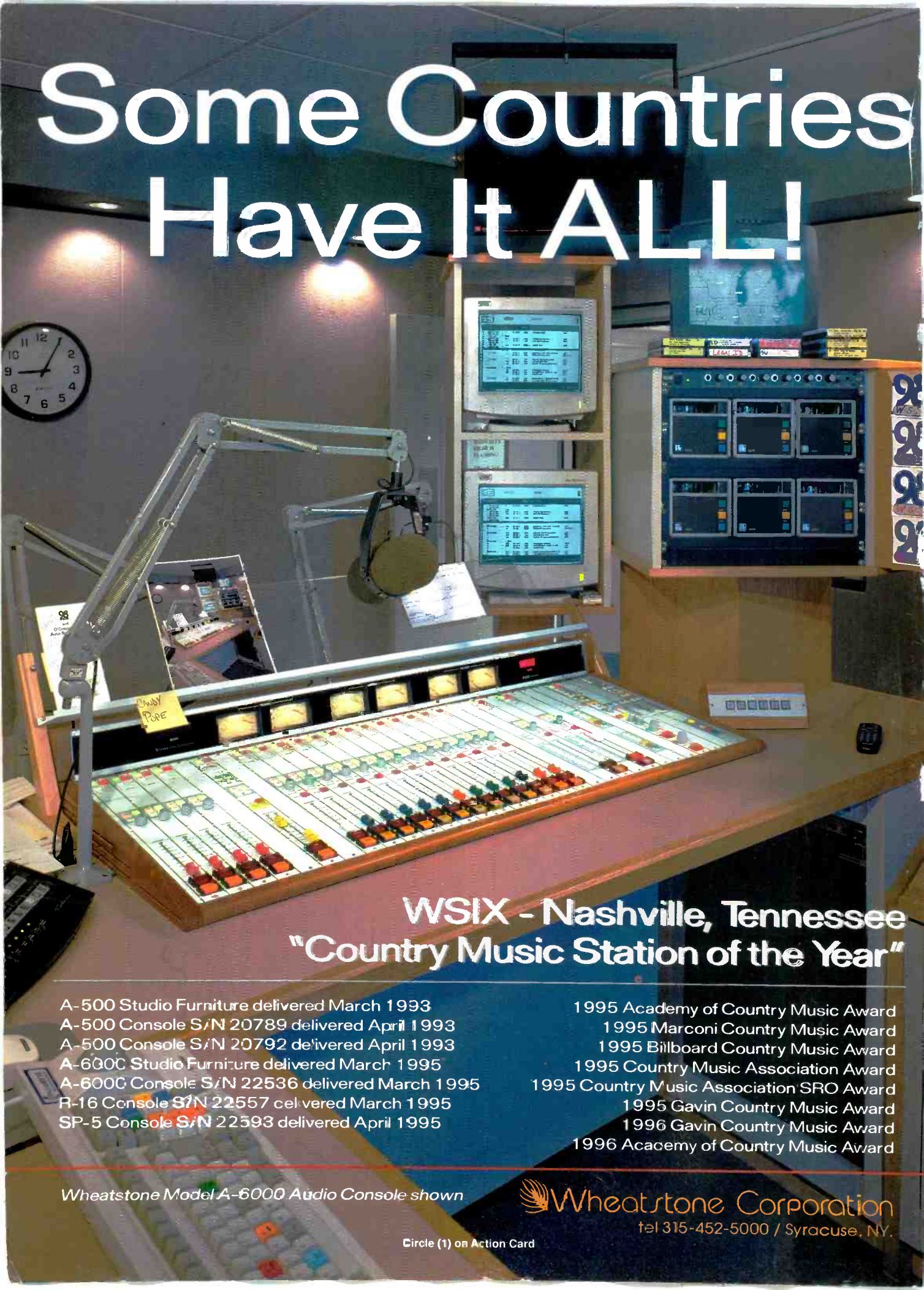
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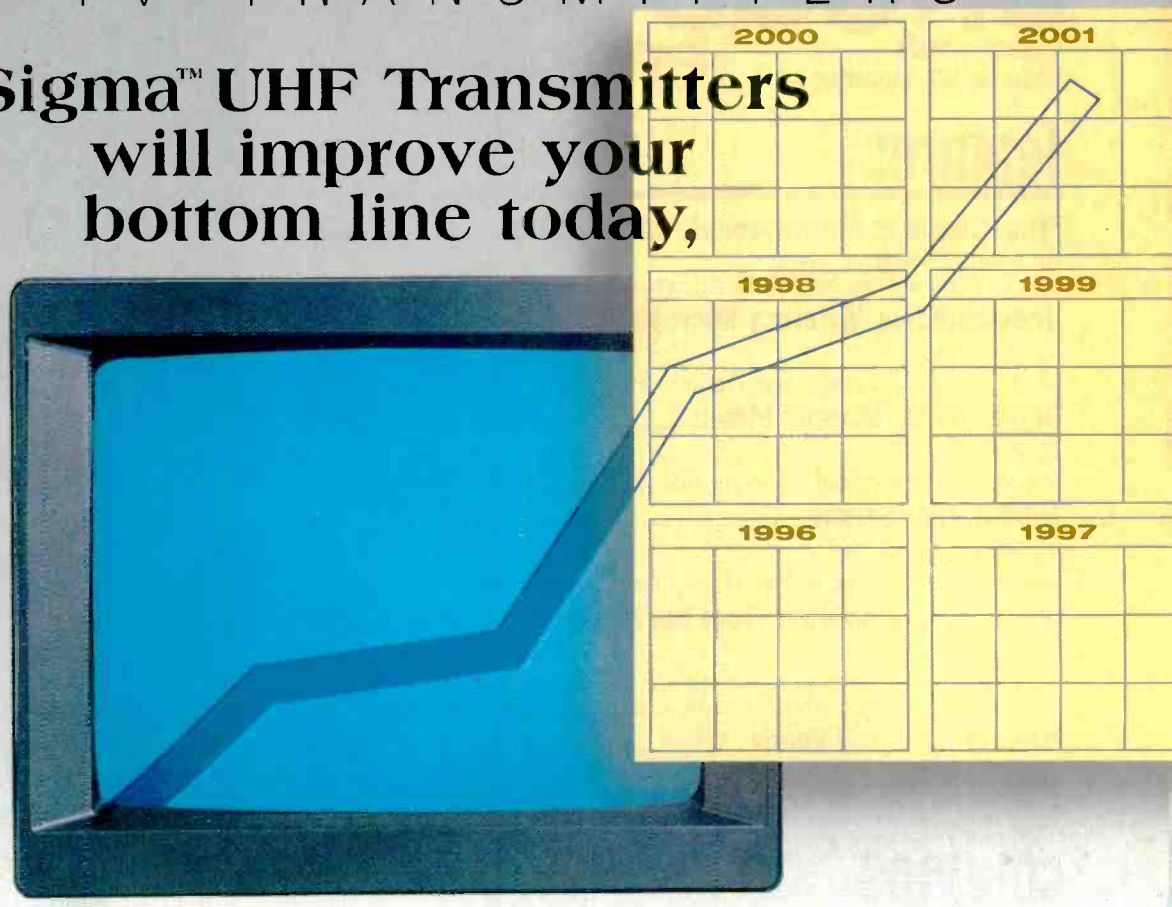

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BROADCAST® ENGINEERING
October 1996
Volume 38, Number 10

features

columns

departments

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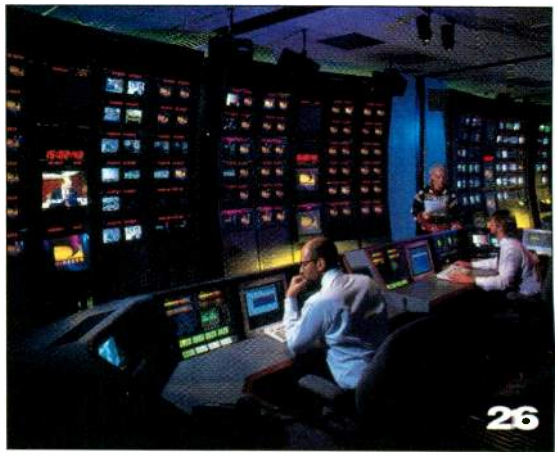

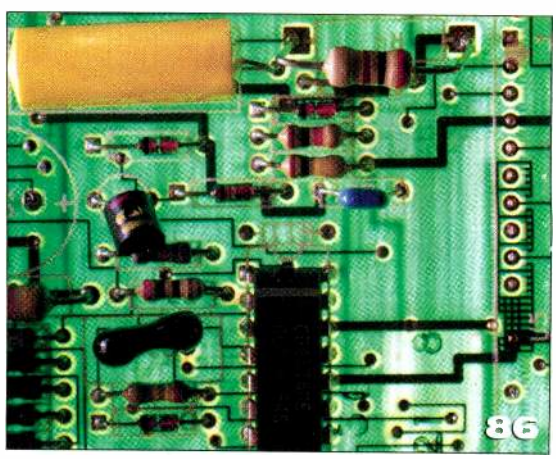

ON THE COVER: The network master control room at AlphaStar, designed and built by A.F. Associates, is a complete digital direct-to-home satellite facility that provides basic, broadcast, premium, pay-per-view and multicultural services. Photo courtesy of A.F. Associates, Inc. Photo by Andy Washnik, cover design by *BE* art director, Stephanie Masterson.

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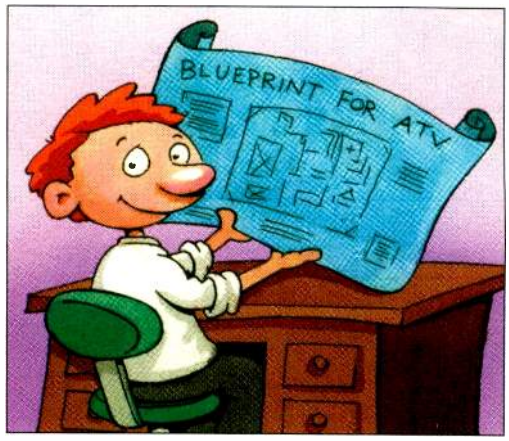
Blueprint for the future

Facing the challenges of an ATV-HDTV-multichannel-all-digital future is sort of like standing face-to-face with an angry bear. One wrong move and you're history.

To avoid disaster, you can't stand still, yet which way to move isn't always clear. Many technology managers at production and broadcast facilities feel these kinds of pressures. Add to this the issue of HDTV and advanced television being approved this year and it's enough to give anyone a headache.



Balancing the risk of doing nothing against implementing a new technology can be scary. Do you go with the tried and true or risk adopting a new tape format or recording scheme that promises better performance and the advantages of digital?

The answer is usually a mix of both approaches. Few facilities are able to remodel with a forklift — out with the old, in with the new. More often, legacy (read expensive) equipment must be retained because of the investment already made in it. This means that any new technology must be able to work with what you already have. The dilemma then becomes not just what technology to adopt, but how to properly interface it with what you currently have. What to do?

Well, hang in there Red Rider, help is on the way. *Broadcast Engineering*, in cooperation with *Video Systems* and *Millimeter* magazines, is sponsoring a technical seminar that will provide the answers to these and many other questions. By attending, you'll learn how to move your facility into the all-digital future and avoid expensive mistakes.

Our third annual Transition to Digital Conference will be held this November in Chicago. The conference will provide detailed answers for technology managers, directors of engineering and chief engineers who need to make intelligent decisions regarding ATV, HDTV and digital video implementation.

The conference is staffed with experts on installing digital video systems, compression, data transmission, building computer and video networks, testing digital video, storage and servers, dual NTSC/HDTV antennas and ATV transmitters. If you're planning on being in business beyond the year 2000, you need to hear what these experts have to say.

In addition, all attendees will be provided with a "blueprint" for building digital facilities. The conference papers have been combined into a large workbook that will provide examples and "how-to" answers to the issues in building digital facilities.

Attendees will also take a field trip of their choice to either a major TV transmitter site or a large production facility. See up-close how these facilities have become successful in the "windy city." Take home some of the answers they've developed.

And, if that's not enough, all *BE* readers and conference attendees have the chance to win a Videotek SDC-101 digital color corrector plus an SDC-102 remote-control unit, an $8,000 package. To enter, all you have to do is complete the entry card next to the conference ad on p. 104.

Don't miss out on this year's exciting program. The answers to making your facility (and you) a success are only a short flight to Chicago away. Call 800-288-8606 for more information. See you there.

Brad Dick

Brad Dick, editor

READER FEEDBACK

CompuServe: 74672,3124
Internet: be@intertec.com
FAXback: 913/967-1905

Don't get caught going down the wrong road. Some video servers will work for you today, but not in the future. Television technology is changing rapidly, with new compression standards, increased storage needs, additional multi-channel feeds, new distribution technologies will impact your facility. Which video server will take you into the future?

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letters to the editor

More on "Buy this baby, and it'll last you a lifetime"

Dear editor:

You hit the nail on the head in your August Editorial, "Buy this baby, and it'll last you a lifetime." I agree with your assessment of the computer industry's motives. It is true that even though it may work perfectly, most computers are functionally obsolete in 18 months. I had to buy a new computer so my children could run some computer software borrowed from our library. My old 286-10 (!) with an EGA monitor just couldn't cut it. They can, however, watch the Disney Channel on a circa-1965 black-and-white TV! You can even tell Chip from Dale without color.

You were also on target with the cable TV industry, as well as the FCC, regarding standards and AM stereo.

While you're at it, why don't you go for the grand slam and include the Coalition of Film Makers? Their condemnation of the 16:9 aspect ratio (the only parameter of the ATV system that has worldwide acceptance) and 30/60Hz frame rates is way too late. Where have they been for the last 10 years? (Where were they in 1953?) Mark Schubin, a respected consultant and excellent researcher, has tried to determine if there is a perfect aspect ratio. He cannot find any evidence of one, but does conclude that if you had to pick an aspect ratio based on historical data and what has been done in film over the past 100+ years, 16:9 is a good compromise. Besides, is the difference between 16:9 and 16:8 (2:1) really enough to scuttle the whole ATV system? I don't think so.

I think every congressional representative should read your editorial for a quick, concise and accurate view of a broadcaster's perspective on the new broadcast TV standard. I know mine will.

Regards,
Ken Hunold
hunoldk@abc.com

Dear editor:

Accolades and honors for your editorial in the August issue. The computer giants, not content with their phenomenal profits from their current planned obsolescence industry, now want to expand that industry so that every household in North America must pay and pay dearly for constant upgrades in order to maintain their ability to receive "free" television over the airwaves, which, they say, the public already owns. In order to avoid the inevitable charges of collusion and antitrust, they justify these plans under the guise of innovation and marketplace competition. Bull!

King Bill is not content with owning the consumer PC software market, he has already shown that he wants to own all of credit banking, now it appears he wants to own all of broadcasting, as well. I say it is time for the government to get involved, in antitrust litigation that is.

J. Carl Cooper,
Pixel Instruments Corporation
Los Gatos, CA

More on "Morse Code beats ISDN"

Dear editor:

In Dallas, SWB does not charge a per minute fee. Unless you Internet twits stop hanging up and dropping calls even voice users will pay a per minute. Get a life Brad. Do you have a problem with the free market?

Wayne or Wanda

Editor replies:

Wayne (or whatever your name is, since you weren't man or woman enough to fully identify yourself), you're the one who has a problem with a free market. Your attempt to justify high rates for us "Internet twits" is insulting and unjustified.

Providing Internet services is seen by many companies as a financial opportunity, and they've priced their products appropriately. Unfortunately, a few, like the one I mentioned, are hell-bent on keeping the competition out, thereby allowing them to charge exorbitant fees.

As my research shows, states with more than one supplier have lower prices for ISDN service. Here in the Midwest, SWB has a stranglehold on telephone service. Your friend (perhaps employer?) is, therefore, allowed to charge whatever it wants, forcing the customer to either pay up or do without.

It's exactly because there is no competition, that I'm forced to pay almost $500 to get something I can get for as little as $67 in states where there is a "free market."

I can hardly wait until the cable guys get their act together and begin providing data service. You, SWB and others like you will be left begging for ISDN customers and it'll serve you right.

Send your thoughts to the editor at
CompuServe 74672,3124
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news

By Dawn Hightower, senior associate editor

WME partners will fly solo in '97

World Media Expo '96 participants have agreed to end their three-year partnership. This will allow the four individual associations, the National Association of Broadcasters, the Society of Broadcast Engineers, the Radio-Television News Directors Association and the Society of Motion Picture and Television Engineers, more flexibility for planning future events and to solely focus attention on respective membership.

The decision to split up in 1997 will not affect this year's WME '96 that will take place from Oct. 10-12 in Los Angeles. This year, 325 exhibitors will participate in WME '96 and registrations are running ahead of the 1995 pace.

WavePhore licenses data broadcasting technology to Compaq

WavePhore has licensed its Windows-based WaveCeiver Lite Multimedia Datacasting software to Compaq Computer Corporation. The software will enable Compaq PC users to receive a variety of digital information in innovative ways by tapping into new data-delivery vehicles.

In addition, WavePhore has announced three new products to its family of real-time news-delivery solutions. Newscast/Intranet is an intranet product enabling end-users to view and quick search premium real-time news on corporate intranets using industry-standard browsers. Newscast/Multicast allows multiple workstations within an organization, connected via a LAN using TCP/IP protocol, to receive streaming real-time news, giving end-users the ability to see every news headline immediately as it arrives from the information provider. The Newscast/On Demand provides automatic replication of up-to-the-second news into Lotus Notes databases with customized profiles created to customer specifications.

UCCE offers courses on error-correcting codes

The University Consortium for Continuing Education is sponsoring a four-day course on "Error Correcting Codes for Communication Systems," Dec. 16-19, in Palo Alto, CA. The course will feature topics on Trellis-coded modulation and Reed-Solomon codes. It will also discuss error-correction for ATM/Sonet, digital cellular radio and digital broadcast satellite.

On March 24-27, 1997, UCCE also will be sponsoring a four-day course on "Error Correcting Codes with Applications to Digital Storage Systems," in San Jose, CA. The course will feature topics on PRML recording and Reed-Solomon Codes and error-correction for DVD disks and next-generation hard disks.

Call Joleen Packman at (818) 995-6335 for more information or visit the web site at www.ucce.edu.

FCC adopts new RFR guidelines

New Radio Frequency (RF) radiation guidelines have been adopted by the FCC, and are a modified version of a revised ANSI standard that was adopted in 1992. These guidelines are more stringent and are in accordance with the National Environmental Policy Act (NEPA) of 1969 and reflect more recent studies on the effects of RFR on the environment. This act requires federal agencies to evaluate the effects of their actions on the environment. The goal of the new guidelines is to ensure that the public and workers are protected from harmful radiation.

The new RFR guidelines are for evaluating the environmental effects of emissions from FCC-regulated transmitters, which include TV and radio broadcast stations and satellite communication antennas.

Focus on DTV strategy at CBA Convention

The 9th annual Community Broadcasters Association (CBA) Conference and Exposition Oct. 25-27, in Las Vegas, will focus on the FCC's new digital TV allotment table. The CBA is using the FCC's allocation program to create a new allotment table that will preserve as many stations as possible from displacement.

For more information, call Katie Reynolds, CBA convention manager at (414) 533-5573 for by fax at (414) 533-5647. ■

Calendar of Events

NOVEMBER 7-10
AES in Los Angeles
Contact: 212-661-8528
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NOVEMBER 13-15
InterBEE in Tokyo
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NOVEMBER 20-22
Broadcast Engineering's Advanced Television '96 Conference in Chicago
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NEWS SOLUTIONS

Circle (12) on Action Card

By Harry C. Martin

DTV allotment rulemaking revisited

The FCC has released its Further Notice of Proposed Rulemaking (FNPRM) concerning digital television (DTV) and draft DTV Table of Allotments.

• *Interim processing.* The deadline for applications for new NTSC stations was set at Sept. 20. However, the FCC will continue to process applications for new NTSC stations that are currently on file. As it processes applications already on file, it will continue to consider requests for waiver of its 1987 ATV Freeze Order on a case-by-case basis.

When applications for NTSC stations are accepted for filing, the commission will continue to issue public notices announcing a "cut-off" date for filing competing, mutually exclusive applications. In connection with these cut-off notices, the FCC will allow additional competing applications to be filed after the Sept. 20 deadline. These applications for new NTSC stations on existing allotments will not have a significant negative impact on the development of the DTV Table of Allotments. Nevertheless, the FCC has reserved the right to determine that the public interest will be better served if certain applications are not granted, are granted only if they are amended to specify reduced facilities or are granted subject to a condition that limits the interference that the station would be allowed to cause.

• *New allotments.* The commission no longer will accept petitions for rulemaking proposing to amend the existing TV Table of Allotments. Any petitions that are on file and any rulemaking proceedings that are open will be addressed on a case-by-case basis, taking into account the impact on the draft DTV allotment table.

• *Minor modifications.* The FCC will continue to grant modifications of the technical parameters of existing full-service NTSC stations, but will condition such grants on the outcome of the DTV rulemaking proceeding.

• *Costs.* The proposed DTV Table of Allotments will affect commercial and non-commercial broadcast TV stations eligible for a DTV channel in the transition period, as well as a significant number of LPTV and TV translator stations. The affected stations will have to obtain new transmission facilities, and to a varying extent, production equipment necessary to operate on the DTV channels. The cost of equipment is expected to vary from $750,000 to $10 million.

• *Service areas.* The commission will attempt to provide all existing broadcasters with a DTV service area that is comparable to their NTSC service areas. FCC figures indicate that nearly half of all stations will have a DTV service area at least equal to their NTSC service area, and only 2.1% are expected to lose more than 10% of their geographic area. (See "ATV Update," July p. 24.) The data concerning interference to NTSC stations also is encouraging. Approximately only 4.5% of NTSC stations will have more than 5% of their viewers experience new interference.

• *Eligibility.* With respect to the proposal to provide existing NTSC broadcasters with a second channel for DTV service, the FNPRM defines "eligible NTSC broadcasters" as: 1) all full-service TV broadcast station licensees; 2) permittees authorized as of Oct. 24, 1994; and 3) all parties with applications for a construction permit on file as of Oct. 24, 1991, who are ultimately awarded full-service broadcast station licenses. There is no guarantee that the second channel will be provided to eligible broadcasters at no expense.

• *LPTV and translators.* The proposed DTV allotment table will affect many LPTV and TV translator stations because there is not sufficient spectrum to accommodate all LPTV and DTV stations. Up to one-third of all LPTV stations and one-quarter of all TV translators may have to cease operation. In general, most LPTV stations in major markets will be affected, with rural LPTV operators being affected to a lesser degree.

The FCC would allow displaced LPTV stations to apply for a suitable replacement channel in the same area without being subject to competing applications, and will permit LPTV stations to continue to operate until a displacing DTV station or new service provider is operational. The commission also has proposed to allowing LPTV stations to file non-window displacement relief applications to change their operating parameters either to cure or to prevent interference caused to, or received from, a DTV station or other protected service.

Comments must be filed on these proposals by Nov. 22, 1996, and reply comments by Dec. 23. ■

Harry C. Martin is an attorney with Fletcher, Heald & Hildreth, PLC., Rosslyn, VA.

dateline

Dec. 2, 1996 is the renewal application filing date for TV stations in Alabama and Georgia. Commercial TV stations in the following states must file their ownership reports (Form 323) or report certifications by Dec. 2: Alabama, Colorado, Connecticut, Georgia, Maine, Massachusetts, Minnesota, Montana, New Hampshire, North Dakota, Rhode Island, South Dakota and Vermont.

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Circle (13) on Action Card

By Leonard Charles

The sky is falling

When Jan. 1, 1997, arrives and the digital technology of the EAS is on-line, broadcasters, cable operators and the emergency management community will posses the ability to alert the public almost as quickly as a disaster is evident. Once originated, the notification can reach its destination without further human intervention. That's good, right?

Actually, it's good only if careful planning precedes implementation. A challenge to that planning is identifying how many sources in your local web are likely to activate the system for the same disaster. Anticipating those redundant sources is the first step in determining how to handle their messages.

Who's on first?

A phone call from a participant in the June 1996 FEMA Teleconference best revealed this potential problem. The caller described nearly simultaneous alerts from a sheriff's office, an emergency management center and the National Weather Service, all prompted by the same tornado. The caller asked, "Would an automated or unattended station re-broadcast all three alerts?"

> Will an automated or unattended station re-broadcast redundant alerts?

The answer lies in the programming of that automated station's EAS equipment. To understand how this works, review the contents of the EAS message *header.* Each EAS message includes this header, which contains embedded codes identifying the alert's event, its location and the originator of the message. In the caller's scenario, all three messages will carry the same "TOR" (tornado warning) event code and the same location code, but the originator codes will differ. Because the EAS decoder can differentiate originator codes, it is possible to program the equipment to relay only one of the messages and ignore the others. Here is how:

As the codes are now specified in the rules, the sheriff's office and the emergency manager's messages will carry the same originator code of "CIV" (Civil Authority). The National Weather Service message will carry the originator code "WXR." Thus, if the station's EAS decoder is programmed to relay a message with the event code TOR, only when accompanied by an originator code of WXR, the station will re-transmit only the National Weather Service message. If the station's EAS decoder is programmed to relay TOR messages when accompanied by *any* originator code, all three messages will be re-transmitted.

There is one more consideration in this scenario: Which message will arrive first? Don't assume that the weather service's message always will be the first to arrive. If, over time, you find that alerts from a source other than the one you've selected are consistently arriving first, you might consider changing your EAS decoder programming in the interest of getting the alert to the public in the shortest time. The accumulated printouts from the EAS unit will make this determination easy.

Manual transmission

The problem of who's first is much more manageable in a non-automated situation. With an operator on duty, all three messages can be programmed for manual forwarding. The operator will then forward the first message received (wherever it comes from) and none of the others. Nevertheless, after you've run the EAS in manual mode for a while, you might also analyze the station's alerting history to see if the time taken by human intervention results in a consistently slower delivery of the alert than automating one of your sources would require.

Remember these important issues when the time comes to program your EAS equipment. Like any other computerized technology, it will only operate as well as its programming tells it to. ■

Leonard Charles is an engineer at WISC-TV, Madison, WI, and chairman of the SBE's EAS Committee.

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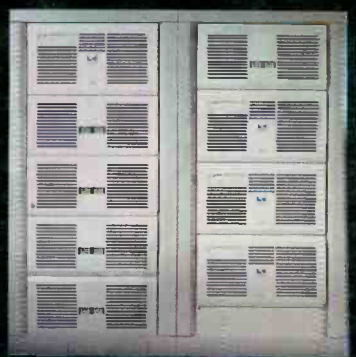

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Circle (6) on Action Card

By William Y. Zou

Calculating the cost of ATV, part 1

A long with the completion of the advanced TV systems standard and anticipation of the FCC's rulemaking on ATV service, broadcasters are gearing up to plan their future — ATV service. Needless to say, the conversion to digital television will be a challenge to broadcasters in terms of technical and economical planning. Broadcasters need to plan their strategies early to allocate or raise enough capital within the window of implementation mandated by the FCC. This article examines some of the various scenarios and cost estimates for building an ATV transmission facility.

Whatever local implementation strategy an individual station may take, the most urgent step is to secure tower space so that an ATV antenna can be mounted. Those stations that have not secured space should do so with all due speed. The costs of building a new tower, purchasing land and constructing a new facility vary widely and cannot be determined in a generic format. For this article, it is assumed that no new transmission tower or construction is involved.

The cost of implementing ATV service will be determined primarily by an individual station's financial ability and the coverage desired. Depending upon financial resources, broadcasters can implement ATV service either with minimal cost or a more forward thinking (and more expensive) approach.

Broadcast origination models

A minimum facility could be built to activate the license at lower cost (see Figure 1), with more elaborate capabilities added later. The pass-through station, using only a network feed for ATV programming with only the most basic local insertion capabilities, can be built for initial operation. All operations would be in the compressed signal domain. A broadcast routing system could be a complex routing switcher or as simple as a digital patchbay. An on-air switcher will also be needed, but may be something more akin

ITEM	FUNCTIONAL DESCRIPTION
MODULATION/DATA RATE	64 QAM/90Mbps
FORMAT	DS-3
FREQUENCY	7GHz BAND
WAVEGUIDE/MISC	250ft WAVEGUIDE, HANGING HARDWARE, CONNECTORS, ANTENNA SUPPORT, DEHYDRATORS
ANTENNA	8ft
MUX/DEMUX	MUX & DEMUX WITH NTSC AND HDTV DATA, DS-3 FORMATTING
INSTALLATION	ANTENNA SYSTEMS & TESTING

Table 1. Assumptions of the STL model.

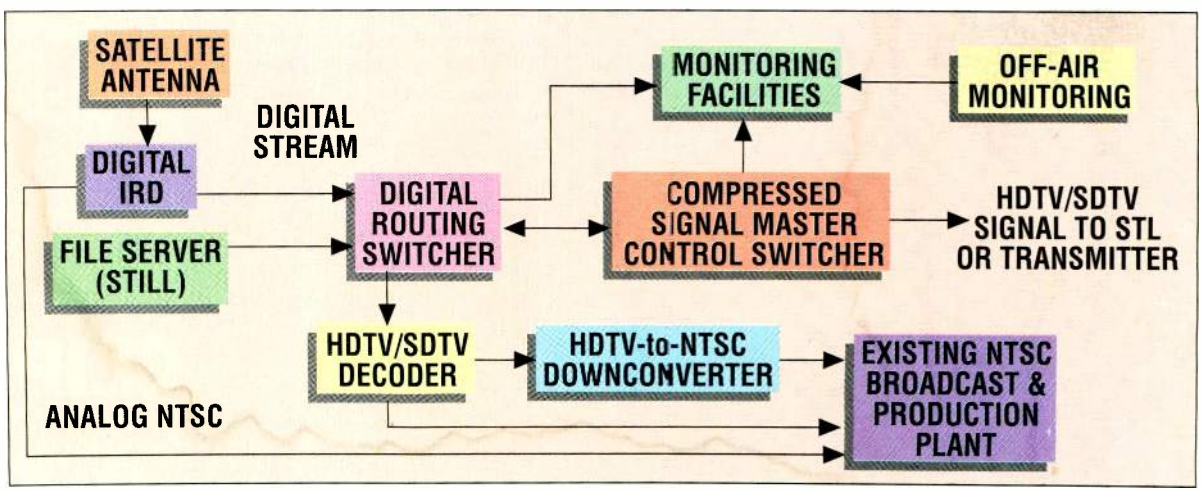


Figure 1. Block diagram of a minimal ATV implementation that provides for limited local insertion.

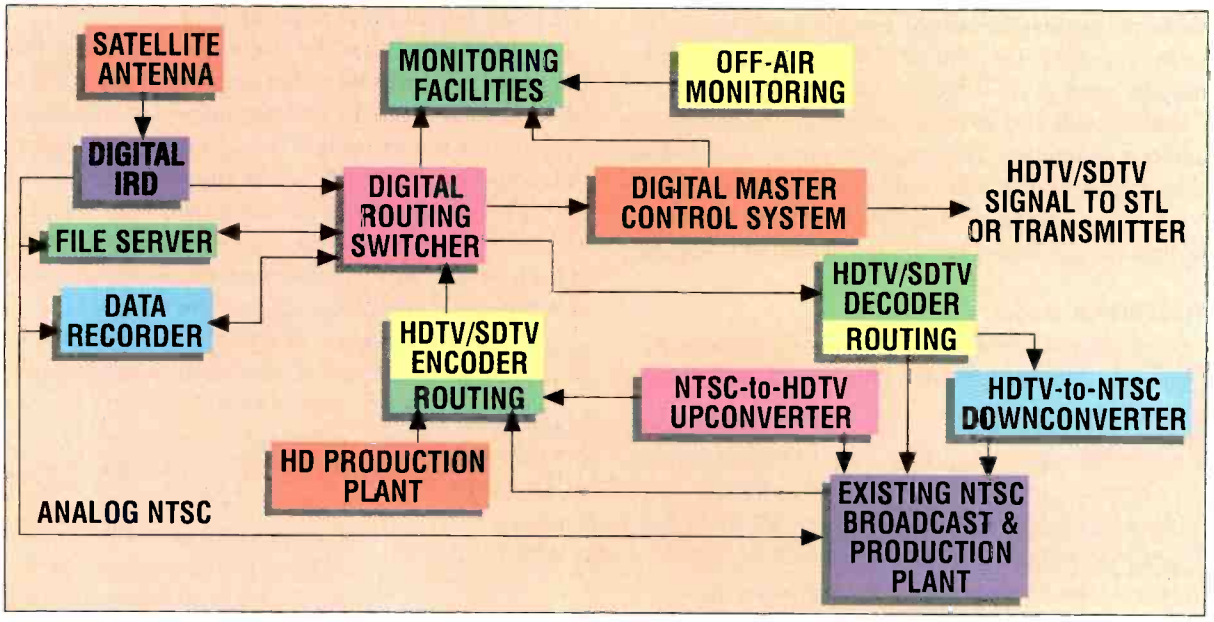


Figure 2. Block diagram of the transitional ATV model, which provides some local origination capabilities.

to a computer workstation than a traditional switcher. No production equipment is available in this model. HDTV production equipment can be added later to migrate the minimal facility to fully functional ATV operations.

Also shown in the model is downconversion of signals from HDTV to NTSC. Either downconversion or a separate NTSC feed may be required to satisfy the FCC requirement on simulcasting. The exact requirements, however, are yet to be determined. The cost of providing downconversion at each station, plus the need for it in other local work, will be

"LOOK WILCOX, THE DIGITAL COMMUNICATIONS TREND IS CATCHING ON EVERYWHERE," WHISPERED SNELL.

balanced against the cost of satellite bandwidth needed for parallel NTSC and HDTV feeds. The latter may only be used as ATV facilities are built.

Stations will also require a minimum of monitoring and test equipment. New signal monitors and troubleshooting techniques will need to be acquired and adopted. New test equipment will also be required as the basic signals change from predominately analog to digital.

Transitional model

A transitional facility (see Figure 2) includes ATV playback, storage, format conversion and limited ATV production capabilities. Compressed signals are used for interstudio distribution. Sophisticated switchers and control systems can provide such functions as real-time bitstream switching and insertion. An HDTV/SDTV encoder can support local programming. Local insertion is not limited to stills, but can handle motion through the use of a video file server.

ITEM	FUNCTIONAL DESCRIPTION
PRECISION DEMOD/DECODER	HD DEMODULATION & DECOMPRESSION
TEST EQUIPMENT	POWER METER, SPECTRUM ANALYZER
HDTV VIDEO MONITORING	HIGH-END HD VIDEO MONITORING
HDTV AUDIO MONITORING	5.1 MULTICHANNEL AUDIO MONITORING

Table 2. Assumptions of the monitoring/testing model.

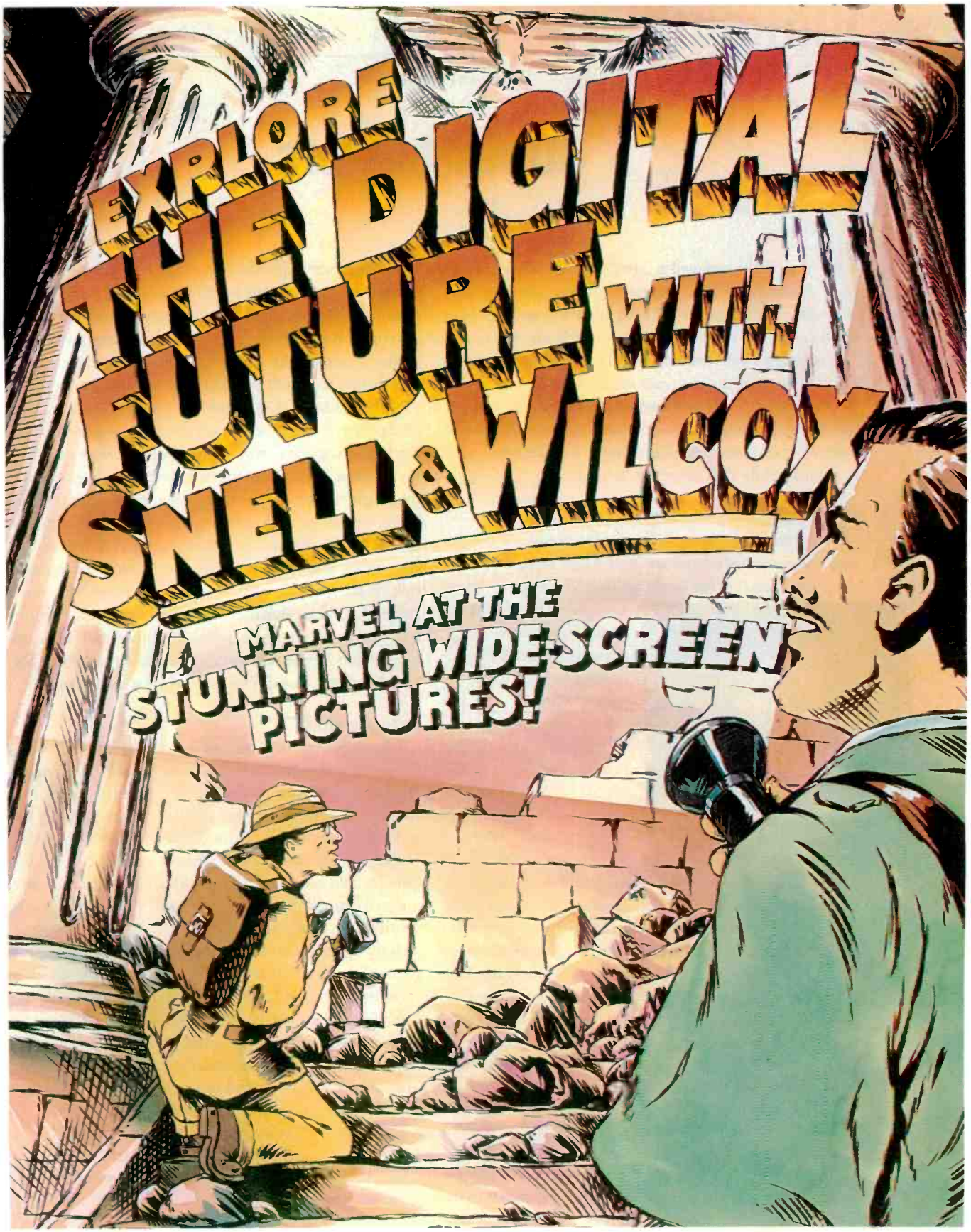
STLs and monitor/test requirements

It is anticipated that the studio-to-transmitter link (STL) for ATV will be a challenge for those stations without a co-located transmitting site. If additional spectrum is not available, the solution is to digitize and compress the NTSC signal and multiplex it with an ATV datastream for a single STL transmission. Here it is assumed that the compressed digital NTSC is fed from the network, therefore, encoding capability is not required at location stations (for minimal broadcast origination model). Due to the bandwidth constraints, and for transmission robustness, digital radio will be used for ATV STL transmission. The assumptions of a digital STL model are summarized in Table 1.

A minimum of monitoring and testing equipment is required even for the minimal broadcast origination model. The basic equipment is listed in Table 2. Next month, we will examine ERP requirements for ATV, as well as cost estimates for implementation. ■

William Y. Zou is a communications systems engineer for the Public Broadcasting Service, Alexandria, VA.

"CLEARLY THE RESULT OF AN EARLY EXPERIMENT IN COMPRESSION..." MUSED WILCOX.



SNELL & WILCOX

Engineering with Vision

Circle (7) on Action Card

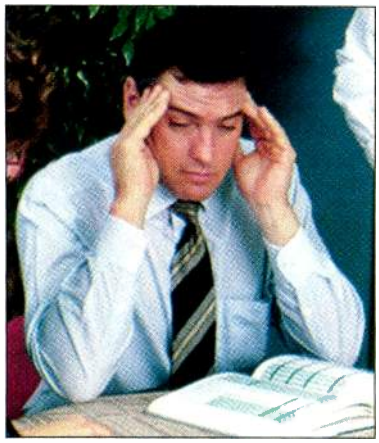
By Curtis Chan

Stress busters

We recently received a letter from a woman who's husband was an engineer under a great deal of stress. He didn't know who to turn to, and his boss wasn't aware of the pressure his subordinate was under. The engineer's wife tried to contact personnel, but to no avail. In the end, the man committed suicide. Hopefully, this is a rare case in broadcasting. Nonetheless, it points out that managers need to be observant and sensitive to their workers' welfare. This column is dedicated to the wife and family that were left behind.

Stress signs

With staff downsizing, job security, company politics and emotional turbulence are high. These factors contribute to job stress and can lower productivity. For managers, lowering their own stress, as well as their workers' stress, is essential for maximizing productivity.



First, you must locate where job stress exists. Then you must decide how to deal with it. Look for signs of job stress in your workers, which may include visible irritation to extreme outbursts. If an employee has been around for some time, look for abnormal behavior from facial and body movements to erratic speech patterns. Also, look for employees who negatively criticize projects or individuals that become easily agitated for no apparent reason. Another stress indicator is a decrease in an employee's performance or an increase in mistakes from a top worker.

Controlling pressure points

If you notice a worker suffering from stress, what do you do? The first step for the supervisor may be to ask if there is a problem. You could say, "I perceive a problem with your performance in these areas and wonder what the cause might be?" By combining your professional management skills with empathy, compassion, sensitivity and patience, you may be able to draw out the person.

As an employee, you should also seek available avenues to help resolve your stress. This is true when you have to wear multiple hats with too many tasks and time is critical for a project's success. People take great pride in their work, but sometimes don't take steps to resolve impending disaster for fear of being perceived as a failure. The reality is that you're no good to anyone if you're too pressured to do your job. Inevitably, you wind up making mistakes or compromising your performance. Know when to seek help before the ditch you are digging becomes too deep.

As the manager, you might want to approach the troubled person to see if there is anything that you can do. You might also suggest that your employee talk with personnel if you think his troubles may escalate over time where he might put himself or the company at risk. Don't cross the line if you receive a negative response for your offer to help. But do let the person know that you are concerned about his welfare and that you will be available if he wants to talk. If the problem persists, you may have to call the person in and set short-term performance goals. Remember, your job is to create a cohesive functional work unit where each worker has a certain degree of autonomy, but also has the responsibility to work as a team member.

Reducing stress

A manager can help reduce work stress in many ways. Make sure that some work each person does is challenging and fun and keep long-term repetitive tasks to a minimum. Distribute the work load so that no one individual has to carry the burden for a whole group. Unfortunately, this is not always possible, so seek a balance and set goals that are attainable. Find creative ways to break the monotony and be observant and sensitive to your staff's needs.

Don't forget your own needs. Get involved in activities that will help you relieve stress. Physical activities allow your body to expel toxins and release stress. Picking a hobby that stimulates your physical and mental states is a must. If you're married, spend more time with your family.

For more esoteric remedies, meditation, yoga, martial arts, a good massage and other new age cure-alls may provide distractions from the workplace. Of course, you can partake in the latest trend and sit down with your favorite book, a cognac and a fine cigar.

Whatever you do, the goal is to know when you and your staff are stressed and then take action. ■

Curtis Chan is president of Chan & Associates, a marketing consulting service for audio, broadcast and post-production, Fullerton, CA.

Author's note: *I would like to extend an invitation to all of you to submit any management topics, ideas or unique situations that you might find useful for the community at large and would like to share with your peers. E-mail me at: cjchan@ix.netcom.com.*

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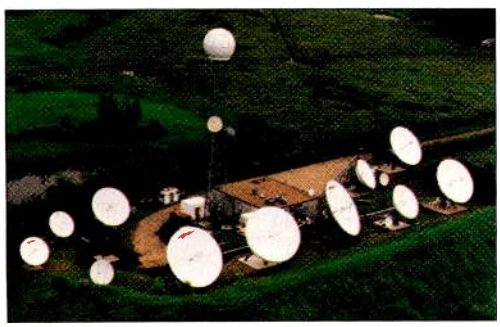
By Mark Durenberger

Using satellite services

Since the dawn of the domestic satellite market only a quarter of a century ago, satellite technology has proved to be a highly effective means of moving video and other information from point to point or from one location to thousands. The simplistic concept of the satellite transponder as a "highly polished signal reflector" or "bent pipe" is still valid and, with few exceptions, the limitations in system performance will usually be found in the earth-station equipment.

This technology is still evolving, however. New uses and services are creating a changing marketplace for the satellite industry. Digital advancements, improved satellite performance and a relaxed regulatory environment are providing new opportunities for service providers and users. Not so many years ago, the transponder market seemed to be the sole province of TV program distributors. Today, economies and service efficiencies are opening new markets — most notably private satellite systems and business TV (BTV) networks.



The antenna farm at Group W Network Services' Teleport Minnesota in Minneapolis.

Hardware improvements

Digital compression technology permits transmission of video in a fraction of the bandwidth required for comparable analog service. The digital approach reduces the cost of transponder time while providing program security and receiver addressability (key issues for programmers who need to control the receiver environment, protecting against unauthorized reception).

New digital receiver designs extend threshold performance margins, so that in effect, less satellite power is needed to deliver satisfactory signals. Today's satellite transponders also deliver more than twice as much power to the ground as the satellites deployed in the early 1980s. This means better performance into the same size downlink or alternatively, a smaller downlink antenna can be used.

Uplink technology is improving as well. The "small-antenna" digital video uplink is a practical reality. Advancements in system performance make it possible to uplink broadcast-quality digital video from qualified antennas as small as eight feet.

New system architectures

Uplinkers are developing economies of scale and opening new service markets by selling "hubbed" services (combining several programs into one uplink signal). The key to the cost-effectiveness of hubbed service is the ability to use low-cost receivers. The disadvantage is that program content must be delivered to the hub site to be combined for uplinking. The hub approach has been used for nearly a decade for radio, music and data service. DBS operators also use the hub approach, and their services are in rising demand, especially by distributors willing to pay for the power needed to reach the new "pizza-sized" antennas.

Satellite operators have implemented another change by offering transponder capacity in fractional segments (or *partial transponders*). This may seem to be an attractive alternative to full-transponder use, but associated equipment costs can be significant and the problems associated with accessing these fractional transponders can be burdensome.

Regulations have also changed. Until recently, the U.S. satellite industry's regulatory structure mandated a clear distinction between domestic and international satellite usage. Those lines are now blurring, and as a result it's becoming easier to access international satellites for overseas traffic and even for domestic use.

Increased flexibility

The design of satellite-based networks can now accommodate a client's specific needs. New architectures and hardware allow network designers to make tradeoffs between the number and cost of downlinks and the cost of the necessary satellite power. Simply put, the more dollars spent on the space segment, the less expensive the receive-site equipment. Conversely, the more sophisticated the receive-site equipment, the cheaper the satellite time.

The role of the service provider also is evolving. A dozen years ago the uplinker played a more or less passive role, transmitting a customer's signal to a transponder and monitoring a downlink for quality control. Today's providers may offer integrated services ranging from network system design to installation and control of receivers and technical support. These services can be packaged with transponder reservations, uplinking, quality control and "help-desk" support for the net-

Continued on page 118

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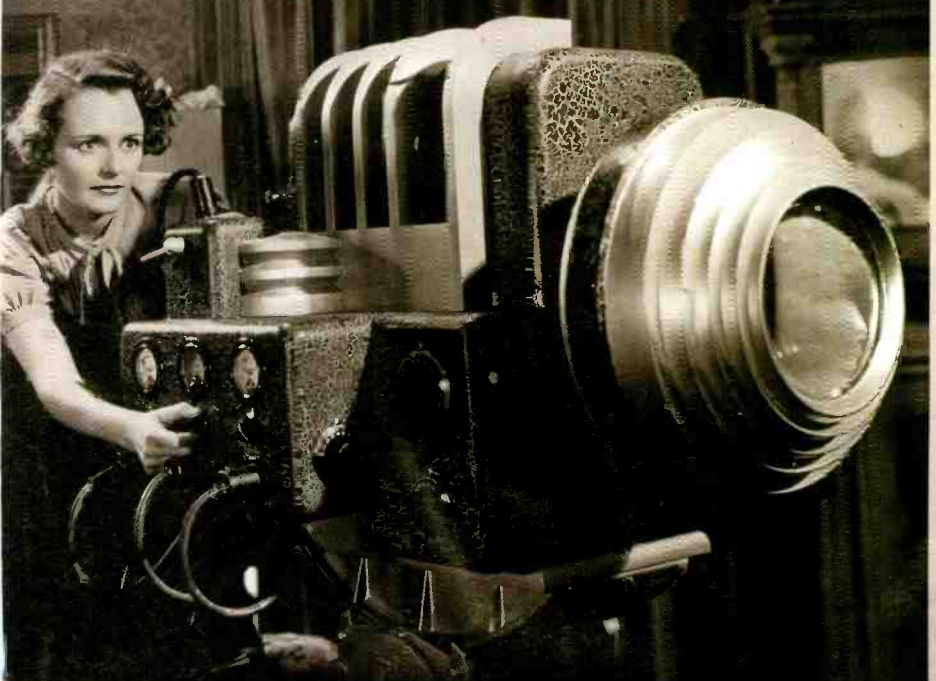

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Circle (14) on Action Card

interactive

By Steven Blumenfeld and Mark Dillon

Sharing info: The new office etiquette

A futurist is someone who claims to know where we're going while a technologist is supposed to know how we'll get there. The future is coming faster and faster, and we're having to make quick and agile adjustments with increasing regularity.

Even though many of us are confronted with far more information than we can process, engineers are often expected to know it all. Yet, it is an impossible task to keep up on all the technologies we are expected to be an expert on and thus retain the title of Wizard or Guru.

Open up

As a group, engineers are often not effective communicators. We like to keep information close to the vest, believing that this amounts to job security. Sometimes this may be correct, but it also makes it hard for us to share and gain information from others. Information hoarding is something we should avoid — it's far better to share so we can all learn and make better use of this resource.

Recently, Mark and I participated in a project where the lack of information sharing had terrible consequences. We spent 13 months flying around the country evaluating various technologies to forge a common strategy across several departments and business units. We were a group of 12 coming together from different areas of expertise. After eight months, a member of the team was reassigned and pulled from the task force. Because this person had not been communicating freely and held much of the information in his head, we were set back months as the remaining team members scrambled to make up the deficiencies.

To avoid this situation, some companies have tried to institutionalize information sharing by making it mandatory. But, monthly reports can take more time to prepare than the work took in the first place. Though this formal business school approach can work, informality can work better. Many Silicon Valley hi-tech firms have institutionalized Friday pizza parties instead of progress reports. These occasions are used to let off steam, to bond with fellow employees and to communicate about work and new ideas.

Last month, we were invited to one and were amazed at the high level of technical information being passed around the table in this informal atmosphere. The management, being concerned about intellectual property and secrecy, rents a back room at the local pizza parlor every Friday evening. This process began after one of their key engineers left the company. With him went a lot of specific knowledge that had to be relearned at a high cost or could not be replaced at all. The company learned an important lesson.

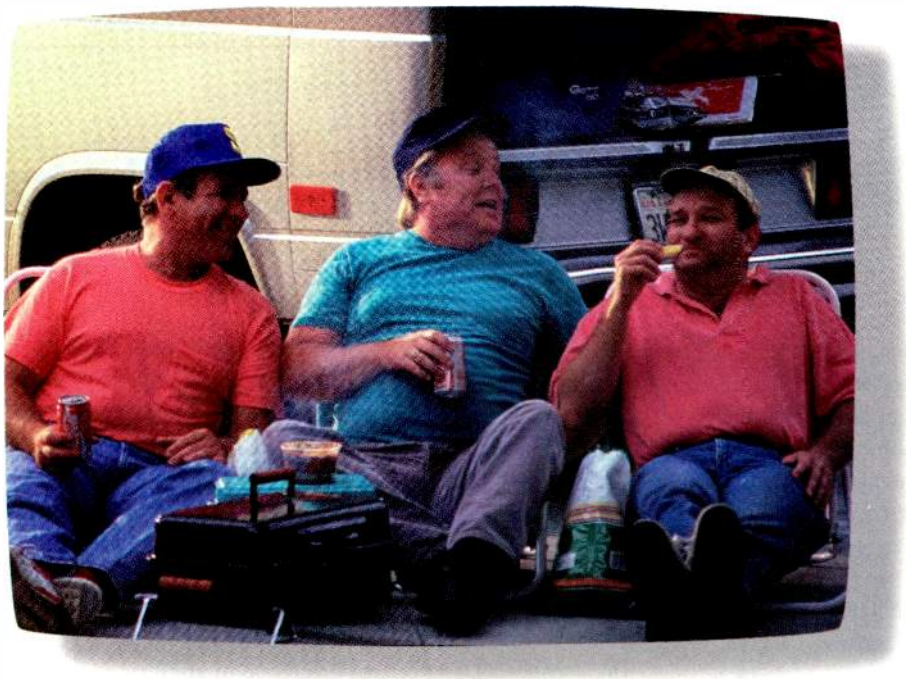
Delegate information

There are many small steps each of us can take on a daily basis. For example, we interact and share information during informal lunch meetings — not just during formal brainstorming and strategy meetings. We make an effort to E-mail "check this out" memos to colleagues on a regular basis. Our staffs are accustomed to receiving reports, newsletters and magazine articles and asked to report back to the rest of us if there is something we need to know. This downward flow of information and ideas has lessened our information overload and prepared the group to be better technology thinkers.

Give your staff permission to read on the job. Share industry magazines with your colleagues and set time aside to discuss important articles. You will find that everyone looks at the same information differently, and by sharing, the group will begin to assimilate the information in new and different ways. This also helps the newer staffers begin to understand the various technologies that must be mastered. In an environment like ours, the amount of lingo and abbreviations can be daunting to a newcomer.

If this is beginning to sound a little bit like those days back in engineering or graduate school, well, you're right. Only this time, each one of us is a student and a teacher — and your report card is a paycheck. ■

Steven Blumenfeld is vice president of technology and studio operations, and Mark Dillon is vice president, on-line services, with GTE, Carlsbad, CA.



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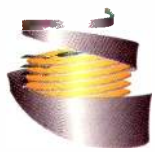

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Circle (15) on Action Card

By Louis Libin

The FCC assigns draft DTV channels

Once again, the FCC is on the move. The third FCC action on the digital second channel for DTV (digital or high-definition television) has been released. The FCC submitted for public comment an allocation/assignment table for a second channel for every TV station to allow the introduction of a DTV broadcast service while stations maintain their current NTSC broadcast services. In the future, the FCC will withdraw the current NTSC licenses so that stations will be required to broadcast only a DTV service.

The entire FCC item is more than 100 pages and includes a new draft assignment table, as well as technical annexes and comments by FCC chairman Reed Hundt. This action is the beginning of the final step in implementation of digital television.

According to the FCC, the goal of the Notice of Proposed Rulemaking (NPRM) is to ensure that the spectrum is used efficiently and effectively through reliance on market forces. In addition it should and to ensure that the introduction of digital television fully serves the public interest by fostering the competitive provision of new and innovative DTV services and by promoting economic growth and the creation of jobs in the telecommunications industry. The table is a much better table than the one the commission proposed in 1992. Many of the improvements are the result of discussions between the commission technical staff and broadcasters.

The channel assignment table

The table is based on the principles of full accommodation for all eligible, existing broadcasters and replication of existing broadcast service areas. Stations will be allowed to maximize or increase their service areas by increasing power and/or antenna heights to maximum facility levels if such increases will not create additional interference to DTV or NTSC stations and will not create service areas that exceed the largest in the market. The plan would use sound spectrum management to allow for spectrum "reclamation." This may not prove to be in the best interest of broadcasters, who require interference-free contours.

The key to the FCC's approach to spectrum management is its core spectrum proposal, which would assign DTV channels primarily between Channels 7 and 51, with as few assignments as possible outside this core spectrum region. The FCC approach uses the technical and interference characteristics of the ATSC DTV standard.

Broadcast analysis

The newly released FCC channel assignments have been analyzed carefully for their NTSC paired station replication. One of the primary driving forces behind the FCC DTV assignments is Spectrum Reclamation — the "giving back" of the previously reserved broadcasters spectrum, for auction and use by another service. The FCC table reclaims 138MHz of spectrum nationwide; this translates into 23 channels, each 6MHz wide. According to the FCC, there is no substantial increase in interference in spite of the spectrum reclamation. The plan may call for the upper UHF spectrum, as well as the VHF spectrum, Channels 2-6.

Does the FCC table hold up?

The preliminary results of the broadcaster analysis indicate that the primary goal of the FCC action of spectrum reclamation does to some degree adversely affect service area replication. The broadcasters' caucus approach has less impact on LPTV and translator stations.

By using language, the FCC attempts to mitigate these possible adverse affects by contending that increased interference will occur at the edge of the Grade D service areas where viewers could experience degradation in picture quality, not loss of service.

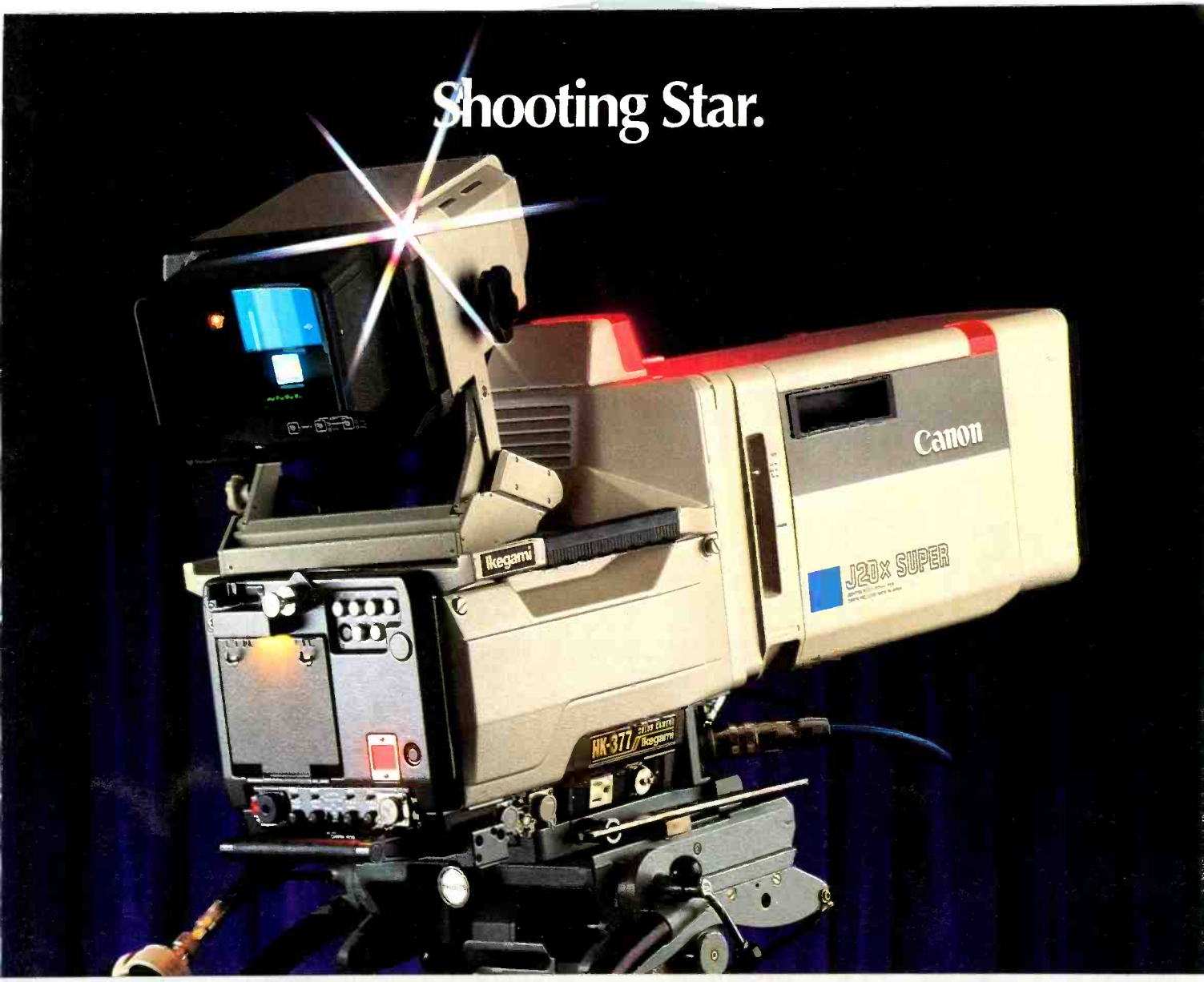
The FCC appears to have come to some conclusions on

Continued on page 119

DTV channel assignment unknowns

- How much new interference would be created?
- Where will new interference be?
- How will early spectrum reclamation affect DTV implementation?
- Are Channels 2-6 really unsuitable for digital broadcasting?
- Are Channels 52-69 really unnecessary for broadcast operation?
- What is the status of pending NTSC applications?
- How will the final DTV channels be selected?
- How will stations move to the core bands?
- Who will pay for the core band moves?
- Are "outside core" band assignments much less desirable?
- How does the core spectrum approach affect LPTV and translator stations?
- What is the true status of Mexican and Canadian border allotments and assignments?

Shooting Star.



The HK-377 Ultra-wideband Studio/Field CCD Camera System has the highest resolution, sensitivity and pixel count of any NTSC camera currently available. The camera employs newly-developed 2/3" FIT CCDs, each with more than 600,000 pixels. An ultra-wideband triax system with 10MHz bandwidth for each RGB channel delivers an unprecedented 900 TV Lines resolution at the base station output. The new base station has provisions for digital signal output (optional) to accommodate the demands of high-quality production.

The HK-377P portable companion offers the same performance characteristics as the HK-377 and operates through the same Base Station or can be configured for stand-alone operation.

Unique features of Ikegami's new high-end camera also include extensive remote control of detail functions, including the Skin Detail to soften the complexion and to give your stars a more youthful appearance. A high-resolution viewfinder has its own VF DTL (Viewfinder Detail) and PIP (Picture-In-Picture) circuits. The HK-377 has an AHD (Auto Hue Detect) circuit for "skin tone capture." Master Control Panels are equipped with memory card I/O Ports. A "Snap Shot File" permits control and scene file data to be written into, and read quickly, for shooting parameter replication.

The HK-377/377P cameras have the Skin Tone Detail feature which received the Engineering Emmy Award for technical achievement.

Current users include: ABC (20/20, World News Tonight, Good Morning America, All My Children, Loving, and all shows shot in NY), CBS (Late Show with David Letterman, 60 Minutes , CBS Evening News, and Sunday Morning), Disney/MGM, MTI, TNN, Turner Entertainment Network, WBNS-TV, Goodyear Blimp, Unitel Mobile Video, Channels 2 and 13 Buenos Aires, and TV Globo, Brazil.

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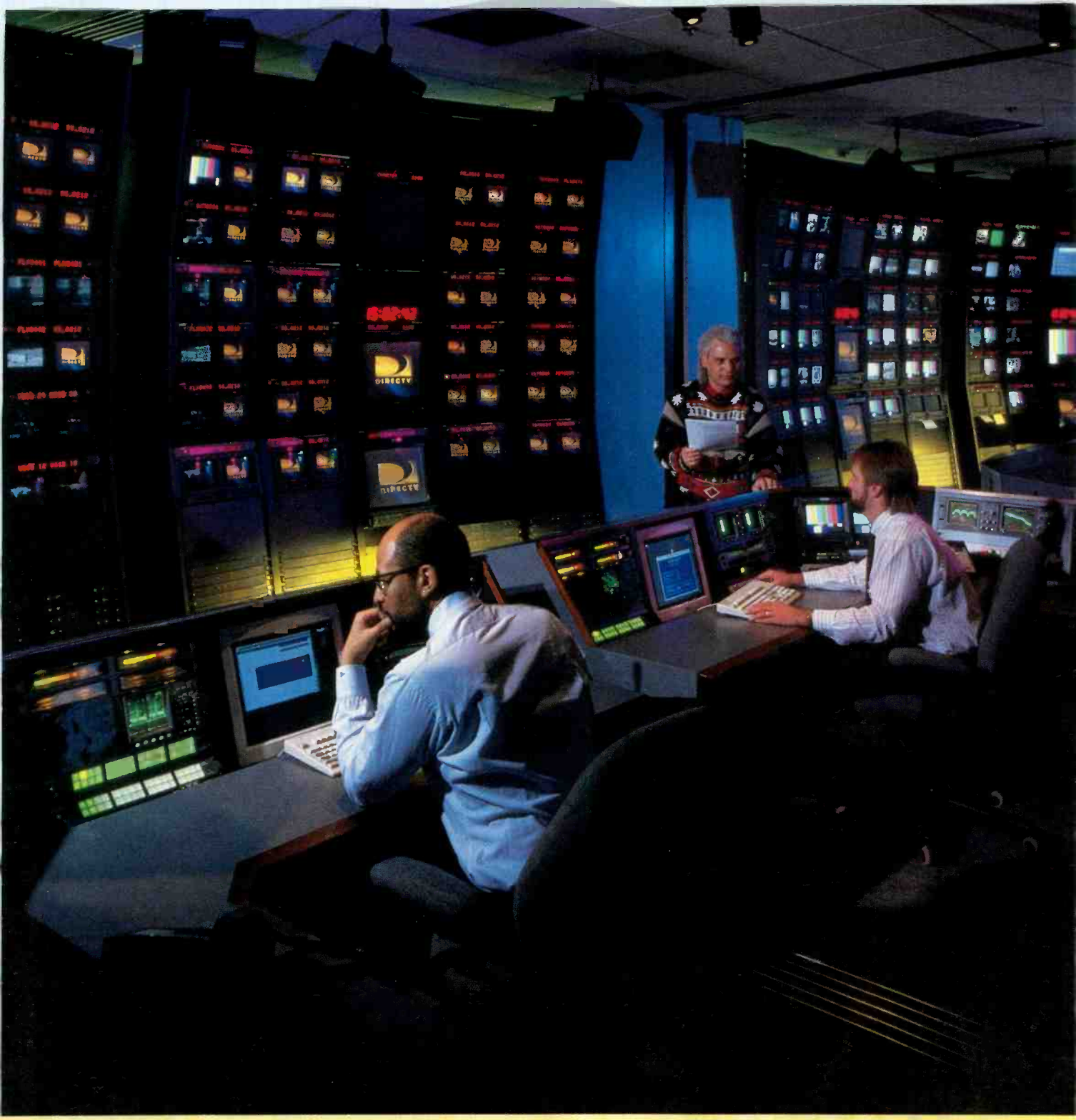
From single to multichannel, step by step

Careful planning can help make the transition to multichannel smoother.

By Michael Guess

THE BOTTOM LINE:
As ATV moves closer to reality, outputting a single NTSC program stream is unlikely to meet future needs. Separate NTSC and ATV streams may only be the beginning. Compression systems allow multiple NTSC streams to be broadcast using the same spectrum as a single uncompressed stream. Properly implemented, multiple channels can be cost-effectively handled. Getting the most from multiple streams requires careful planning, coordination and some level of automated operation. $



The Broadcast Operations Control area of the DIRECTV Castle Rock Broadcast Center.

With Microsoft's foothold in TV news and the Baby Bells erecting microwave transmission towers for wireless cable (MMDS), it's clear that TV broadcasting is in the midst of a radical transformation. In the process, multichannel facilities promise to become the norm, relegating single-channel broadcast operations to quaint reminders of "the good old days."

Several developments are encouraging the growth of the multichannel concept. The most influential may be the regulatory changes at the heart of the Telecommunications Reform Act. These changes relaxed network and station ownership standards. In the first half of 1996 alone there were a total of $39.6 billion in high-profile mergers and acquisitions. Among them were Disney's $19 billion acquisition of CapCities/ABC and Time Warner's $7.5 billion purchase of Turner Broadcasting. At the same time, an increasing number of local

From single to multichannel, step by step

stations are adding new revenue streams by entering into local marketing agreements (LMAs) and programming cable operations.

The new program delivery systems that continue winning acceptance among the viewing audience also promise to feed the proliferation of multichannel facilities. Subscriptions to direct broadcast satellite services are expected to double by the end of 1996. Cable networks such as Discovery, MTV and TNN are creating regional channels throughout the world and uplinking them to satellites for direct broadcast. Meanwhile, many in traditional broadcast television are pinning their hopes on HDTV and ATV to help maintain market share. The ATV standards addressed in the Telecommunications Act call for the FCC to temporarily provide a second channel so broadcasters can run an ATV channel in parallel with their current service. If the FCC follows through on this announcement, stations will have to grapple with the intricacies of moving from a single channel to at least two channels.

One of the master control rooms at ABC Singapore, a state-of-the-art multichannel facility.

The process of defining, designing and deploying a multichannel facility introduces a host of new challenges for broadcasters including regional spot insertion. It's a process that can't be underestimated. Craig Porter, CE at KRON-TV in San Francisco, an NBC affiliate that also operates a cable channel serving 30 head-ends, sums up the challenge this way: "If you treat your second channel as anything less than another TV station, you're going to have problems." This article provides an overview of the most critical factors to take into account when going from a single channel to multiple channels.

Facility infrastructure

Most TV stations still have analog infrastructures that are not ready for retirement. However, video servers and much of today's video equipment are already digital.

By doing a straight economic analysis, stations can determine the residual value in existing analog equipment and compare that to the cost of necessary conversion equipment. If the residual value is lower than the cost of the conversion equipment, it may be cost-effective to replace existing equipment with digital systems.

Audio presents a special dilemma. Stations can choose to handle audio separate from the video as AES/EBU or embedded in the serial digital video datastream. In either case, most facilities have found it best to completely move away from analog audio for new systems.

Using digital audio does have its own set of problems. For example, with embedded audio, there is the complicated process of extracting audio, providing separate distribution and routing, and finally re-embedding it into the serial datastream; all without allowing the audio to get out of sync with the video.

Obviously, equipment decisions are easier when building a multichannel facility from the ground up. For most, the answer is to go 100% serial component digital. There are still some product and interface issues to deal with, but they are more manageable.

A multichannel facility implicitly means that there will be multiple distribution and routing paths for each channel. Other than adding additional equipment for distribution, you should pay special attention to signal routing. Routing systems are available that can easily accommodate the complex routing required in a large multichannel and multiformat facility. Through careful planning, signal routing and automation systems can be integrated seamlessly.

Redundancy and fault tolerance

In broadcasting, eliminating single points of failure is critical. This is even more critical in multichannel operations. A fault that might have taken down a single channel may now obliterate several.

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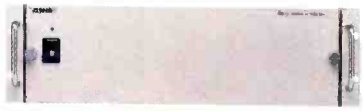

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From single to multichannel, step by step

Power systems should be redundant and, where practical, be combined with uninterruptible power supplies (UPS). This can be done with two separate feeds from the local electric utility company, having the entire facility on a UPS and including a generator system capable of powering the entire system.

Asia Broadcast Centre, which transmits signals owned by such clients as Discovery Channel and Sony Entertainment Television, took these steps to guard against outages. Its Singapore headquarters receives two main power inputs from the local utility with switch gear to transfer the load. The backup system includes three 75kVA UPS systems to carry critical loads across the time gap between a mains failure and the run up, stabilization and switch over to three 500kVA diesel generators. It typically takes less than seven seconds to go from mains failure detection to automatic transfer to generators.

If the entire facility cannot be protected, then place computer systems and file servers on UPS-protected mains feeds. In some instances, minor disruptions in the program service may be tolerable, however, if a video server's file system becomes corrupted or disk drives crash during a power failure, the effects could be catastrophic. Additionally, the time required to reboot systems can turn a minor power glitch into major downtime. Two minutes of boot time can cause an entire station break to be lost if the system loses power close to the break.

Another way to guard against problems is to avoid consolidating automation control on a single computer. Use separate computers for each channel to guard against a single point failure. If it is possible to delegate control, then a supervisory or hot stand-by system could act as a backup for an on air computer system. Servers should be equipped with mirrored disk drives or be part of totally mirrored systems to minimize the risk.

Scaleable and extensible systems

Multichannel systems need to be sized such that they can meet long-term requirements. Immediate needs may be as simple as adding programming for a local cable channel. However, this may be the precursor to additional channels so plan accordingly.

New channels should be added as an extension of the existing system without taking it off-line. A system that accommodates future growth would have a common database for all commercial

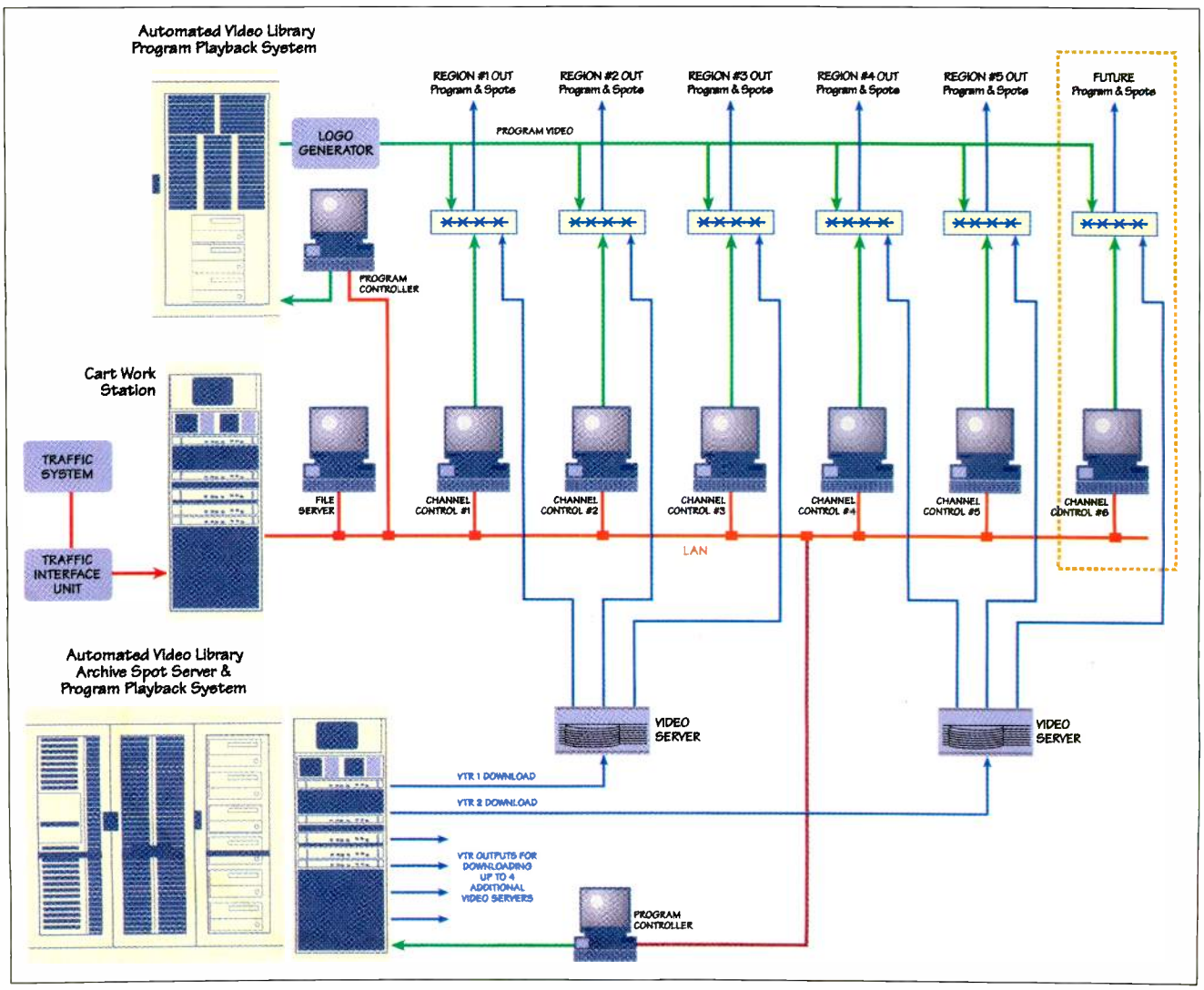

Figure 1. Multichannel playback requirements vary from facility to facility. The diagram depicts one possible implementation for multichannel operations.

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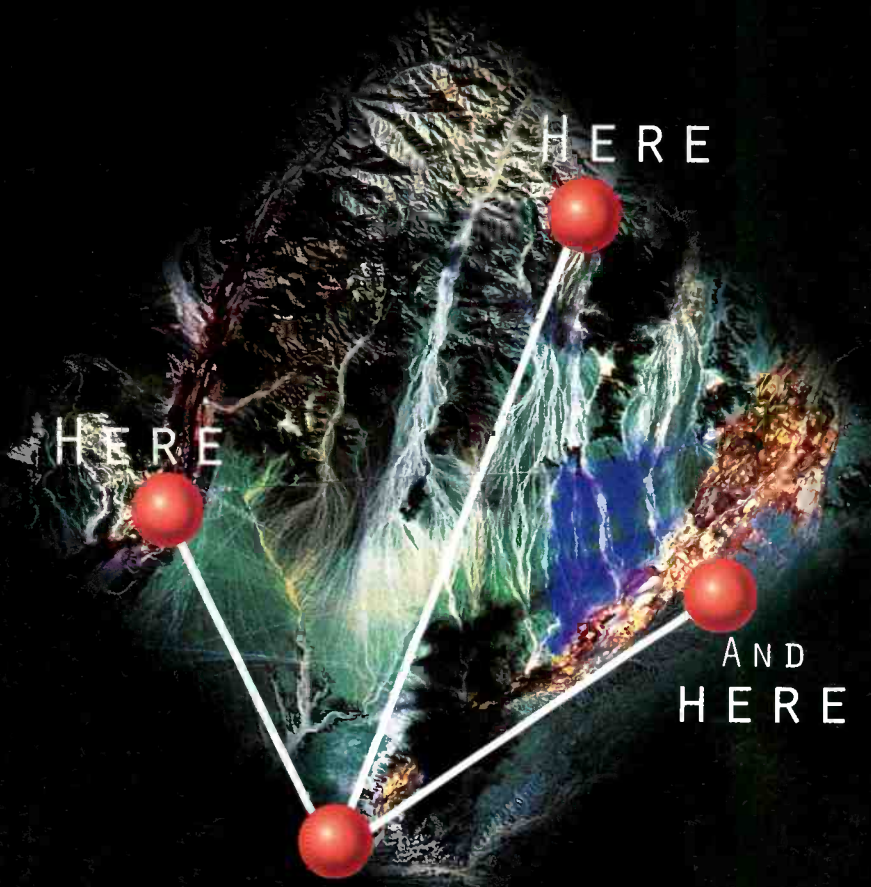

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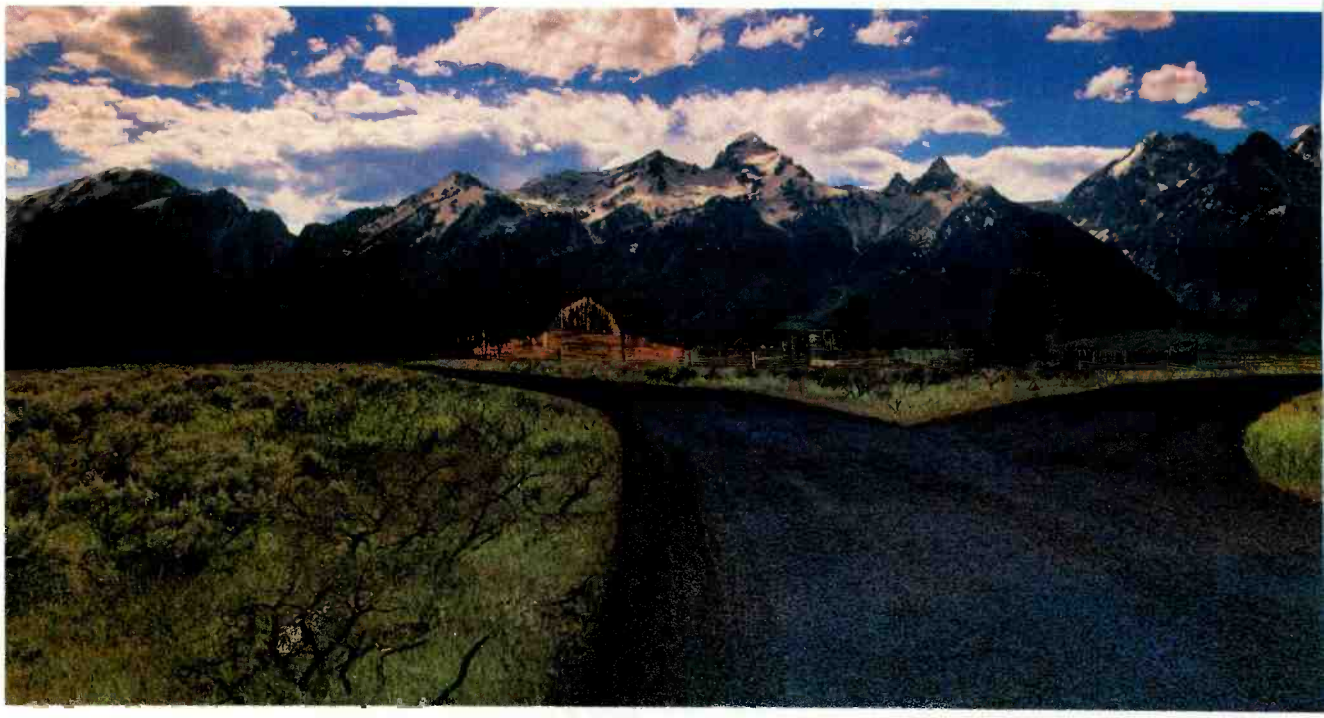

Our VideoStore™ Multichannel Video File Server: This solution is ideal for broadcasters, telcos, cable systems and interconnects who are looking for a cost-effective, stand-alone, complete commercial insertion package.

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One Road For Digital Ad Insertion.

Our VideoStore file server is a complete cost-effective package for automated broadcast master control.

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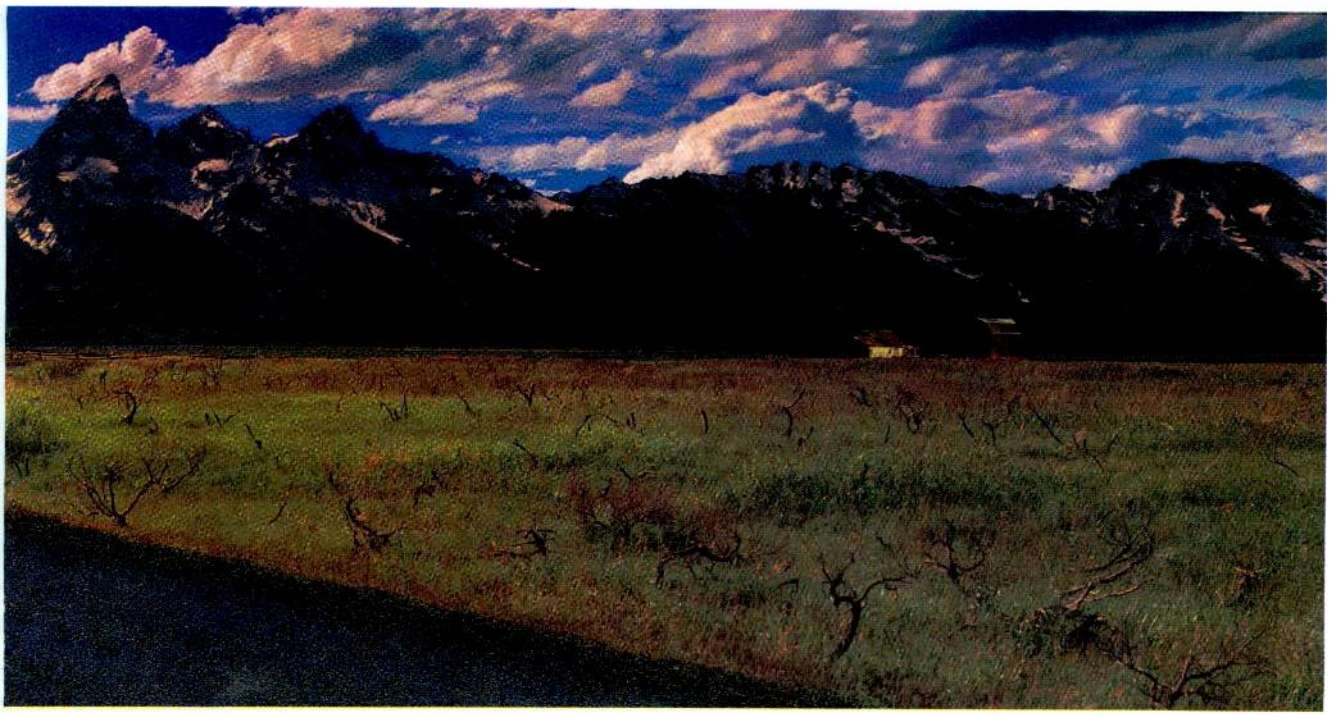
Yet its highlights don't stop there. There's also our Predictive Maintenance™ feature. Its built-in redundancies offer maximum protection against mishaps while letting you know of virtually all potential problems before they become real ones.

Plus, with the VideoStore System's open protocol, even third party automation vendors can use any control platform to operate the VideoStore System. In other words, you get the flexibility that you want, that you require, and that is so necessary to integrate the automation software package that's best for your station.

other. Which explains why we've taken both.



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Another Road For Digital Ad Insertion.

STAS is a modular system for integrating commercial and program material into a plant-wide digital solution.

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From single to multichannel, step by step

media and material and a single network to tie all the equipment together. Sharing of data, storage and operation is paramount to ensure a cost-effective multichannel operation.

On-air — videotape, video server or hybrids?

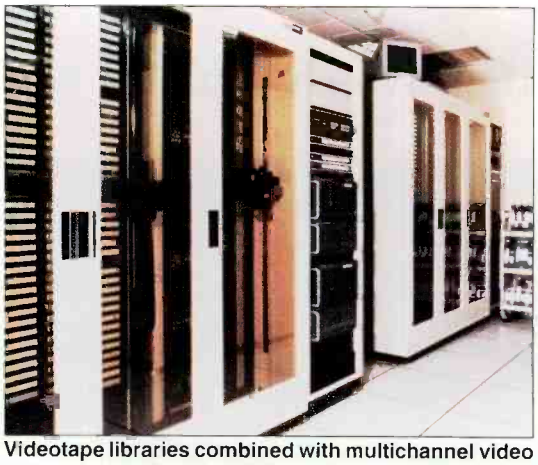
On-air presentation systems are evolving from videotape recorders to digital disk recorders and video servers. In deciding which storage medium to use consider cost, system redundancy, material migration and longevity.

Although videotape is the most cost-effective way to store video, it carries costs that aren't borne by video servers, including ongoing machine maintenance and replacement tape stock.

Video servers aren't without maintenance issues; entire disk drives may need to be replaced, but unlike videotape, the media on a disk drive isn't prone to wearing out. Also, unlike a VTR, the heads in the disk drive don't need to be replaced after 2,000 hours.

It costs about $.05 per megabyte to store video on tape making this the most efficient means to store long-form material. The cost to store video on disk drives runs from about $.70 to $3 per megabyte depending on the size and architecture of the video server.

Expenses aside, video servers have significant advantages over tape machines for multichannel operations. These include random access to the material stored on the disk drives, multiple simultaneous outputs, and the ability to record and playback at the same time. Taking these factors into consideration, it becomes apparent that a hybrid system provides the most economic solution. Because videotape is best for long-form program playback and video servers are best for random access and repetitive playback, you can use an automated video library for program playback and spot archive. In such a system, the contents of the spot archive are downloaded to a video server, prior to use on-air. Because the video server has simultaneous record and playback and has multichannel output, it can be used to feed multiple channels. Furthermore, the spot archive in the video library provides a level of redundancy in the event of a catastrophic failure. Relegating the spot playback to the video server takes about 80% of the load off an automated video library, allowing it to service more than one channel.



Videotape libraries combined with multichannel video servers provide the on-air programming for ABC-Singapore's Broadcast Center.

In those cases where a video library is cost-prohibitive, manually loaded tape machines under automation control can provide program playback, with spot playback from a stand-alone video server-based spot insertion system. Some video server spot insertion systems include a spot archive dub application that speeds the loading of spots into the server by automating the process. This also provides protection in the event that the video server should need to be reloaded after a failure. Because a stand-alone spot insertion system uses the same video servers, multichannel spot insertion is possible with a single system.

Storage and operational benefits of a central spot library

Storage requirements increase every time another output channel is added to

Video compression: How much is too much?

Without the enabling technology of video compression, the cost of putting together multichannel systems would be prohibitive. Video compression allows video servers to provide extended storage time and reduces bandwidth requirement to allow for multiple record and playback channels. Because of these reduced bandwidth requirements, a single satellite transponder can carry as many as 12 channels of video.

Now that compressed digital disk recorders and satellite transmission systems have been in use for some time, it's possible to determine what level of compression is acceptable. Most broadcasters find little fault with compression ratios of 7:1 for motion JPEG and 20:1 for MPEG-2. This equates to a data rate of 24Mb/s for motion JPEG and 8Mb/s for MPEG-2. Even greater compression ratios are possible with MPEG-2 for more tranquil program material. According to Tim Jackson, director of Discovery Channel's technical operations outside the U.S., "We can use low bit rates and get six channels per transponder. But MTV or ESPN, which have fast-moving, high-action scenes, can't use the lower bit rates and get the same quality. They may have to go with four or five channels in a transponder. Before you assume you're going to save millions, do some tests and look at the quality to see if it's worthwhile."

JPEG was originally designed for still photography, and was adapted for video. Because audio was not a part of the original standard, manufacturers found proprietary methods to include audio in the datastream. Hence there are no interchange standards for motion JPEG. Algorithms used by one server manufacturer are not usually compatible with other systems, making each server a closed system. This is not the case with MPEG-2. The specification for MPEG-2 includes a defined transport layer that makes it possible for data file transfer amongst different storage systems. This also provides the means to distribute compressed datastreams within a multichannel broadcast facility. Among the advantages of compressed datastreams are the ability to pass multiple compressed channels through existing bandwidth and faster than real-time copying of files through existing channels.

It should be apparent that if motion JPEG requires storage at 24Mb/s and MPEG-2 only burns storage at 8Mb/s, the result is a threefold improvement in storage utilization. While storage improvement does have a cost, MPEG-2 is not readily editable and requires more time to provide a decompressed output from a dead start. Motion JPEG can be frame-accurately edited and decompresses more quickly. Each application is unique — weigh the issues carefully before deciding which is best for your facility. ■

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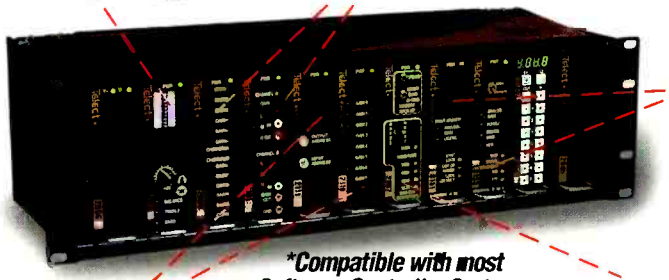

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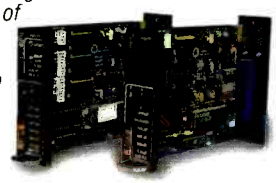

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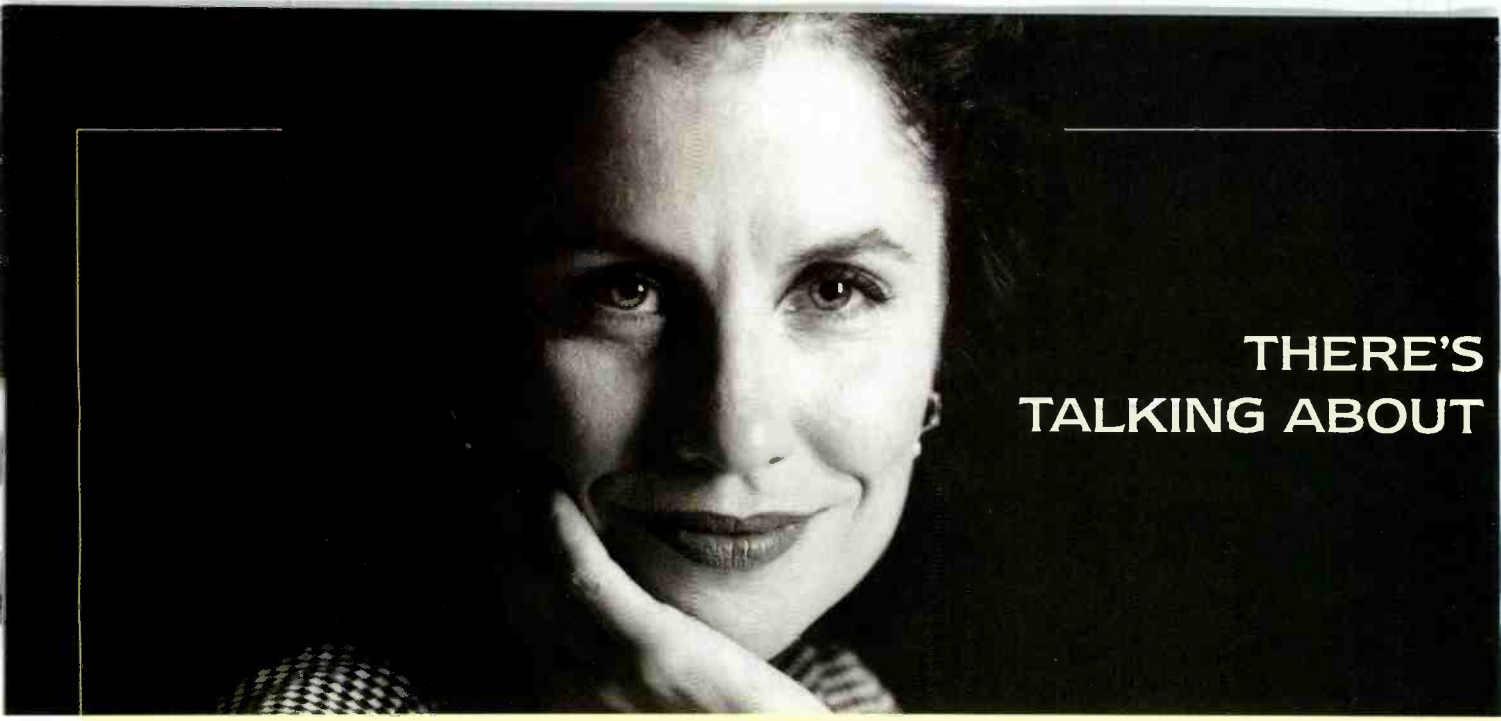

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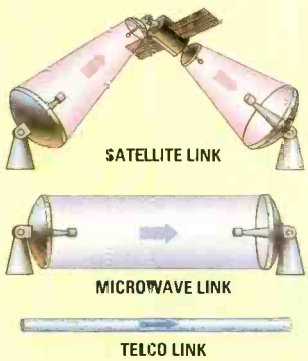

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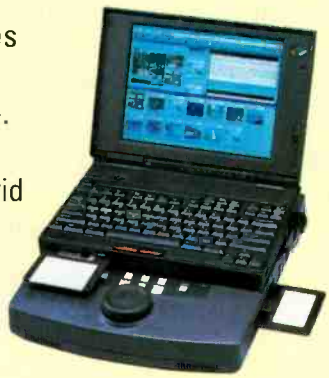

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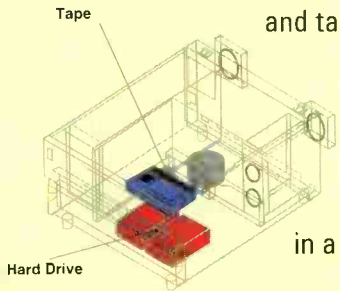

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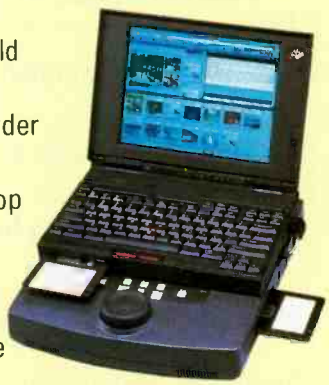

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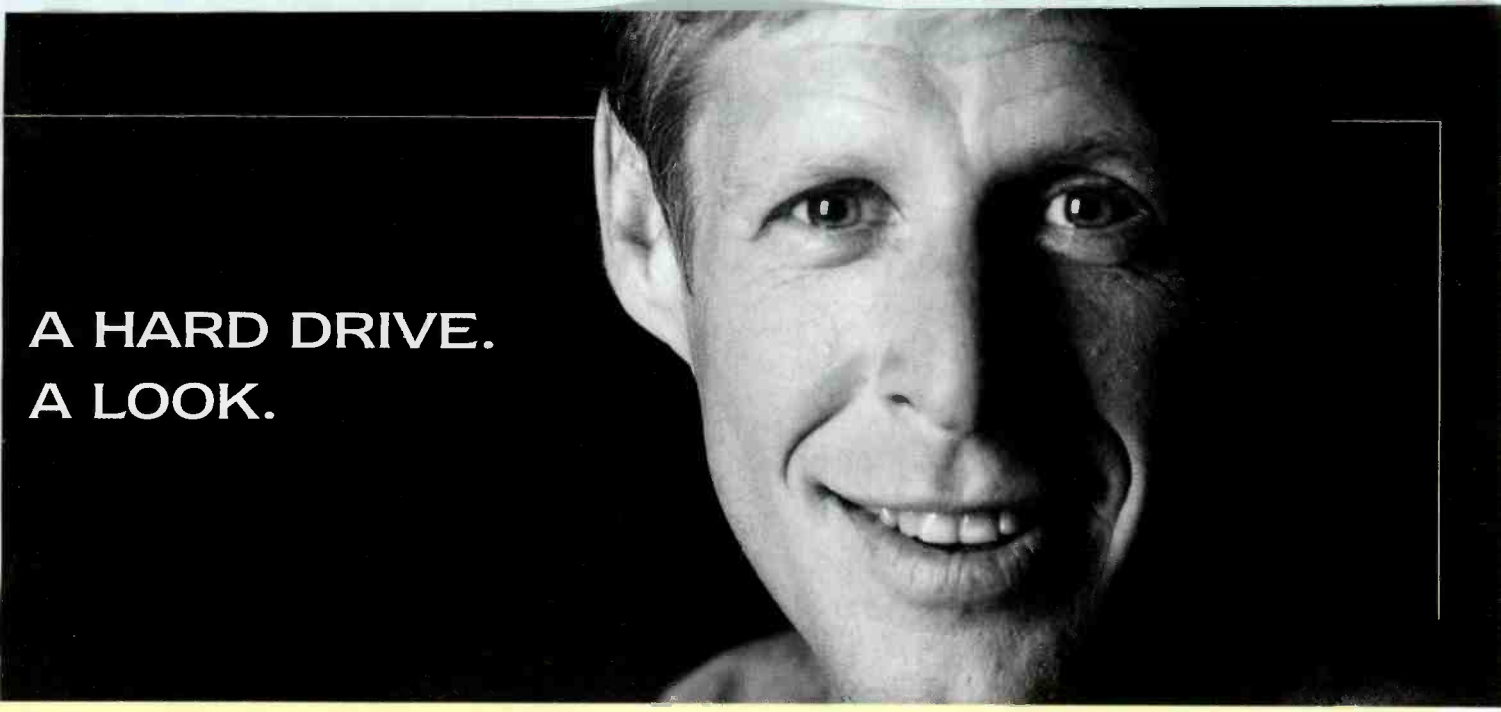

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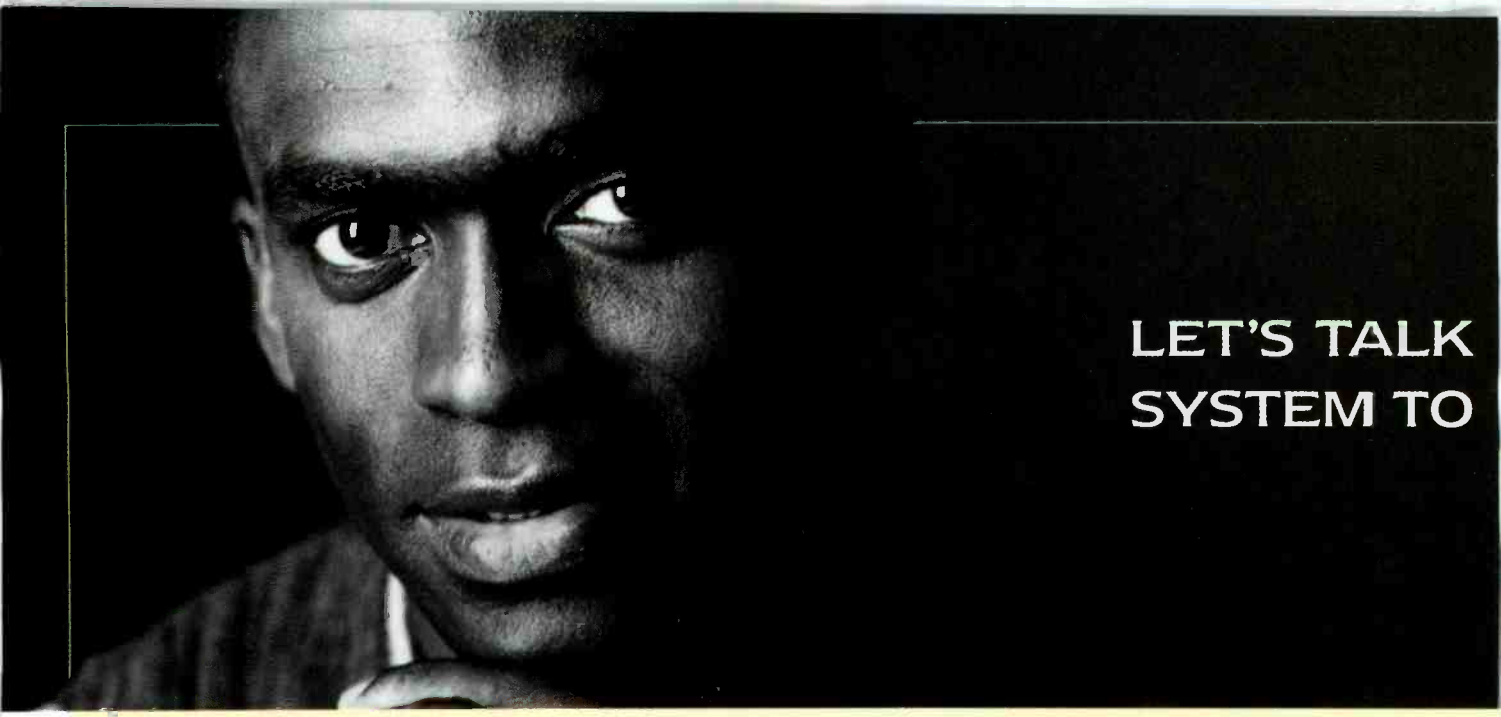

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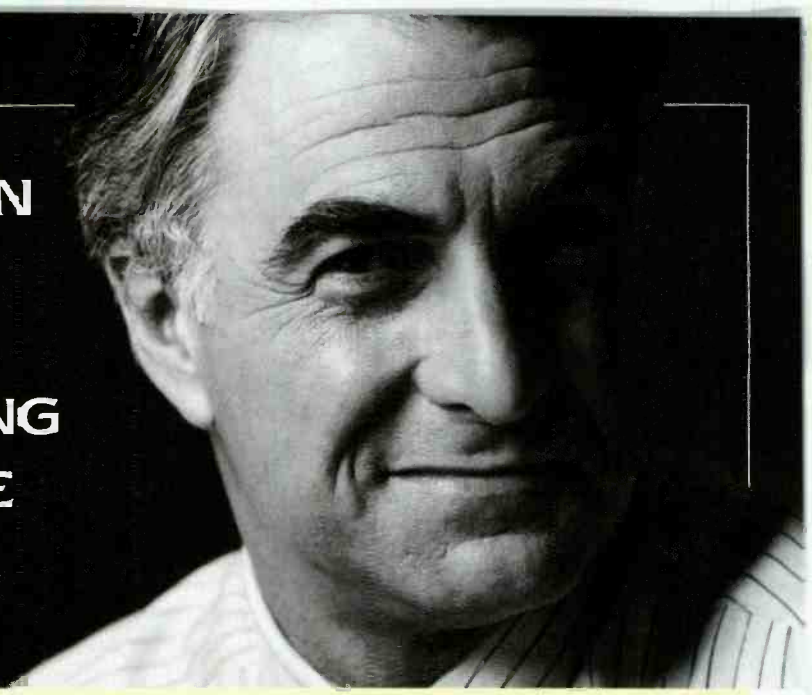

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a multichannel facility. On a three- or four-day weekend, can the system continue operation with minimum manual assistance? This could be an expensive proposition using a video server.

A large automated video library can hold upward of 18,000 30-second spots using multicut videotapes. A central spot archive that serves spots to video servers streamlines operations. First, the traffic department needs only one copy of any spot. Once this is logged in and dubbed into the automated library, it is hands off by traffic and on-air operation. The spot will be automatically downloaded to the video server(s) as required by the playlist, eliminating the need for duplicate copies of a spot in the library.

Facility automation

The question of whether to opt for a centralized mainframe client/server system or a PC-based distributed system is partly answered by the level of redundancy required. The decision is actually made easier if the operation is multichannel. Consolidating the automation system into a single central system is practical and easy to accomplish for a single channel. However, it becomes a difficult and risky proposition as channels are added because the centralized facility automation can become a single point of failure for multiple channels. In contrast, a distributed facility automation system provides redundancy that protects each channel.

A distributed automation system must be able to network at the local and wide area levels. This will become more important as multichannel systems spread across nations and continents.

Unlike the automation system itself, the database should be centralized. Operating a multichannel broadcast system with multiple databases is certain to drive up operations costs and lead to on-air errors. Instead, the automation system should have a common database that serves the entire multichannel broadcast operation. This master database contains a record of all the spots, programs and other material in the facility that can be played out. This valuable repository of data should be carefully protected with mirrored disk drives on the master database file server or completely mirrored file servers.

Traffic system interfaces

A comprehensive closed loop between the traffic department computer system and on-air automation is absolutely mandatory for multichannel operations. The bridge between the traffic system and on-air automation provides the ability to download program logs and return as-run logs. This leads to the seamless scheduling of programming, automated playback, and reconciliation for the accounts receivable system. It's easy to see how quickly this important link in the system can become a millstone that weighs down the facility if not properly addressed. Interestingly, this is one of the most overlooked areas for efficiency improvement in a broadcast facility.

The traffic system has traditionally been purchased independently of the on-air automation system, with traffic software suppliers designing their products to be compatible with the major on-air automation systems. With these functions so closely linked, it was inevitable that they would be combined into a single system. At least one product on the market handles traffic and on-air automation. Another firm is set to introduce a product that manages traffic, as well as program scheduling, ad sales, account management and videotape tracking.

Preparing for digital transmission

For this article, analog or digital transmission means the broadcast transport of the video itself, not just the video format. Because the existing broadcast infrastructure is analog, broadcasters who are adding channels today have to use analog transmission. However, that will change when the FCC adopts a transmission standard.

This is not the case for direct broadcast satellite systems, which already deliver compressed digital signals. Nor will it be the case for the new players like telephone companies building MMDS systems. Because the home viewer still has an analog receiver, the set-top box providers will bridge the gap between digital and analog.

Compression for satellites

Satellite transponder channels stand to gain from digital compression. Satellites are expensive to launch and once in position, are not easily upgraded. Adding more satellites to increase capacity is becoming less feasible as geostationary positions in space threaten to reach their limits. That leaves video and audio data compression, which can provide as much as an eightfold increase in satellite transponder capacity.

The Discovery Channel, for instance, added several new networks at 20% of the cost of a typical analog signal by using a digital compression system to transmit three program channels. The Discovery Channel owns a 27MHz transponder allotment on the satellite used to uplink its programming to Latin America, Spain, Portugal, Argentina and Brazil. Historically, this 27MHz allotment would only carry one analog channel.

Another advantage of digitizing video information: it becomes less difficult and costly to apply encryption to the data to protect it from piracy.

Other transmission systems

Two wireless cable technologies, multichannel multipoint distribution system (MMDS) and local multipoint distribution system (LMDS), may eventually go head-to-head with direct broadcast satellites. MMDS is currently operating in Brooklyn, NY, and other locations, while LMDS will become commercially available soon.

Although satellite and wireless cable transmission are making headlines, cable is still a viable long-term candidate for video program delivery. While a significant number of cable multichannel operations are retransmission, services that include commercial insertion and program replay are coming on-line.

As new transmission systems gain market acceptance and federal regulations encourage consolidation of TV station ownership, broadcast equipment manufacturers will respond with advanced technologies that streamline multichannel operations. To remain competitive, broadcasters may be turning to multichannel operations in the near future. Running these operations cost-effectively will be critical to their success. Careful research, planning and implementation will all be required. ■

Michael Guess is director of marketing at Odetics Broadcast, Anaheim, CA.

From single to multichannel, step by step

Broadcasters always need more

By George Maier

Prior to the ENG revolution, most broadcasters required little more than an STL and a network feed for video connections to and from the studio. The occasional feed from the big event (i.e., sports venue, political event, road race, golf match, etc.) was often handled by a local exchange carrier, which used large bulky portable microwave systems. Those that remember the Raytheon KTR-1000, RCA TVM-6 and M/A-COM MA-7B portables, also remember that it took a substantial (and muscular) crew one to two days to install and align these behemoths.

Through the seventies and the eighties, news became big business in TV broadcasting. The requirement for additional feeds grew with ratings and expanded news budgets. Another major change was the networks' shift from terrestrial to satellite delivery systems. Approximately 70% of the affiliates were able to locate their satellite receiving antennas at their studios. Those that didn't, needed one or more feeds from the downlink site. By the mid-'80s, it was obvious that microwave frequencies were becoming exhausted.

During this time, several manufacturers (including Artel) introduced broadcast-quality fiber-optic video transmission systems. As more fiber became available, and digital technology matured with respect to speed, price and performance, Artel and others developed digital video fiber transports.

Today's highest-quality digital transports do not use any type of compression, employ 12-bit encoding and offer at least six channels of video on the same fiber. Systems using 10-, 9- and 8-bit encoding schemes are also available. Although they may offer higher-channel density per fiber, there are trade-offs in performance, the most significant of which is video signal-to-noise ratio. The advantage is that digital fiber transport performance and video channel capacity significantly exceed analog fiber or microwave systems. A current 12-bit fiber transport, such as the SL-4000, can deliver six channels of virtually transparent video over a 120km path. Although no one makes a totally redundant multichannel fiber system, all of the failure-prone common modules are duplicated and automatically switched.

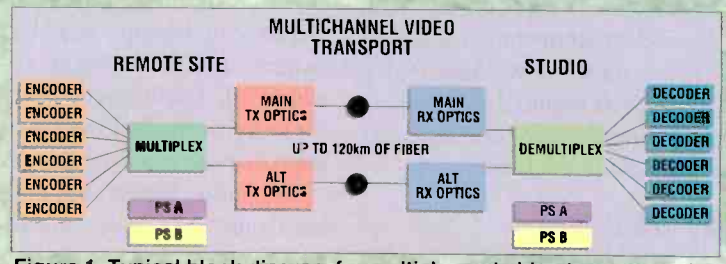

Figure 1. Typical block diagram for multichannel video transport using fiber.

The figure is a representative block diagram of a typical multichannel video system showing the redundant features. As the need for high-quality video channels increases, doubling system capacity is simply a matter of combining two systems on the same fiber using simple wave division multiplexing. For added redundancy, dual combiners and diverse fiber routing could be used. The advantage is in survivability; if one video shelf totally fails, the other is still available.

If more high-quality channels are required, a new technology known as DWDM or dense wave division multiplexing, allows up to 32 optical transports to be combined on the same fiber. This technology takes advantage of refinements in laser, optical mirror and filter technology, and closely relates to the old microwave combining networks, which used waveguide filters and circulators to combine multiple carriers on one transmission line.

For broadcasters, this means there can be plenty of non-compressed video feeds that easily exceed EIA/ANSI RS-250C short-haul video requirements. For wide area transmission, the use of compression is presently mandatory because of the imbedded carrier infrastructure, but most people are willing to accept one pass through compression as a means to an end.

As it stands now, the U.S. fiber infrastructure is at a point where most broadcasters still have little access to dark fiber. As deregulation deepens, some experts predict that excess dark fiber will have to be made available to whomever can pay the price. Meanwhile, the LECs are making major investments in multichannel digital video equipment to offer competitive non-compressed video loop services to broadcasters. On a global scale, fiber availability is growing quite nicely, deregulation is setting in, and in some instances, advanced forms of TV transmission are already in service. ■

George Maier is vice president of marketing for Artel Video Systems, Incorporated, Marlborough MA.

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Understanding wireless microphones

At the receive end, a number of different physical arrangements are possible. The most common is an AC-powered, single-channel (usually rack-mounted) receiver, with antenna(s) mounted directly onto the back panel. Mic- and line-level outputs are usually provided on XLR connectors, allowing the receiver to be connected to a mixer just like any mic or other wired audio source. A number of manufacturers now offer half-rack receivers or combine two receivers into a single rack unit, in some cases sharing antenna(s).

In larger systems, multiple wireless microphones may be used. Naturally, each wireless mic in such a system requires its own RF channel, and if multiple mics are to be used simultaneously, then multiple receivers are required to capture each signal independently. This can amount to a veritable forest of antennas, so master antenna systems have been devised for such applications. These use either active or passive RF splitters to allow connection of multiple receivers to a single antenna system.

A final class of receiver is the portable, battery-powered type. This approach allows both ends of the wireless link to be mobile. It has become quite popular among two-person ENG crews, allowing a reporter to move freely with a hand-held wireless mic, and a camcorder operator to easily follow with a portable wireless receiver mounted on the camcorder, feeding the received mic signal to the camcorder's audio input.

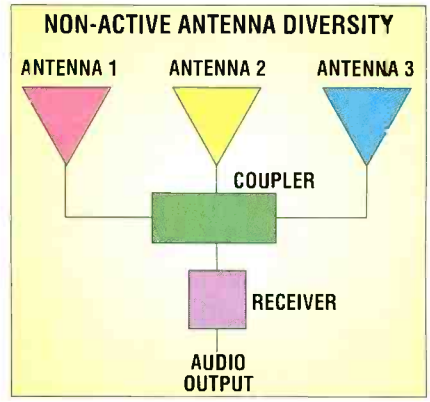


Figure 1. Non-active antenna diversity uses widely spaced antennas that are passively mixed by the receiver.

Diversity reception

Wireless mics in the United States operate in a number of spectrum bands. Most professional systems use transmission frequencies in or near either the VHF or UHF TV broadcast bands. Low-power (in the milliwatt range) narrowband, analog, monophonic FM transmission is used by practically all systems today.

Like any RF transmission system, reception problems can be caused by fading or interference. Because the distances between wireless mic transmitters and receivers are usually short, fading from lack of overall signal strength is

usually not a problem. If transmission frequencies are properly chosen (more on this later), interference from other sources can also be avoided in most cases. The most commonly encountered problem in using wireless microphones is fading from multipath — which could be considered a "self-induced" form of interference. With wireless microphones, multipath is usually caused by reflected energy from room boundaries, sets or columns, particularly those near the mic or the receive antenna. For this reason, it is far less of a problem when wireless mics are used outdoors. In outdoor applications, interference from other RF sources can be more problematic.

Because of their shorter wavelengths, UHF systems can exhibit more instances of multipath than VHF systems might have within a given space, but the area affected by each UHF null is typically smaller. Conversely, VHF systems may encounter fewer multipath locations, but the effective area of any null will likely be larger.

The solution to both systems' multipath problems can usually be found in the technique called *diversity reception*. Multiple receive antennas (typically just two) are placed at different locations, and connected to the receiver. This allows a variety of transmission paths to be established, which statistically reduces the possibility of a deep fade caused by multipath interference. Diversity antennas for VHF systems should generally be spaced somewhat further apart (a few feet) than UHF antennas (a few inches is usually adequate).

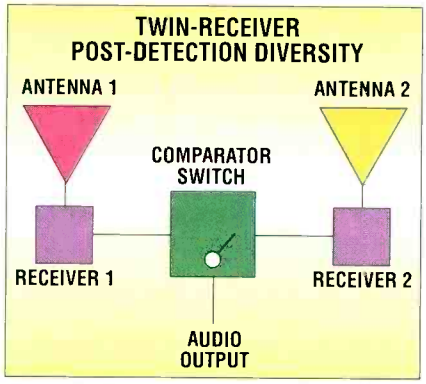


Figure 2. This approach switches between duplicate receiver sections to obtain the better-placed antenna's signal.

How wireless microphone receivers accept and process the signals from diversity antennas varies widely. The simplest, generally referred to as passive or non-active diversity, uses widely separated antennas (sometimes three or more) and combines them passively to a single receiver. (See Figure 1.) While this reduces the possibility for total fading, all antennas are feeding the receiver at all times, and their combined signal is almost never as good as a single, unimpaired path would be.

A more common approach among diversity receivers today uses an active switching approach. One way to do this uses two RF sections, each con-

nected to its own antenna. (See Figure 2.) Both detectors' outputs are fed to a single demodulator, which chooses the better RF signal via a comparator. (Other systems add redundancy by using two complete receivers, placing the diversity switch downstream of the audio sections.)

A less-expensive variant simply switches between incoming RF signals from two antennas, ideally feeding the stronger signal to a single receiver. (See Figure 3.) In practice, however, some of these systems only monitor the active antenna, and when its signal begins to fade, the system switches to the other antenna — which may have an even worse signal at the moment. Generally, this will cause the receiver to quickly switch back to the first antenna, but an additional degradation of the output signal may have been caused in the process.

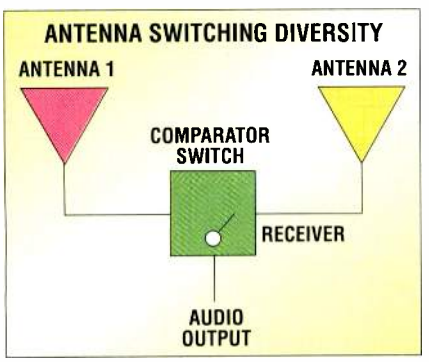


Figure 3. To reduce cost, this method tries to switch the stronger signal from two isolated antennas to a single receiver input.

To solve this problem while keeping costs reasonable, a more sophisticated style of single-receiver design monitors both antennas' signals continuously. In one system's case, instead of simply switching between antennas, the two incoming RF signals are combined with continuous phase correction. (See Figure 4.) Although this places some limits on how far apart the receive antennas can be spaced (to remain within the range of the phase correction circuitry), it can successfully optimize reception conditions where other single-receiver systems might have difficulty.

Note that the use of a single receiver allows some manufacturers to keep their systems' costs low, while others apply the method's efficiency toward the creation of a single, high-quality receiver.

Incidentally, multimic systems using master antennas can (and typically do) take advantage of diversity reception by using dual master antennas and dual RF dividers to feed each receiver's diversity inputs. The distance between these (or any wireless mic system) antennas and their receivers should always be minimized to avoid excessive cable losses. When cable distances of longer than 25 feet for UHF or 50 feet for VHF systems are required, a low-loss cable should be used.

Signal quality and interference

The use of narrowband FM channels has an impact on the fidelity of wireless mics. In the past, even the best systems were noisy and limited in high-frequency response. Today's top performers use companding and other complementary signal-processing techniques to improve S/N and audio bandwidth. It is not uncommon for even mid-priced wireless systems of recent vintage to rival the audio quality of typical wired mics.

The popularity of wireless mics has created some new problems, however. Their ever-expanding use means more potential for interference. Therefore, proper channel selection has never been more important.

Frequency coordination for shared-use channels, along the lines of what broadcasters do with RPUs today, may be warranted in major markets. Many theaters have permanent installations or touring shows that use wireless systems. If your studio happens to be adjacent to such a facility, or if you're doing an ENG shoot in the vicinity, interference between wireless microphone systems may result without proper frequency coordination.

A related problem occurs when multiple wireless mics are used on a project simultaneously, such as is common in today's Broadway-type shows. In these cases, not only must each mic have its own channel, but the channel spacings must be adequate and harmonic multiples (2A-B and the like) must also be avoided. Touring shows (or traveling broadcasters) must also cope with the differing broadcast TV channel allocations in each market they visit. For the 20+ wireless-mic shows that are commonplace today, it's easy to see why computer programs have been developed to determine frequency selections.

A related development in wireless mic technology is the frequency-synthesized oscillator, which allows tech crews to change wireless mic and receiver frequencies in the field with the flick of a switch, instead of exchanging hardware or plugging in crystals.

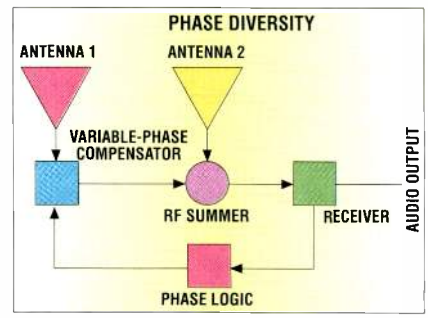


Figure 4. Active phase diversity keeps both antennas active for a stronger signal, with continual adjustment of the phase relationship between antennas via microprocessor control.

Even when all these practices are observed, intermodulation can still occur in multimic systems when miked talent approach one another and two active transmitters are placed only a few inches apart. In this case, the intermodulation takes place in the *transmitters'* final stages.

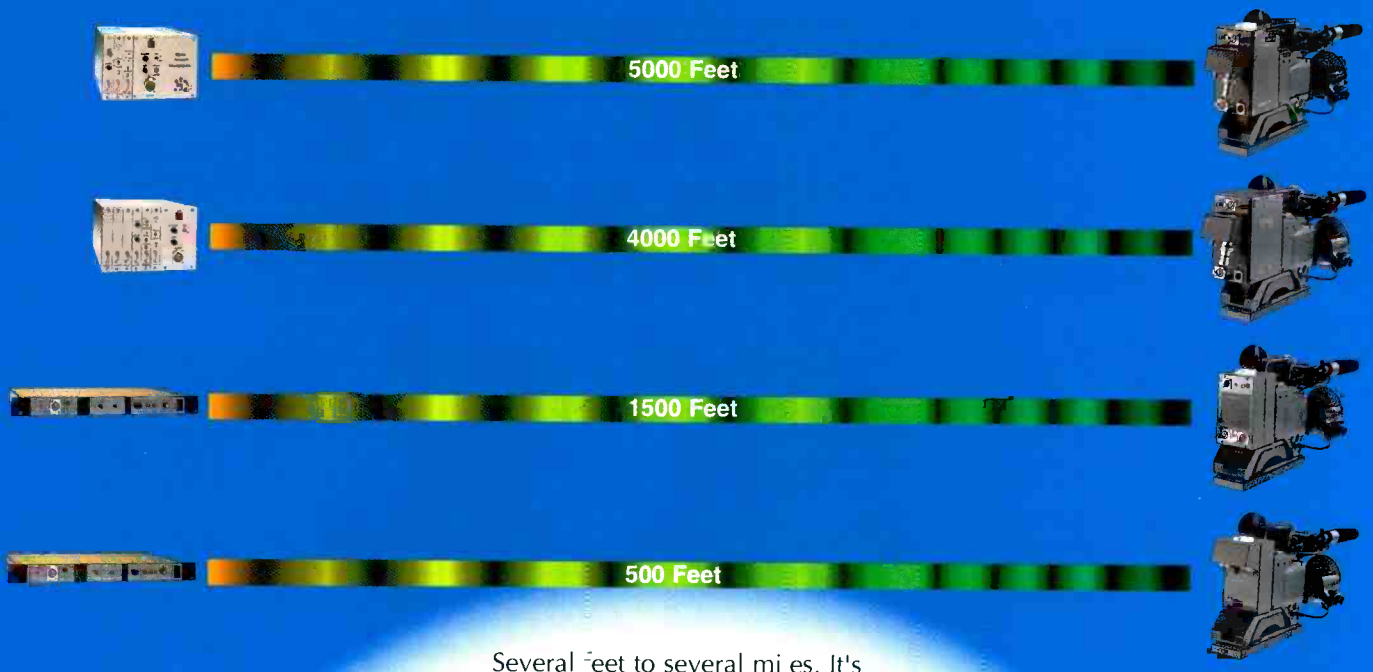
Distance between transmit and receive antennas can also have an unexpected impact. With some of today's more powerful wireless-mic transmitters, too close a placement of receive antennas can cause overload in the receiver (or active antenna distribution system). This can result in non-linear behavior (typically intermodulation) or desensitizing of receivers.

The future

Wireless mics are one area where digital audio has yet to find a warm welcome. Yet the digital future may affect wireless mic systems via the entrance of digital *television.*

Note that if current plans advance to reality, a portion of the VHF TV band will be reallocated to non-broadcast applications. Although wireless mics have always shared the band on a secondary basis, this coexistence was possible because the two services were populated by a few fixed, high-pow-

Telemetrics Goes The Distance.



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*All distance specifications based on using standard Belden 9232 triax and 8281 coax cable.

ered transmitters (television) and many mobile low-powered transmitters (wireless mics). If the VHF band is reallocated to personal communications services, then both of the services sharing the band will use many low-powered mobile transmitters — a far less desirable arrangement for peaceful coexistence.

Today's lower interference potential in the UHF band has already prompted many manufacturers and users to move there for their wireless mic applications. But the UHF situation will also change due to ATV — and even sooner in the process — as new ATV stations sign on, mostly in the UHF band. New PCS allocations are also moving into the UHF wireless mic spectrum.

Time will tell whether either of these ATV-related issues become real matters of concern for wireless mic users. In the meantime, broadcasters will continue to unfetter themselves from their audio cables and use wireless mics to help them get more mobile. ■

In-ear monitoring

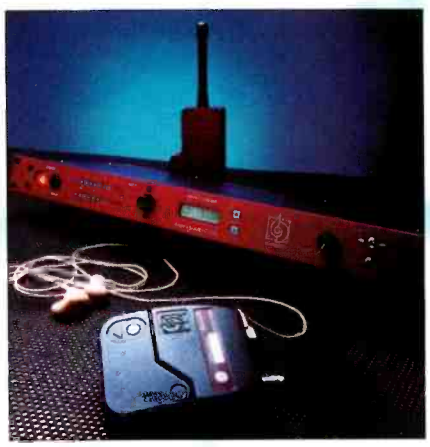
By Skip Pizzi

A new form of stage monitoring for performing musicians is replacing traditional wedge and sidefill stage monitor speakers with high-quality earphones. Referred to by a variety of names — earphone monitoring, personal monitoring or *in-ear monitoring* (IEM) — this relatively recent innovation has been embraced by the concert music industry.

The equipment used for IEM is available in a variety of forms. Both wired and wireless systems are in use, as well as single earpiece and double earpiece units. Most musicians prefer double earpiece systems because of their greater isolation and their ability to provide a stereo mix.

Wireless monitoring systems use some of the same frequencies allocated to wireless mics. Because these frequencies differ around the world, it's important to verify that any wireless monitoring system is legal where you're using it. This will keep you out of trouble with the authorities and minimize your chances of being interfered with by other incompatible services.

To maximize isolation and comfort, some IEM system manufacturers offer custom-molded earpieces. The user is generally fitted by an audiologist who makes wax impressions of the ears, a quick and painless process. The impressions are sent to the IEM manufacturer who assembles the custom earpieces. In some cases, the earpiece color can also be matched to the user's skin tone, with matte finishes applied to reduce reflections. This makes the earpieces less visible to audiences.



The Radio Station I.D.S. is a UHF wireless IEM system from Garwood Communications that can be used internationally.

Most systems allow the user to adjust his or her own volume, typically on a beltpack unit. Some earpieces also offer adjustable porting for tailoring of frequency response by the user. It's also important to guard against hearing damage from IEM. Most systems include protection limiting in their transmitters for this reason. Wireless receivers should also include adequate muting so that no loud pops or noise bursts occur when the RF signal is lost.

Because each IEM wearer has a personal monitoring system, separate monitor mixes — and separate RF channels for wireless systems — are required. This requires a multi-output mixer and makes multiple wireless monitoring systems subject to the same harmonic interference problems as multiple wireless microphones (see main article). Some high-end wireless systems offer the ability for transmitters to automatically program receivers to selected frequencies.

Applying these advantages to broadcasting

Recently, some broadcasters have begun to adapt IEM for use with *interruptable foldback* (IFB) systems of wired and wireless designs. The high-quality, stereo audio that IEM systems provide to musicians fits in nicely with the improvements in aural fidelity that the latest generation of IFB systems are delivering to broadcast talent and crews.

As a result, some new IEM features directed at broadcast IFB applications have been introduced. These include greater immunity to RF interference, products designed for permanent rather than touring applications and increased flexibility for placement of transmit antennas for wireless IFB. The latter involves the use of an active transmit antenna that incorporates the transmitter stage. This allows it to be placed inside a venue near the receivers, which may be at some distance from the truck or control room where IFB signals originate. Without this capability, RF losses in the cable between the wireless IFB transmitter and its antenna might be excessive.

For on-camera (as opposed to on-stage) use, even more effort has been placed on making the earpieces less visible. First, a single earpiece is often acceptable to broadcast talent because isolation from on-stage sound is generally not a problem, and a stereo IFB mix is usually not required. The latest systems have also involved miniaturization. One receiver looks like something straight out of *Mission Impossible* — the single-piece unit is the size of a pencil eraser that includes antenna, receiver, battery and earpiece and simply pops into the user's ear canal.

IEM systems also can be used by broadcast crews when they require more isolation or higher-quality, stereo audio than traditional headsets can provide (such as on-field boom or parabola mic operators at sporting events).

The combination of today's new IFB technology (including wireless systems) with IEM can add significant additional flexibility and quality to broadcast monitoring systems, for fixed and remote applications. ■

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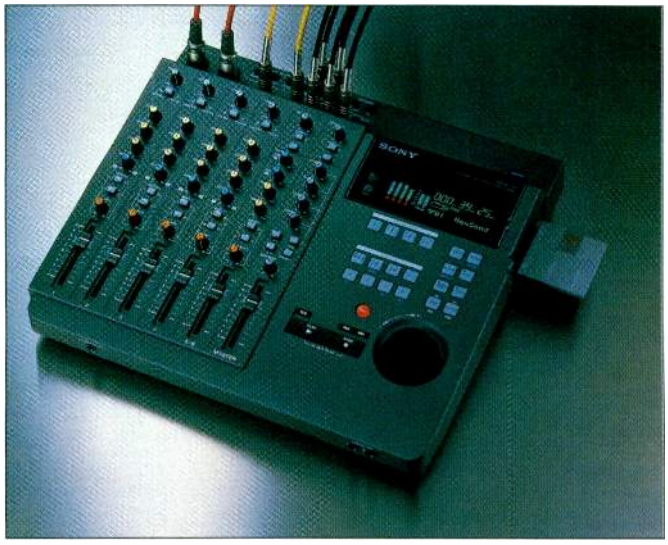
Digital audio storage media

Keeping up with digital audio recording formats is a full-time job.

By Terry Skelton



THE BOTTOM LINE:
New recording media and their increased storage densities have prompted manufacturers to launch a variety of new systems for digital audio storage. As this occurs, broadcasters' need to maintain compatibility and easy interchange of audio media among facilities is becoming more difficult. $

In the past, audio recording media choices were relatively simple for the broadcaster. Quarter-inch tape was the standard. You could even play a two-track stereo tape on a full-track mono machine. The only real variable was which one of two tape speeds you used. To be completely exhaustive, the only other audio decks that a typical (non-multitrack) broadcast facility needed were audio cartridge and cassette machines. Coping with multiple formats was generally more of a problem on the video side of the operation.

In the digital age, all that has changed. Now the industry is filled with many different media (both for audio and for video, but lately with audio taking the lead in digital media types). What's more, a given physical media may be used with different and incompatible recording formats.

Today, many different devices vie for the same job in the broadcast facility, each using different media and approaches. Not only is this complicated, but it seems to be changing almost daily as companies improve their products. Some pieces of digital audio equipment are already into their fourth or fifth generation of software.

Formats du jour

Table 1 is a scorecard of today's audio storage media. Note that the video cassette, open reel tape and DAT are the only media that were not designed as computer products. The "general-purpose" nature of the computer-peripheral systems has allowed different manufacturers to develop independent applications for them,

Above: The Sony MDM-X4 represents a new generation of inexpensive, integrated portable studio systems, using MD-Data media for four-track digital audio recording.

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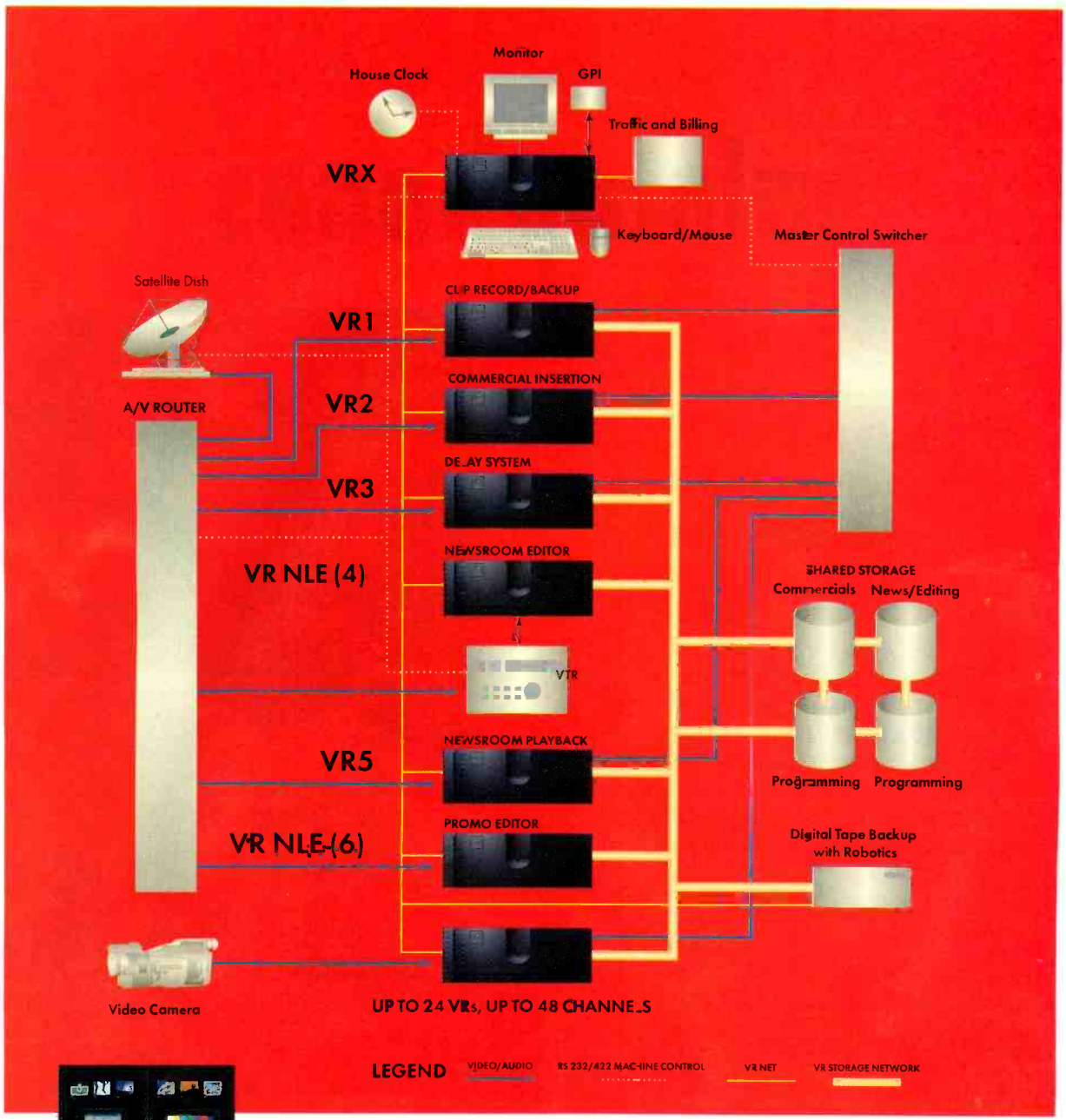

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Circle (22) on Action Card

Understanding wireless microphones

Wireless mics are setting broadcasters free.

By Skip Pizzi

THE BOTTOM LINE:
For broadcast crews interested in going mobile, the wireless microphone is a welcome tool. Once considered so problematic as to be rarely worth the trouble, today's wireless systems are being used in the studio and the field almost as commonly as their wired brethren. $

Wireless microphones allow ENG crews to move freely and independently.

As their prices drop, reliability improves and audio quality increases, wireless mics are finding increasing applications for broadcasters. They have helped TV talent and techs increase their mobility, eliminating yet another of the boundaries that previously tethered TV production. To best understand their use, a review of the basics is a good place to start.

Physical designs

Wireless mics come in two basic physical varieties: hand-held and lavelier. A hand-held wireless mic incorporates its transmitter into the body of the microphone, operating as a single unit. A lavalier system uses a standard lavalier mic, which connects to a separate bodypack transmitter. (The transmitter is usually concealed in a pocket or worn inconspicuously by the talent.)

An alternative to the hand-held mic is the transmitter pod. It is a small wireless transmitter with an integral XLR connector that simply plugs into the end of any microphone, turning it into a one-piece wireless system for hand-held, boom or mic-stand use.

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DIGITAL S In the race to satisfy the demands of the digital age, JVC finishes first with Digital-S — the first affordable, high-quality, digital video recording and editing system.

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4:2:2
COMPONENT DIGITAL

a very mild 3.3:1 compression ratio that yields a 50Mbps data rate. And these technological advancements have been applied equally to both acquisition and editing. For acquisition, Digital-S introduces the extremely versatile BR-D40 Dockable Recorder. For super high-end editing of tapes, you have a choice of two powerful Editing Recorders, the BR-D85 with pre-read and digital I/O, and the very economical BR-D80. Completing the line is the BR-D50 Player, and flexible BR-D51 Player with S-VHS playback.

When it comes to flexibility, Digital-S reins supreme. For starters, Digital-S is the first and only system in its price range to offer video pre-read*, an incredible feature which enables layering and A/B roll editing with only two VTRs instead of three. Equipped with RS-422A control interface, it provides seamless integration with computer editing, graphic tools, plus S-VHS or Betacam systems. The system's BR-D51 Player boasts S-VHS playback capability so you can utilize your present tape library. Plus, the Digital-S system is also applicable to disk-based, non-linear editing systems of the future. Complete with analog inputs/outputs: composite, Y/C, Y, R-Y, B-Y and XLR audio, as well as digital inputs/outputs: SMPTE 259M and AES/EBU, Digital-S lets you take advantage of maximum performance with the minimum amount of degradation in either digital or analog environments.

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(* Pre-read is only available on the BR-D85.)

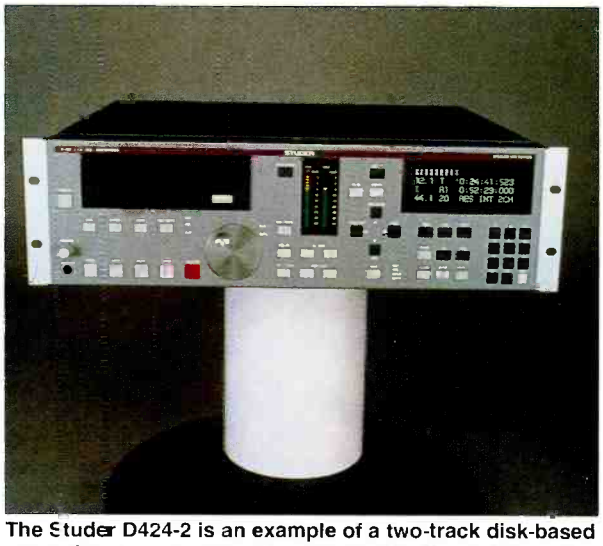
JVC PROFESSIONAL

Circle (21) on Action Card

which has added to the current lack of standardization. In many cases these manufacturers felt they could move into the relatively small and "closed" professional market without waiting for an industry-wide standard format to develop — a different strategy than they might have taken for the much larger and "open" consumer market.

Other manufacturers have stuck with well-established media or they have formed alliances with other vendors to offer some level of compatibility. In another growing trend, formats originally intended for consumer use have been redirected or adapted for professional applications (for example, DAT, CD-R and MiniDisc).

In the case of computer peripherals, even the use of the same media (such as magneto-optical [MO] discs) by two different manufacturers does not imply compatibility between their systems due to differing file formats. This is akin to the difference between PCs and Macs, which can both use 3.5-inch floppy disks, but usually not in an interchangeable fashion.



The Studer D424-2 is an example of a two-track disk-based mastering recorder that uses standard 5.25-inch MO media, but a proprietary recording format.

Of the audio media products that *are* interchangeable, DAT is certainly found in greatest proliferation today, and is the current *de facto* exchange format of the professional audio industry. CD-R is a fast-rising second, with MiniDisc (MD) a distant third. Among multitrack formats, two different *modular digital multitrack* (MDM) systems each enjoy wide-ranging interchange, with multiple manufacturers producing equipment for each format. The ADAT format is now supported by Alesis, Fostex and Panasonic, with the DTRS format supported by TASCAM and Sony.

Some products enjoy a more limited form of interchange, allowing transfer of basic audio data from one company's machine to another, but losing other identification, editing and cuing ("auxiliary") data.

This creates an environment that gives users three choices: 1) Buy from a company that unilaterally offers all the different products you'll need (such as field recorders and control-room playback machines); 2) Buy systems that use interchangeable media and formats (such as

MEDIA	FORMATS	TRACKS	COST (per track-minute)*	COMMENTS
Video cassettes (S-VHS, Hi-8)	ADAT, DTRS	8 per tape; can be linked up to 128 max.	$0.01 - 0.05	Linear access, widely available, inexpensive; limited archival life; extended-resolution adapters available
Open reel tape	DASH	2 to 48	$0.07 - 0.09	Physically large, tape easily damaged, expensive, linear access; low error rate, relatively robust archive; extended resolution available
	Nagra-D	2 to 4		
DAT	DAT (audio), Data-DAT	2	$0.01 - 0.04	High capacity, widely available, inexpensive; limited archival life; linear yet fast access; extended record-time option
CD-R	Red book, Orange book II	2	$0.05 - 0.07	Random access, but somewhat slow; playback (Red book) possible on any CD player; good archival robustness
Hard disc	.WAV, .SND, .AIFF, .AU, others, and many proprietary file formats	Essentially unlimited; typically 2 to 8 per drive	$1.40	Fast random access, large capacity; limited life span; fixed and removable types available; expensive as permanent storage
MO (ISO standard)	Same as hard disc	Same as hard disc	$0.20	Robust, easily transportable, two-sided, high density; reasonably fast random access; relatively expensive system
MO (Sony)	MS Disc (Sony proprietary format)	2	$0.40	Same as ISO-std MO, except one-sided and allows up to 2.5x real-time operation for simultaneous rec+play
Magnetic disc cartridge	Bernoulli, ZIP, JAZ	typically 2; up to 16	$0.50 - 0.75	Fast random access, robust, relatively inexpensive and high-capacity removable format
Floppy disc (3.5 inches)	DCR 1000 (Fidelipac proprietary format)	2	$0.50	Mandatory apt-X100 data compression; typically one-cut-per-disc application; random access
PCMCIA cards	I, II, III; RAM or hard disc	1 or 2	$6.00	Small, robust media; limited capacity and expensive systems; fast random access; mandatory data compression
MiniDisc (audio)	MD standard (ATRAC coding)	1 or 2	$0.08	Small, robust, inexpensive; ATRAC data compression mandatory; random access
MiniDisc (data)	TASCAM; Sony	4, possibly 8 in future	$0.15	ATRAC compression; limited interchange between formats

* All costs approximate; where compression is optional, uncompressed storage is assumed.

Table 1. A list of current digital audio storage media and formats.

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DAT); or 3) Buy multiple, incompatible systems and be prepared to cope with real-time transfers and loss of auxiliary data.

Most of these choices will be predicated on the specific application that the user has in mind for a recording device. Putting aside the general-purpose computer-based products and full-blown digital audio workstations (DAWs) — which are easily the subject of an entire separate study — this analysis considers only audio media that reasonably allow transport of equipment and recordings. These types of systems can be applied to all areas of audio that involve acquisition, storage or editing.

Field acquisition

Until recently, digital field acquisition of audio was essentially limited to DAT. This is still a good choice, especially considering the costs. The medium is physically small, reasonably priced and has a high capacity. For voice work, the half-speed feature offered by some machines (32kHz sampling, 12-bit resolution, stereo) allows four hours of stereo on one $7 cassette. Portable DAT recorders are available in a wide range of sizes, types and price ranges, including some with SMPTE time-code capability. The primary drawbacks are access time (somewhat long when compared to disc-based systems), transfer time (generally limited to real-time at present) and battery life (fairly short on some portable units). There are also some nagging questions about the archival longevity of DAT.

A few manufacturers are trying to apply computer memory devices to the acquisition process. These include use of PCMCIA cards and removable hard drives. Two European manufacturers, Maycom and Nagra, have introduced portable PCMCIA RAM-card recorders, while Studio Audio's *SADiE Mobile* uses a removable hard drive. After returning from the field, the RAM cards or removable hard discs from these systems can be connected directly to computer-based studio production equipment via a parallel interface or docking port, allowing instant editing access with zero upload time. Alternatively, the portable units' data can be file-transferred to the fixed computer system at a faster than real-time computer bus speed.

Removable hard drives may exhibit some ruggedness limitations under stressful field conditions, while the RAM card may be practically indestructible. Cost and size per minute of storage for both of these media types are still relatively high as well.

Another approach toward solving the shortcomings of DAT comes from Denon, which makes a portable pro MD recorder, the DN-80R. In addition to the standard RAM playback buffer intrinsic to all MD machines (which allows uninterrupted playback when the unit is moved, bumped or otherwise subjected to physical shock), the DN-80R includes another, larger RAM buffer for similar protection during *recording*, the only MD machine to offer such a feature. (It also includes additional physical shock protection, adding some size and weight to the unit.) At a lower price point and smaller size, Sony offers an MD deck designed for reporter's use, but without the record buffer or extra shock protection, and is equipped with consumer-type connectors.

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There is also one open-reel, four-track digital recorder made by Nagra (the Nagra-D) that is gaining popularity for high-quality, on-location music recording or film and TV dialog recording.

On the air/master control

Broadcasters have probably been using digital audio storage systems in the on-air and master control areas longer than in any other application. Here again DAT has been the most common, often used for time-shift recording and playback of musical themes or other audio spot announcements. DAT machines have been known to mute during on-air playback, however.

Broadcasters also have been getting good use out of the recordable compact disc (CD-R, also known as CD-WO for "write-once"). It's now affordable, easier to use, and can be played back on even the cheapest of consumer CD players (see notes below). Blank CD-Rs are available in 63- and 74-minute lengths (550MB and 650MB respectively), and you can put up to to 99 cuts on them. Under the Orange Book II specifications (the latest standard for CD-R), it is no longer necessary to record the entire CD and its permanent table of contents (TOC) in one pass. Cuts can continue to be added until either the 99-cut limit or recording-time capacity is reached. A recorded CD-R cannot be played on a standard CD player until the permanent TOC is added, which makes the disc "Red Book-compatible" (the original standards document for audio CDs).

There are a few ways around this rule, however. Some professional CD players will play CD-Rs without permanent TOCs. Alternatively, some CD recorders can write a *pre-TOC*, whereby time-based "sectors" (of 10, 30 or 60 seconds) are used to pre-format the disc. This allows the CD-R to be immediately playable on any CD player, and audio cuts can continue be added to the disc by any CD recorder until time or sectors run out.

Another benefit of the CD-R is that it is easy to make as many copies as you need of announcements, bumper music, promos and the like for all your control rooms, production suites, trucks and sister stations. CD-Rs can also be used for LP dubs, archival recordings, demos and vanity copies of guest-artist appearances.

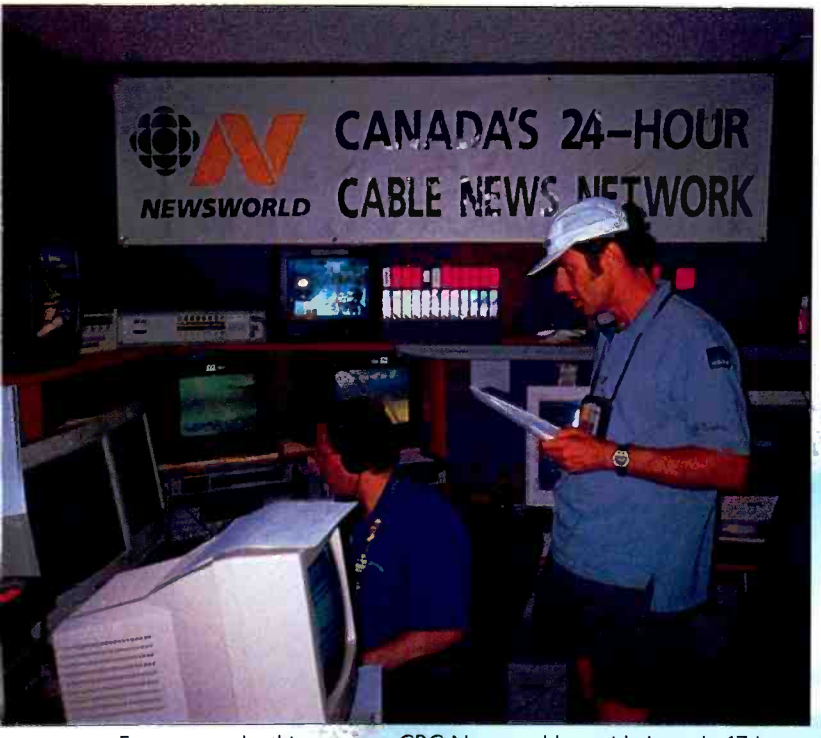
Several companies have introduced two-track audio mastering recorders using removable MO discs. The advantages with these include fast access time, a non-contact medium and long archival life. High-resolution recording (up to 24 bit) is also offered. Media costs are high compared to DAT, however, and the recorders are somewhat expensive. Each of these systems is proprietary, so no exchange between different manufacturer's products is possible. Some systems even use proprietary MO media.

Also in use in control rooms for five or six years has been the digital cart machine, such as 360 Systems' DigiCart. Using a removable Bernoulli computer disk and/or a non-removable hard disc, the DigiCarts offer instant start, high-fidelity and random access, plus simple editing and sequencing capabilities. Dolby AC-2 data compression is optional.

Covering the field with Sony's new Betacam SX™ DIGITAL VIDEO equipment

Betacam SX™ equipment proves a winner at the 1996 Summer Games

CBC Newsworld relies on new Sony equipment



For two weeks this summer, CBC Newsworld provided nearly 17 hours a day of Summer Games coverage to Canada with Sony Betacam SX equipment.

THE 1996 Summer Games saw some spectacular successes for Canada. And, to bring the Games to the Canadian public, the Canadian Broadcasting Corporation's Newsworld, Canada's 24-hour cable news network, utilized the Sony Betacam SX system for its ability to handle the immense workload with speed, flexibility, efficiency and power. The Sony Betacam SX system got a punishing workout at the Games: CBC Newsworld, Canada's leading supplier of live news programming, was on-air about 17 hours a day for two weeks, with the Betacam SX equipment in constant use.

"The Sony equipment performed beautifully," says Clive Valentine, CBC's manager of operations for TV News, from Atlanta. "Most of our 15-minute, hourly highlights package *Atlanta This Hour* is fed directly from the SX machines."

CBC Newsworld went full tilt, using Betacam SX equipment in Atlanta. Ten Sony Betacam DLE-110 Live Editors, each with a dedicated Betacam SX DNW-A100 Hybrid Recorder with five hours of hard-drive storage, were used to create "hot highlights" packages of events that were fed to air almost immediately after they took place.

CBC Newsworld also used four other DNW-A100 Hybrid Recorders in configuration with "quick cuts" and serial digital edit suites, and a fifth Hybrid Recorder for playback. In the field, CBC Newsworld used three DNW-7 Betacam SX camcorders to shoot backgrounders and interviews.

The speed and flexibility of the Betacam SX DLE-110 Live Editor and DNW-A100 Hybrid Recorder were a perfect match for CBC Newsworld's mandate at the Summer Games. As Canada's exclusive cable TV network for the Games, CBC Newsworld was not allowed to compete with host CBC-TV's own "live-to-air" feeds and was limited to playing to air only delayed material. But, with the speed of the Betacam SX equipment, sometimes the delay was measured in mere seconds. That speed was one of the main factors behind CBC Newsworld's decision to go with Betacam SX equipment.

"CBC Newsworld wanted a transition from traditional editing into the nonlinear world that would

be intuitive for their operators and that would be fast for news and for live events and information gathering," explains CBC Newsworld senior system technologist Eric Milotzki. "A fast turnaround time was one of the bottom lines. And the Betacam SX format allowed us either to simultaneously record and play back or record and edit from the same Hybrid Recorder on a single workstation. This allowed us to package highlights of events as they occurred and then immediately play them to air."

An example of this kind of speedy turnaround took place on the evening of Day Five, during the thrilling women's 200-meter individual medley. Using the Betacam SX equipment, CBC Newsworld got the event to air 15 seconds after it occurred.

In addition to generating 15-minute highlight packages every hour throughout the day from 9:45 a.m. to 1:45 a.m., the Betacam SX DLE-110 Live Editor and DNW-A100 Hybrid Recorder also gave CBC Newsworld the speed and flexibility to react quickly to big events or unexpected incidents, without waiting for the 15-minute highlight window. That's how CBC Newsworld was able to respond promptly to the Canadian gold-medal win in the 100 meters and, again, when they won the 4x100 meter relay.

"It was already a pressure-cooker with the stress of putting together the highlight packages every hour," says Milotzki. "All of the edit suites were working like crazy. But we knew this race was going on, so we were recording the feed on the Hybrid Recorder and editing it at the same time.

"It was tense, because it was a major world competition and the single largest track event at the Games. So it was a big deal when a Canadian won it...and we had the highlights right away. Because the Sony Betacam SX system was so flexible, with all that going on, we were still able to put out truly important events, right after they happened."

CBC Newsworld also produced the flagship *CBC Morning News* live from Atlanta and numerous one-hour programs, including a nightly news special, phone-in show, and interviews with athletes and their families.

"The Betacam SX equipment allowed us to use our time efficiently," says Milotzki. "Because of the simultaneous record/playback and record/edit, Betacam SX equipment freed our operators to do other things. You could have one editor driving a couple of workstations — editing on one and recording on others."

According to Jean-Paul Creignou, Sony Electronics' product development manager for Betacam SX products, CBC Newsworld's use of the DLE-110 Live

The Betacam SX DLE-110 Live Editor (top) gave CBC Newsworld personnel the opportunity to do digital nonlinear editing within moments at the Summer Games. Meanwhile, Hybrid Recorders worked side by side throughout many long days in Atlanta.

Betacam SX is "an excellent stepping stone to an all-digital facility and an excellent integration point for existing tape stock."

Eric Milotzki | CBC Newsworld senior system technologist

Editor and DNW-A100 Hybrid Recorder was a perfect example of the power, flexibility and speed of the equipment.

"The DLE-110 can record a feed onto the hard disc drive of the Hybrid Recorder, and it is able to play out, at the same time, some of the highlights that are still being recorded," says Creignou. "While you're still watching the live feed, you can mark some highlights or cue points. The system then lets you go back to the beginning of the highlights and replay it immediately, even with dynamic motion control, such as slo-mo effects."

Editors also took the tapes recorded on the Hybrid Recorder into a linear editing station, where they could use the unedited feed to prepare other programs. CBC Newsworld then archived the edited highlight packages for the entire Summer Games.

"Daily archives of the edited packages were made very easy by the fact that you could get so much information on a Betacam SX tape," says Milotzki. "You can get three hours on a 90-minute tape, and that was a huge benefit. It was a very economical way to archive."

Another feature of the Hybrid Recorder was its multiformat input and output: The Hybrid Recorder allows serial digital in and out, NTSC in and out, component analog in and out, and boasts a serial digital data interface (SDDI) at 4X normal speed.

"I called it the 'mix master' of broadcast television," notes Milotzki. "All of these I/Os were available simultaneously, so we fed our routing switcher NTSC, we fed our digital edit suites serial digital, and we fed our monitors component analog. It's any standard in, any standard out. And you don't need any outboard or external conversion hardware.

"The benefit was cost and real estate. We didn't have to buy the hardware and, because you pay for every square foot, we saved space."

With such intense usage at the Summer Games, CBC Newsworld editors became familiar with the Hybrid Recorder features — and liked what they learned.

"The machine is intuitive," says Milotzki. "It looks like a DVW-A500 Digital Betacam machine and it acts like one. The editors liked the GUI and the timeline, which was very intuitive. And it has one great feature that every editor loved: the un-do button. You don't redo it or scrub over it; you just undo it."

"The fact that we could get five hours' hard drive storage was also great," he adds. "That gave us the time to record longer events like marathons and still have plenty of room on the disc to edit multiple items or package multiple highlights."

Another benefit of the Hybrid Recorder was its ability to input up to four audio channels, with flexibility for assigning and mixing the channels.

"You can mix any one of those four channels in any combination you want," explains Milotzki. "And when you archive that information, you have four discrete audio channels that aren't mixed. So when you recycle it later, you're not going to lose anything."

Ruggedness and durability were other features of the Betacam SX equipment at the Atlanta Games. Milotzki cites the "nice, solid transport mechanism and nice solid chassis" that "can stand the abuse of a remote broadcast and the wear and tear of travel."

Also important in CBC Newsworld's program creation was the ability of the Betacam SX equipment to play back Betacam SP® tapes. Numerous CBC Newsworld camera operators roamed the floor with Betacam SP camcorders, and brought back SP tapes which could be played back on the Hybrid Recorder, for digital nonlinear editing with the DLE-110.

Supplementing CBC Newsworld's many Betacam SP camcorders were three new DNW-7 Betacam SX camcorders, which were used for live feeds of interviews with athletes in the locker room or down on the field or with an athlete's parents in the stands. The DNW-7 offered a host of features that made it an ideal choice for the Summer Games, says Milotzki, including its "excellent low-light capabilities, long battery life, double normal record time, and compatability with Betacam SP tape stock." A feature that proved very useful at the Games was the camcorder's built-in wireless microphone, offering 94 discrete channels in the UHF-TV spectrum.

"In a show this big, you can be put in a difficult position if your microphone's frequency has already been registered by someone else," says Milotzki. "This gave us the flexibility to come in at the last minute and offer them 94 distinct frequencies they could choose from."

The DNW-7 also allowed the CBC Newsworld videographers to play back the tape in full color to the broadcast center, a speedier and more efficient solution than a slow physical delivery through heavy traffic and tight security.

"We had full color playback out of the camcorder to our location, without having a VTR out there," reports Milotzki. "It saved us from trucking out a tape machine and saved us the time of running the tape back. And we had two channels of audio, so we could send split tracks of IS on one channel and the commentator on the other. A year from now, when we go to edit another show, we'll be able to keep the ambiance and put in a new narrator."

Other DNW-7 features that shone under the pressures of the Games were the double volume of material that could fit onto each tape and Sony's lithium ion batteries, which were "extremely lightweight and rapid charging, no memory and long-lasting," Milotzki says. Calling the Betacam SX camcorder "well balanced and ergonomically designed," Milotzki also notes that its "clear scan" feature allowed them to shoot computer screens, supporting scan rates up to 80kHz with no loss in light and providing clear, non-rolling images. For a live Internet chat program, for example, CBC Newsworld was able to focus the DNW-7 on the computer screen, without losing a single f-stop.

Taking all of the features of the DLE-110 Live Editor, the DNW-A100 Hybrid Recorder, and the DNW-7 camcorder into account, Milotzki concludes that Betacam SX is "an excellent stepping stone to an all-digital facility and an excellent integration point for existing tape stock."

"The whole concept of how we simultaneously recorded and edited would have been impossible in the analog world," he says. "As a result, we couldn't have turned out anywhere near the volume of material in anywhere near the same time frame for that cost. We pulled off something that wasn't technically and logistically feasible and wasn't cost effective in analog."

Or, as CBC Newsworld's Valentine puts it: "We did things that were literally impossible without Betacam SX technology."

Other family members of the Betacam SX line (from the top) are the DNE-50 News Editor; DNW-A45 Hybrid Recorder; and DNV-5 Dockable Recorder.

CNN sports channel purchases 29 Betacam SX™ SYSTEMS

The Sony Betacam SX DNW-A50 Hybrid Recorder will be a mainstay in the production of CNNsi, a joint-venture sports network between CNN and *Sports Illustrated.*

CNN's *Sports Illustrated* Channel (CNNsi) purchased 29 of the new Betacam SX DNW-A50 Hybrid Recorders for use in CNNsi, its new sports network. CNNsi is a joint venture with Time-Warner's *Sports Illustrated* and is scheduled for a December launch. The CNNsi facility will use all-digital server technology and will be fed by Betacam SX Hybrid VTRs.

"Sony's reputation in the digital arena, and CNN's experience with our SX camcorders and hybrid recorders during the Republican and Democratic conventions, interchangeability with Betacam SP videotape, as well as demonstrated performance of SX compression helped solidify their decision to make a purchase of this magnitude," says Dick Walters, Sony's senior account manager for Turner Broadcasting System.

BC-00581

SONY®

Removable magnetic disc recorders may soon begin to implement the next generation of removable magnetic disc cartridges from Iomega. These include the 100MB ZIP and 1GB JAZ products, which offer high capacity, fast operation and low cost.

Fidelipac's Dynamax DCR1000 digital cart machine also has been on the market for about five years, using 3.5-inch computer floppy diskettes or a hard drive, with mandatory *apt X-100* data compression. In its high-density form, the floppy provides only 63 seconds of stereo audio, but it works for the operators who prefer the "one spot, one disc" concept, just like operating with carts.

Denon, Sony and Otari have developed several devices based on the MiniDisc (MD) format that are also aimed at direct replacement of the audio cart machine. Denon claims the MDs can be re-recorded a million times and should last 50 to 100 years. All MDs use *Adaptive Transform Acoustic Coding* (ATRAC), a 5:1 perceptual data-compression coding process, now in its fourth version. Denon also makes an MD "replicator," which duplicates one MD at a time, operating at 3.5x speed and bypassing the ATRAC decoding.

Most of the "digital cart machines" can be run by station automation or editors via serial interfaces.

Broadcast production

One of the most successful recent advances in the production and multitrack-recording area has been the *modular digital multitrack* (MDM), available in two different tape-based formats: ADAT and DTRS. They each provide eight tracks of digital recording, with the ADAT using S-VHS tape and the DTRS using Hi-8 tape. Multiple machines can be locked together to provide up to 128 tracks. The tape is inexpensive, but it is a contact format and there is a tape transport and spinning head system to be maintained.

MDMs are already fairly widespread and the machines can be synched via the common time-code formats to video editors. They are also being used for film dubbing, location film work and location music recording.

More recently, *disc-based* MDMs have been introduced, using hard drives, removable MO discs and JAZ cartridges. Some are intended to be direct replacements for the ADAT and DTRS machines, right up to plugging into their remotes and cables. The benefits of these systems are their almost instantaneous random access and lower maintenance. In addition, some machines of both tape and disc formats offer extensive editing right in the machine, while others offer external keyboard and SVGA monitor outputs to fully access all the editing and mixing features. Costs are much higher than tape for the removable disc storage, but disc media will probably last a long time.

The drive toward higher sampling rates and resolutions is also evident among MDMs. Several disc-based MDMs offer up to 24-bit resolution, and a few outboard adapters (like the Rane PAQRAT or Prism Sound MR-2024T) allow similar performance to be achieved on tape-based MDMs, albeit at the expense of track capacity on the tapes.

> In most of the post-production field, the trend is toward removable discs.

TASCAM and Sony have recently introduced inexpensive 4-track portable studios (which include effects, EQ, mic pre-amps, a mixer and a digital recorder that can sit in your lap), using the data version of the MD. These typically offer 37 minutes of four-track recording, and a unique read-before-write operation allows bouncing of four tracks, internal mixing and recording back onto two of the same tracks in a single operation. Once again, the standardization problem rears its head, however. While audio should be playable between systems, cues and edit information are not compatible. Roland offers a unit with similar functions that uses a built-in hard drive (JAZ drive optional), allowing 891 track minutes compared to the MD's 74.

Otari has handled the RADAR hard-disc 24-track recorder for about two years. Like digital multitrack tape decks, this unit can accommodate video rates and SMPTE time code. It is also available in eight- or 16-track versions.

Open-reel multitrack digital recorders have been used for years for post-production, and have been undergoing continual improvements (including up to 48 tracks on a single tape). They are commonly employed on major TV programs, especially those with live musical content that want the opportunity to re-mix in post.

In most of the post-production field, however, the trend is away from tape-based systems and toward removable discs, either MO or magnetic. What slows the process down is that almost anything on a tape is a standard format and almost anything on a disc isn't. So for the moment, it looks as if the audio storage media wars shape up like this:

1. *For field:* DAT, if you want highest linear quality, reasonable cost and/or need SMPTE time code, or MD, if you can live with the data compression and want a smaller, possibly longer-lived medium.
2. *For the on-air/master control room:* DAT for highest linear quality at a reasonable cost with SMPTE time code, or one of many removable-disc systems for instant access. Remember that as storage costs come down and capacity goes up, equipment makers are leaving data compression (and older removable-disc formats) behind.
3. *For post-production:* As storage costs go down, it's going to be hard to beat removable disc media. They support instant access, long operating and storage life, multiple sync formats and linear recording.

Overall, the decisions are difficult, and there's no shortage of choices. Your challenge is finding the best format for your application, while keeping compatibility and longevity in mind. ■

Terry Skelton is an audio consultant and trainer based in Bucks County, PA.

Circle (104) on Action Card. See also "Recording and Playback Products," p.70 of the *BE Buyers Guide.*

1996 salary survey

Time for a raise? Find out what your peers are making with this year's salary survey results.

By Dawn Hightower

THE BOTTOM LINE:
It's review time and you're ready to ask for that much-deserved raise. Hold it. Don't make a move without arming yourself first with *Broadcast Engineering's* annual Salary Survey. This information is invaluable in finding out where you stand with others in like positions, salary-wise, in the industry. $

Can you justify a request for a raise? Just look to the tables. This year, job levels have been broken down into an easier-to-read format. Look for your job title to find out what the estimated median salary is for TV Top 50, Below TV Top 50, Cable and Production job titles.

Executive/General Management

This year's salary levels for the TV Top 50 category remained the same as last year at $75,000+. The Below TV Top 50 category showed a slight decrease of less than 2% this year, from $52,500 to $51,666. For Cable and Production salaries, there was a more dramatic decrease compared to 1995. In cable, there was more than a 10% decrease from $53,570 to $48,333. Production salaries dropped even lower this year, by more than $13,000 from $61,667 to $48,333; more than a 27% decrease.

VP/Director of Engineering

Salary levels were less this year across the board for the TV Top 50, Cable and Production categories. Salaries in the TV Top 50 decreased by $4,167

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EXECUTIVE/GENERAL MANAGEMENT

SALARY LEVEL	TOP 50	BELOW TOP 50
Less than $15,000	2.2%	5.4%
$15,000 to $24,999	0%	10.8%
$25,000 to $34,999	0%	18.9%
$35,000 to $49,999	13.3%	13.5%
$50,000 to $74,999	24.4%	24.3%
$75,000 or more	60%	27%
Estimated median salary	$75,000	$51,666

VP/DIRECTOR OF ENGINEERING

SALARY LEVEL	TOP 50	BELOW TOP 50
Less than $15,000	0%	0%
$15,000 to $24,999	0%	7.1%
$25,000 to $34,999	5%	19%
$35,000 to $49,999	7.5%	33.3%
$50,000 to $74,999	42.5%	35.7%
$75,000 or more	45%	4.8%
Estimated median salary	$70,833	$47,000

CHIEF ENGINEER

SALARY LEVEL	TOP 50	BELOW TOP 50
Less than $15,000	0%	0%
$15,000 to $24,999	0%	2.7%
$25,000 to $34,999	1.7%	20.5%
$35,000 to $49,999	23.3%	47.9%
$50,000 to $74,999	55%	27.4%
$75,000 or more	20%	1.4%
Estimated median salary	$62,727	$43,076

STAFF ENGINEER

SALARY LEVEL	TOP 50	BELOW TOP 50
Less than $15,000	0%	2.6%
$15,000 to $24,999	9.1%	31.6%
$25,000 to $34,999	15.2%	39.5%
$35,000 to $49,999	39.4%	26.3%
$50,000 to $74,999	33.3%	0%
$75,000 or more	3%	0%
Estimated median salary	$44,999	$31,000

OPERATIONS MANAGEMENT

SALARY LEVEL	TOP 50	BELOW TOP 50
Less than $15,000	2.3%	3.7%
$15,000 to $24,999	0%	7.4%
$25,000 to $34,999	18.2%	29.6%
$35,000 to $49,999	20.5%	46.3%
$50,000 to $74,999	31.8%	11.1%
$75,000 or more	27.3%	1.9%
Estimated median salary	$59,999	$39,999

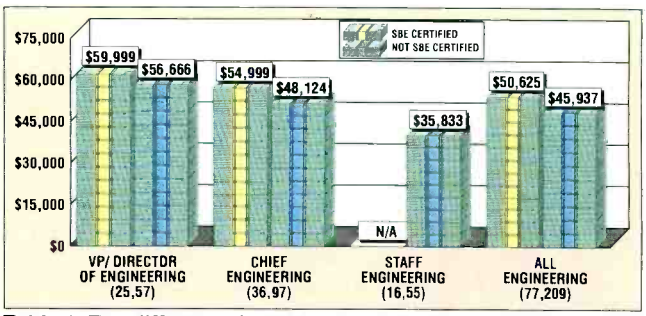

Table 1. The difference in salary levels for those who have SBE certification vs. those who are not SBE certified. The base for each segment is shown in parenthesis beneath the segment title. The first number in parenthesis is the SBE Certified base, and the second is the Non-SBE Certified base.

from $75,000+ last year to $70,833 this year (less than 6%). Cable salaries were less this year by more than 13% at $47,083 compared to $53,333 last year. Production salaries dropped only slightly less than Cable salaries. There was more than a 12% decrease over 1995, from $53,750 to $47,857. TV Below Top 50 actually saw a slight increase of $1,000 at $47,000 up from $46,000 last year.

Chief Engineer

Good news. Chief Engineer salary levels increased this year. TV Top 50 showed a positive jump of $4,156, up from $58,571 to $62,727 this year. TV Below Top 50 had a modest increase of $349, up from $42,727 last year to $43,076 this year.

(Chief Engineer salaries for Cable and Production are part of the VP/Director of Engineering category.)

Staff Engineer

Compared to last year, Staff Engineer salary levels were only down by $1 from last year's $45,000 range to this year's $44,999. The TV Below Top 50 showed a slight decrease of $1,333 from $32,333 in 1995 to $31,000 this year. Cable salaries showed an appreciable increase of more than 18%, up from $36,000 in 1995 to $42,500 this year. Production salaries dropped from $45,000 to $43,888 --- less than a 3% decrease.

Operations Management

The Operations Management salaries was the only cate-

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EXECUTIVE/GENERAL MANAGEMENT

SALARY LEVEL	CABLE	PRODUCTION
Less than $15,000	3%	6.3%
$15,000 to $24,999	6.1%	15.6%
$25,000 to $34,999	12.1%	9.4%
$35,000 to $49,999	33.3%	25%
$50,000 to $74,999	24.2%	25%
$75,000 or more	21.2%	18.8%
Estimated median salary	$48,333	$48,333

VP/DIRECTOR OF ENGINEERING & CHIEF ENGINEER

SALARY LEVEL	CABLE	PRODUCTION
Less than $15,000	1.8%	1.5%
$15,000 to $24,999	1.8%	6.2%
$25,000 to $34,999	19.6%	13.8%
$35,000 to $49,999	41.1%	33.8%
$50,000 to $74,999	30.4%	29.2%
$75,000 or more	5.4%	15.4%
Estimated median salary	$47,083	$47,857

STAFF ENGINEER

SALARY LEVEL	CABLE	PRODUCTION
Less than $15,000	0%	0%
$15,000 to $24,999	13%	7.9%
$25,000 to $34,999	13%	18.4%
$35,000 to $49,999	39.1%	42.1%
$50,000 to $74,999	34.8%	18.4%
$75,000 or more	0%	13.2%
Estimated median salary	$42,500	$43,888

OPERATIONS MANAGEMENT

SALARY LEVEL	CABLE	PRODUCTION
Less than $15,000	0%	0%
$15,000 to $24,999	9.1%	7.7%
$25,000 to $34,999	43.6%	30.8%
$35,000 to $49,999	23.6%	34.6%
$50,000 to $74,999	21.8%	17.3%
$75,000 or more	1.8%	9.6%
Estimated median salary	$34,582	$42,000

gory that increased across the board this year. The TV Top 50 had the biggest increase, by almost $15,000, up from $45,000 last year to $59,999 this year. The TV Below Top 50 rose to $39,999 from last year's level of $33,125; a $6,874 difference. Cable salaries increased nominally from this year's $34,582 over last year's $33,500, a difference of $1,082. Production salaries increased by $4,778, up from $37,222 in 1995 to $42,000 this year.

SBE certification

Once again, as you can see in Table 1, SBE certification does make a difference in what you can command in salary. In every salary level across the board for broadcasters, salaries had increased. ■

Editor's note: The complete results of the Salary Survey are available for $75 each. Contact Debbie Bounds at 913-967-1970. Or contact the BE FAXback line at 913-967-1905 for more information.

HELP WANTED

Do you qualify for today's jobs in the broadcast industry? Whether you are in operations or maintenance, continuing training and education and hands-on experience are essential. Following are some sample job descriptions of different engineering positions:

Position: Electronic News-Gathering Technician
Position summary: Operate the ENG van for live remotes; operate technical equipment used in TV broadcast system; run audio and video cables; maintain daily fluid levels in generator and truck engines; operate videotape machines, satellite dish controllers, microwave receiving equipment; master control switching center and TV transmitters; videotape recording, duplication and playback, coordination and reception of live signals from the field; reception of satellite signals and coordinating, switching and controlling the quality of the on-air signal.

Position: Engineering Maintenance
Position summary: Maintain all aspects of TV station equipment; install equipment for TV operations; operate remote truck, work with departments to ensure smooth, timely technical operations; operate videotape machines, satellite dish controllers, microwave receiving equipment, master control switching center and TV transmitters; videotape recording, duplication and playback, coordination and reception of signals from the field; reception of satellite signals and coordinating, switching and controlling the quality of the on-air signal.

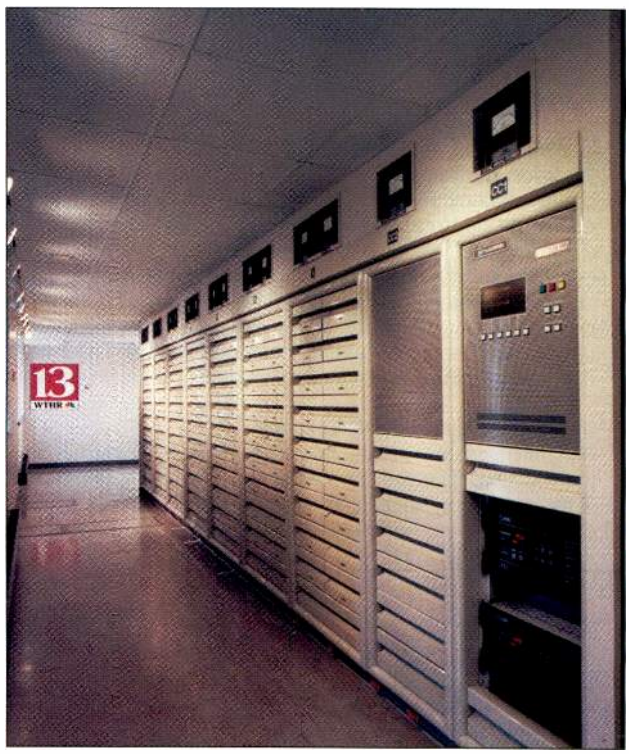
Position: Operations Technician
Position summary: Operate technical equipment used in TV broadcast system; operate videotape machines, satellite dish controllers, microwave receiving equipment, master control switching center and TV transmitters; videotape recording, duplication and playback, coordination and reception of live signals; reception of satellite signals, and coordinating, switching and controlling the quality of the on-air signal.

Position: Studio Maintenance Engineer
Position summary: TV maintenance experience; knowledge of TV electronics; design technical systems; create documentation to put design into practice, install equipment and perform corrective and preventive maintenance. ■

WTHR-TV Rebuilding from the ashes

Faced with a fire-damaged 25-year old transmitter, WTHR undertakes major transmitter building renovation and installs a new transmitter in just five months.

By Kenric B. Stone



WTHR's new Harris HT 70HSP transmitter.

THE BOTTOM LINE:
Last October, WTHR-TV 13 was knocked off the air by a transmitter fire. Following an all-night effort, the station was back on the air at 50% power. After working several days around-the-clock, the station was broadcasting at 100% power. However, the problem was not over. Inspection during rebuilding and cleaning revealed that the fire had shortened the remaining life of the 25-year-old transmitter. The fire also had released environmental contaminants that had spread throughout the equipment and the transmitter building. The decision: order a new transmitter, begin decontamination and initiate a renovation program to accommodate the transmitter. Four months later, the transmitter was delivered, and on March 21, five months after the fire, WTHR's new transmitter went on-line. $

A transmitter fire is a broadcast engineer's worst nightmare. Shortly after 8:00 p.m. on Oct. 16, 1995, the nightmare became a reality for the engineers at WTHR-TV 13 in Indianapolis, as oil in an electrolytic capacitor within the power supply section of the RCA-TT50FL VHF-broadcast transmitter leaked out and dripped onto a high-voltage transformer. Minutes later, with smoke filling the building, the station was off the air.

A prime-time transmitter fire

Fortunately, the RCA-TT50FL transmitter consists of two sections and only one section had been physically damaged by the fire. However, the remaining section also had suffered considerable contamination.

Executives from the station's owner, Dispatch Broadcast Group of Columbus, OH, arrived on the scene within hours to provide assistance. Working through the night and into the morning hours, the WTHR/Dispatch team readied the "undamaged" section of the transmit-

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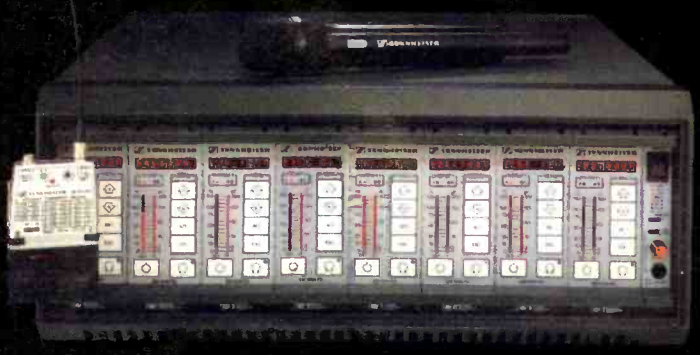

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WTHR-TV: Rebuilding from the ashes

ter for return to operation. At 4:30 a.m. on Oct. 17, WTHR was back on the air at 50% power.

The next day, WTHR purchased a used power supply section for the transmitter from a TV station in Pennsylvania. Working on a 24-hour basis over the next several days, WTHR installed the used parts and completed the rebuilding and cleanup of the fire-damaged section. Within a few days, WTHR was back on the air at 100% power.

WTHR transmitter building.

There was more serious damage, however, as careful inspection of the transmitter components during cleaning revealed that the fire and resulting interaction of chemicals contained in the smoke had most likely significantly shortened the service life of the 25-year-old transmitter. Reliability was now a serious concern. The fire had also released environmental contaminants that had spread throughout the equipment and building by the HVAC system.

The decision

WTHR was considering purchasing a solid-state VHF transmitter from the Harris Corporation Broadcast Division's Platinum Series. Of particular interest was the 60kW HT 60HS.

Following discussions with Harris, it was concluded that WTHR required more redundancy than the standard HT 60HS provides. WTHR wanted a transmitter capable of maintaining full-power operation (46.8kW) even if an entire RF amplifier cabinet is removed from service.

Harris engineers developed a new model configuration that would provide the station's desired level of redundancy. The result: a 70kW transmitter with independent RF paths and a new high-power combining system — the HT 70HSP.

The new transmitter

The new transmitter's modular design ensures that full-power (46.8kW) operation is maintained when an RF amplifier cabinet is taken off-line for service or in the event of a complete cabinet failure. The transmitter is comprised of parallel and redundant control systems, dual-combination visual/aural exciters and seven identical RF power amplifier cabinets. Each of the cabinets contains visual and aural drivers and visual and aural power amplifiers. Each solid-state RF power amplifier module uses four identical Class AB push-pull FET amplifiers to produce 1,050W of peak visual or average aural power. The modules feature built-in protection from six fault conditions, a "hot pluggable" design for safe insertion and removal during transmission and requires no tuning.

Two identical linear power supplies are used in each amplifier cabinet. Fault-protected power supplies are regulated to handle voltage variations of ±10% in the incoming AC power, as well as changes in load currents. Each cabinet is also protected by separate external AC breakers, ensuring that an AC fault within an amplifier cabinet will not take the entire transmitter off the air.

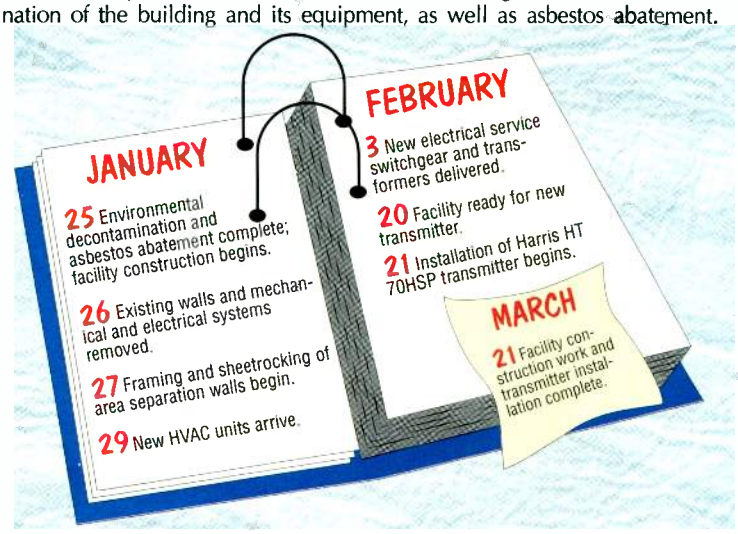
Isolated HVAC distribution and air handling ensures consistent and independent cooling to each power amplifier module, even while a module is off-line for service. Positive air pressure minimizes build-up of dirt and other contaminants.

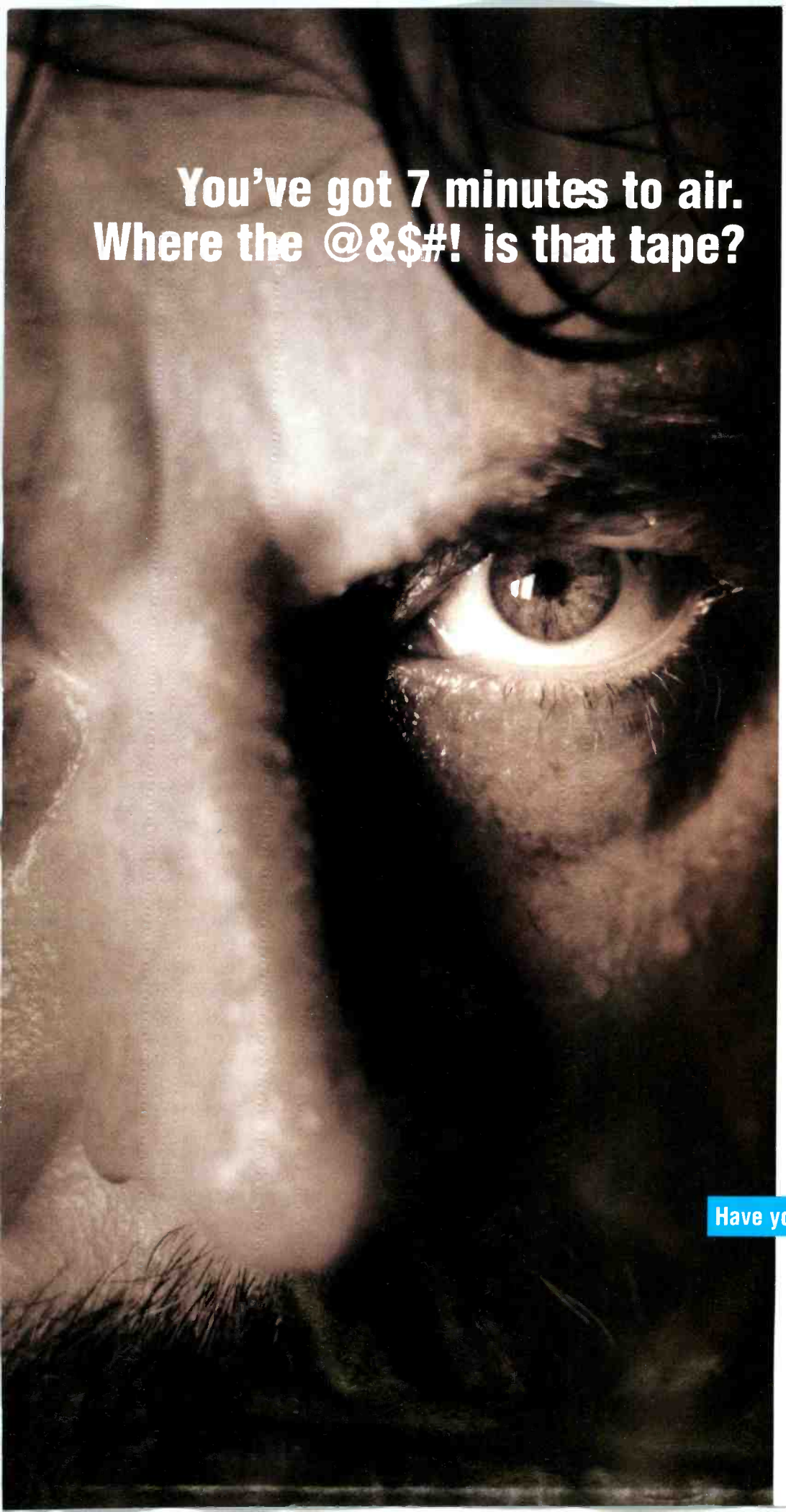
The transmitter features a distributed control system, which enables each amplifier cabinet to be independently controlled. To ensure seamless and continuous full-power service should any amplifier cabinet need to be removed from operation, Harris provided a new combining system. The seven-way system is based on a new high-power Geysel combiner. Harris had already been using a Geysel unit to combine RF module output within the amplifier cabinets. Therefore, the new high-power version simply extended a proven design principle, allowing output of the seven separate 10kW amplifier cabinets to be combined externally.

The Geysel high-power combiner is simpler than a traditional system. A

Construction and installation timetable

Concurrent with the design and engineering of the transmitter, WTHR authorized The Austin Company to proceed with architectural and engineering design to renovate the existing facility to accommodate the new transmitter. The Austin and Harris teams defined and coordinated specific electrical service, HVAC and space requirements. Roy F. Weston, Inc. of Concord, CA, began environmental decontamination of the building and its equipment, as well as asbestos abatement.





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WTHR-TV: Rebuilding from the ashes

traditional system would have been an RF plumbing nightmare for a system as complex as WTHR's. The Geysel system simply feeds amplifier cabinet output into the combiner via phased transmission lines, and does not require any reliability-degrading RF switches in any path. In addition, the Geysel system requires less space than a conventional system.

Fast-paced transmitter building renovation

Concurrent with the ordering of the transmitter, The Austin Company of Cleveland, OH, was hired to plan, design, engineer and construct a fast-paced renovation of WTHR's transmitter building to accommodate the new transmitter installation, four months away.

An area of the transmitter building that had once held the station's original transmitter, and which now housed a workshop and equipment storage area, was selected to become the new transmitter equipment room.

Concerned with scheduling and delivery of new electrical service switchgear, transformers and HVAC equipment, Austin engineers quickly completed sizing and specifications for purchase of this equipment. Because the transmitter was being designed and constructed for complete redundancy, building support systems were designed for redundancy as well.

New Harris seven-way, high-power Geysel combiner.

Building and technical equipment support systems include new 1,200A service feeder duct bank; new electrical distribution equipment switchgear; dedicated and independent grounding and bonding systems; new redundant 208V step-down transformers; and a new dedicated HVAC system, which provides fully automatic and redundant capabilities in maintaining a 70°, 50% relative humidity environment, year-round.

The end result

On Feb. 20, three weeks after the start of construction, the building was ready for the new transmitter. Final construction and installation activity continued virtually around-the-clock for the next 30 days. On March 21, installation and testing of the HT 70HSP transmitter was complete.

WTHR and its owner, Dispatch Broadcast Group, were able to replace the old transmitter with state-of-the-art equipment. This was achieved through teamwork among WTHR engineers, corporate management, Harris Corporation Broadcast Division's engineers and technicians and The Austin Company's architects, engineers and construction personnel.

From concept to completion in just five months, WTHR's new Harris transmitter and transmitter facility are state-of-the-art, setting a new standard within the broadcast industry for functionality and reliability. ■

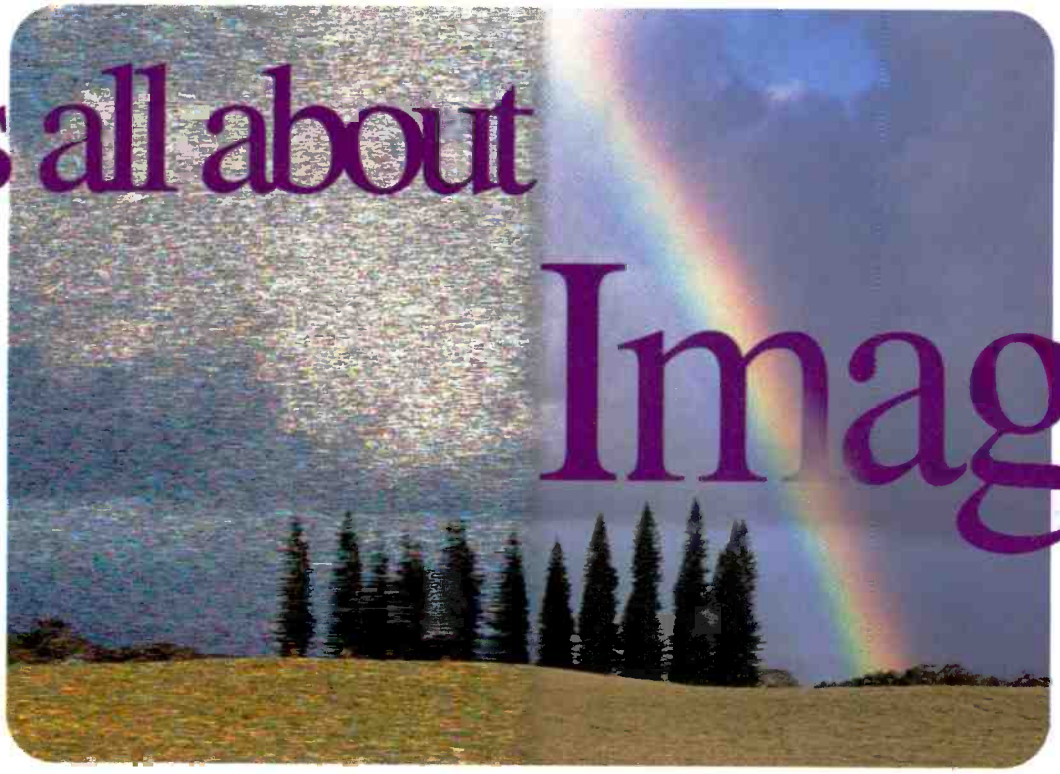
Kenric B. Stone of The Austin Company is manager of business development for the broadcasting, communications and entertainment industries.

Photos courtesy of The Austin Company.

Limiting your risk

- **Evaluate your transmitter facility for possible contaminants**, such as PCBs and asbestos. Even if it is not feasible to remove them, knowing that they are there is important in case of a fire.
- **Identify or provide fire-rated separations** within the facility to isolate fire damage to limited areas. Try to protect space that could be used for the installation of a new, replacement or emergency-loan transmitter.
- **Install smoke detectors for early warning in the event of fire.** Tie smoke detectors to a monitoring company, your master control at the station and, perhaps most important, an Emergency Power Off (EPO) system for the transmitter power and HVAC system.
- **Provide a central location at the transmitter facility for control of all power** by fire fighters, as well as your engineering personnel. Be certain that transmitter/technical power is controlled separately from HVAC, lighting and convenience power. It is extremely important to be able to maintain lighting when transmitter power is cut (emergencies never occur in the daylight).
- **Review access to your transmitter facility for emergency personnel and equipment, including roadways, driveways, etc.** Can emergency vehicles make the turns? Can fire fighters gain quick entry to the building? (You want fire fighters to be able to put out a fire as quickly as possible to contain equipment and building damage.)
- **Review HVAC systems.** Are systems separated to minimize the spreading of smoke? Are the return air ducts equipped with smoke detectors to shut down the air-handling units? Consider redundancy of HVAC systems, with automatic transfer, to avoid problems with unit failures.
- **Most important, develop a Disaster Plan.** Review the "What if" questions and have a strategy (in your mind, on paper, approved by management and known by your engineering staff) to respond to the various disasters or emergencies that can strike your transmitter.

It's all about Image.



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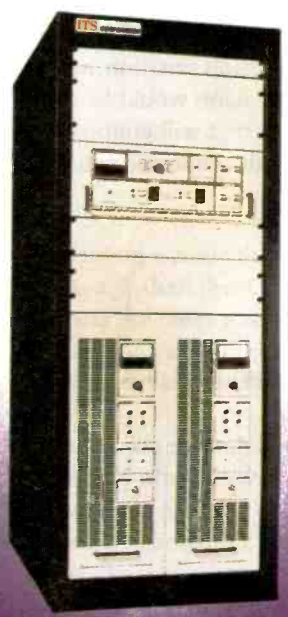

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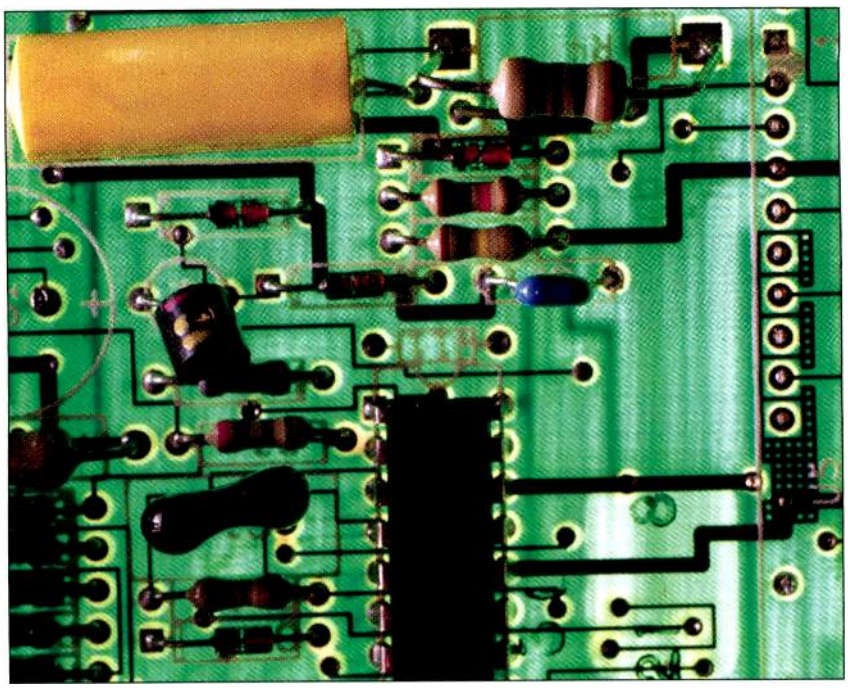
Monitoring video feeds



Don't wait til it's too late, monitor your video feeds now.

By Jay McGaughey

THE BOTTOM LINE:
Because facilities now must monitor dozens of video feeds, knowing when one fails is of paramount importance. The author has built an inexpensive device that monitors video feeds. Now, if a problem occurs, the device will warn of a failure that otherwise may not be discovered until it's too late. $

Frequently in a broadcast facility there are video paths that are important, but are not constantly monitored. In cases where the path is not frequently used, a failure may go undetected until it is needed. In this situation, a means of detecting the failure of video and indicating an alarm would be useful.

This article will describe an inexpensive device that will continuously check for the presence of video on a loop-through connector pair.

How the monitor works

On detection of a failure with a duration set by the user, a piezoelectric device will sound an alarm and a front-panel LED will flash. Included is a failure memory to remember a failure occurred but video has returned. A rear panel contact closure is also provided to indicate the failure to external devices. This could be used to have a PC log failure times or automatically switch to another source.

In use at the University of Georgia are two units that are placed at each end of a 70-mile multiple hop bidirectional microwave path. In this way, an alarm is initiated at each end corresponding to a failure of the path in that direction. The entire unit cost was less than $150 and can be wire-wrapped in about four hours.

The system provides for choosing two time thresholds called fail delay

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and acquisition delay. These are used to give control over how long video must be missing or present before an alarm will sound or be cleared. These two times are variable from zero to 7.5 seconds in one-half-second intervals.

> In cases where the path is not frequently used, a failure may go undetected until it is needed.

Each is set by four dip switches according to Figure 1. Figure 2 is a schematic of the unit. The presence of video is determined by looking for the regular occurrence of separated vertical sync pulses. U1 is an LM1881 sync separator integrated circuit. At pin 3, a low pulse should occur once each field of incoming video. If video begins to get abnormally low or noisy, the vertical sync will get more difficult to find. This will result in more than one pulse per field until video drops out entirely. At that point, the pulses will stop and the vertical sync pin will go low.

51-4 (8)	51-3 (7)	51-2 (6)	51-1	DELAY (SECONDS)
C	C	C	C	NONE
C	C	C	O	.5
C	C	O	C	1
C	C	O	O	1.5
C	O	C	C	2
C	O	C	O	2.5
C	O	O	C	3
C	O	O	O	3.5
O	C	C	C	4
O	C	C	O	4.5
O	C	O	C	5
O	C	O	O	5.5
O	O	C	C	6
O	O	C	O	6.5
O	O	O	C	7
O	O	O	O	7.5

O = OPEN C = CLOSED

Figure 1. Each unit at the end of a 70-mile hop is set by four dip switches.

Control system

The central system control is provided by a Motorola 68HC811 microcontroller. This is a complete 8-bit microprocessor system on one integrated circuit. In order to make construction easier, a complete ADAPT-11 module containing the microcontroller and its support circuitry was purchased from Technological Arts Inc. (1644 Bayview Ave., Suite 1704, Toronto, Ontario M4G3C2; phone 416-963-8996).

This module can be mounted on a PC board and wire-wrapped with little effort. In addition, a serial port is provided on the module. This is used to download from a PC the program that runs the microcontroller. The program operates as a loop 30 milliseconds long. It checks to see that either one or two vertical sync pulses occur within that

period. If not, then this is treated as a video absence to be time qualified by the delay interval selected. Use of a microcontroller greatly minimizes the amount of integrated circuits that would otherwise be required and gives timed intervals that are not dependent on resistor-capacitor time constants.

U4 is a retriggerable one shot that is used to give a front-panel indication of the health of the system. Once each pass through the program loop, the microcontroller triggers the one shot. As long as this continues regularly, the one shot never times out and the green LED stays on. This gives a much better indication of system activity than a power-on light would.

U3 is an open collector buffer used to drive the piezoelectric alarm device and the relay coil for K1. Jumpers J1 and J2

On detection of a failure with a duration set by the user, a piezoelectric device will sound an alarm and a front-panel LED will flash.

allow configuring each of these device's actions. In position 'B' to 'C,' the device will activate only during a current failure. In position 'A' to 'C,' it will activate on a remembered failure. In addition, there are two front-panel alarm LEDs. One flashes on a current failure only while the other flashes on a remembered failure.

A push-button switch allows for resetting the failure memory once the current alarm condition is clear. An eight-section dip switch S1 is present to allow setting of the delay intervals mentioned earlier. This will set the system to alarm or clear on variable intervals of video presence. The program also initializes the system so that power outages to the unit are not remembered as video absences.

After construction, the ADAPT-11 module is connected to a serial port of a PC to download the object code from

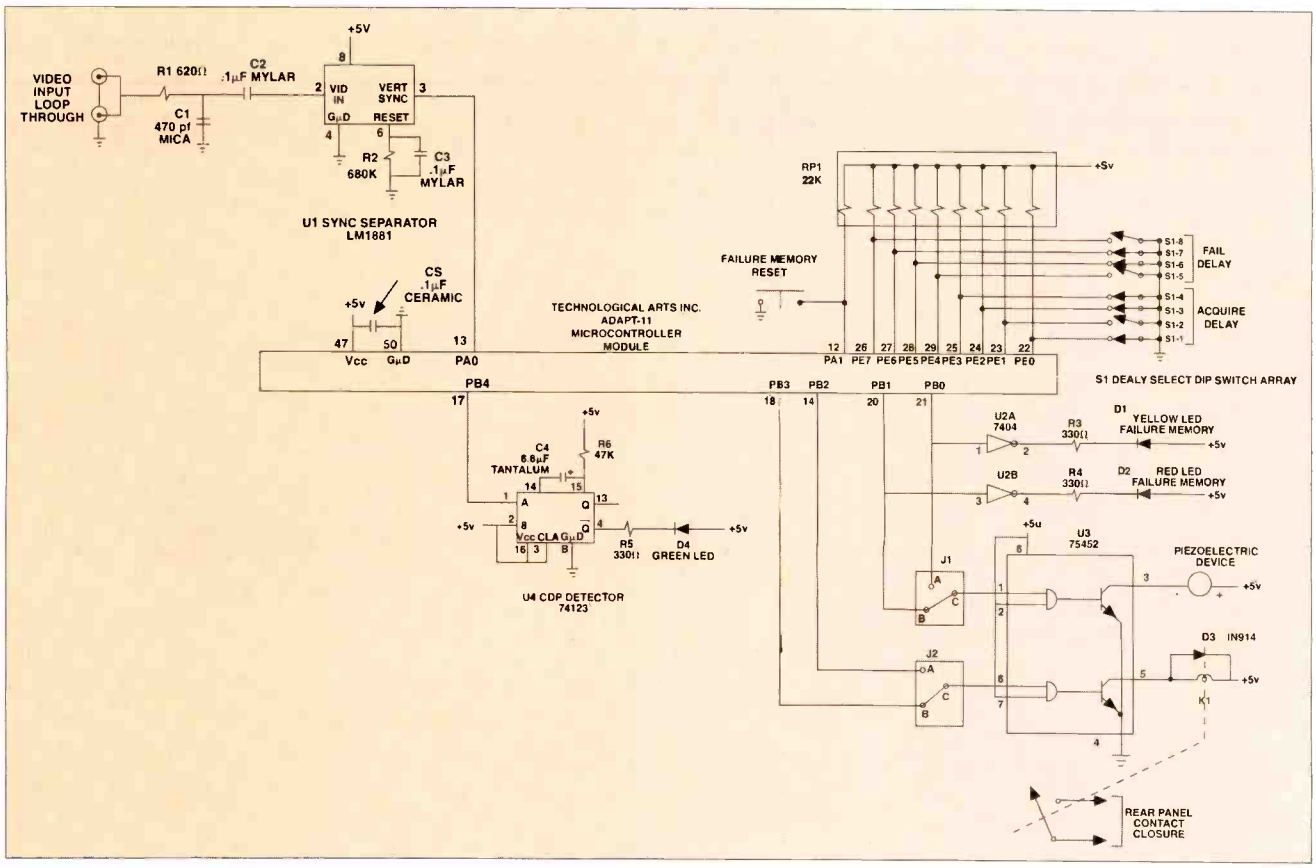

Figure 2. A schematic of the video monitoring system.

the disk to the microcontroller's EEPROM. This is a 2K electrically erasable programmable read-only memory. The object code is serially downloaded and simultaneously programmed into this memory. The EEPROM can be erased and reprogrammed up to 10,000 times. Strategically placed, this system can warn of failures that may otherwise only be discovered after it's too late. ■

Jay McGaughey is an electronics engineer at the University of Georgia Telecommunications, Athens, GA.

Editor's note: *A disk is available free-of-charge with the source and object code along with the downloading utilities. A complete parts list also is included. Contact Jay McGaughey at the University of Georgia Telecommunications, Room 167 Georgia Center Building, Athens, GA 30602; or by phone at (706) 542-6732; or by E-mail at mcgaugheyj@gacsrv.gactr.uga.edu.*

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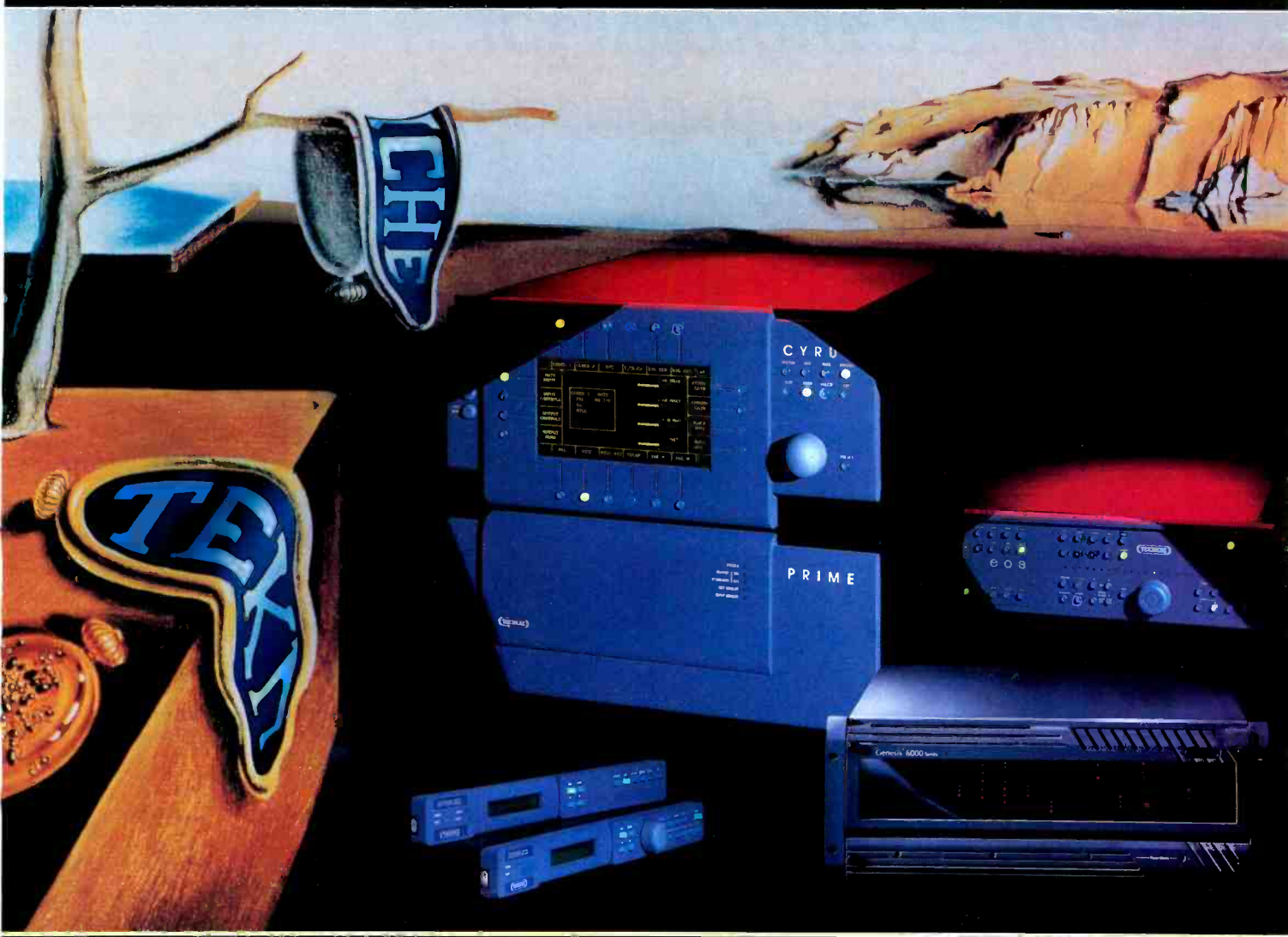

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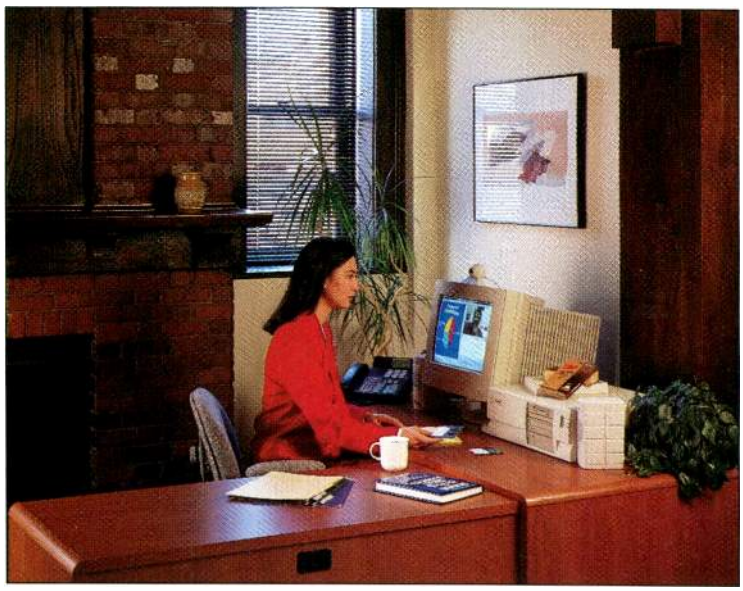
New technology for computers goes home

In addition to laptops, still cameras and portable storage successors are making their way into the consumer market.



By Marjorie Costello

In the last column, we discussed Sony's entry into the home PC arena. This month, in addition to reviewing loaded laptops, we will look at still cameras and portable storage.

When Sony eventually enters the notebook arena, the company will be competing with some familiar names from the video world, now filling the pipeline with dozens of new models. The list includes Toshiba, Sharp, Panasonic, Hitachi, Samsung and NEC — among others. Toshiba, the notebook leader, is facing feature and price competition from Compaq, which just launched its new Armada notebook line. Compaq, the desktop leader, is battling it out with Toshiba, now that Toshiba has entered the home desktop PC market.

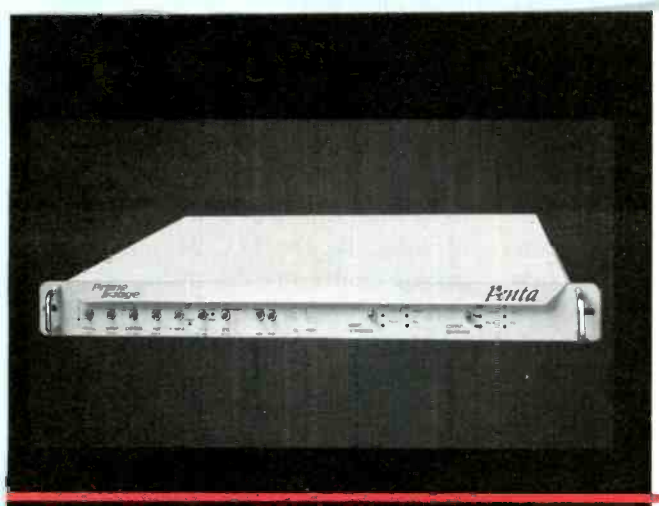
For professionals using notebooks for road work and presentations, the good news is the gap between desktop and portables is nearly closed. Although portables usually cost more than desktop models, notebooks with crisp color displays, 100MHz+ microprocessors, 8MB+ of RAM, 1GB+ hard drives and longer-lasting batteries are available for less than $3,000 list prices. Another important trend is the availability of CD-ROM drives — either integrated or as modular add-ons — for multimedia playback, along with zoom video, for full-motion video playback.

For those who want the ultimate in display quality, Sharp now offers a notebook with 16:9 display. Slated for introduction in October, the model's widescreen 16:9 aspect ratio LCD will make it possible — among other benefits — to view two web pages simultaneously. With its SVGA resolution, the WideNote line, starting at $3,000, could gain a huge following among professionals involved in portable presentations and mobile desktop video.

Digital still cameras focus on more for less

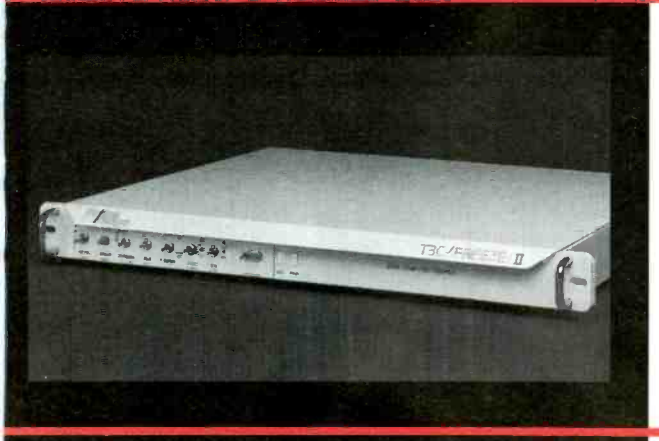
The digital still camera has become one of the hottest computer content creation tools for adding images to online text and CD-ROM projects. The product's rebirth as an electronic publishing tool is ironic, since still cameras were originally introduced as a quick, cost-effective replacement for chemical-based "hard-copy" photography.

The other significant trend is that still camera prices are coming down, with Kodak now offering the DC20 at less than $350 for the consumer market. The model can be connected by a serial cable to a computer for downloading images, making it possible for anyone to illustrate a web site or send pictures along with E-mail. Before Kodak's DC20, most other consumer digital still cameras — such as models from Casio and Epson — carried suggested

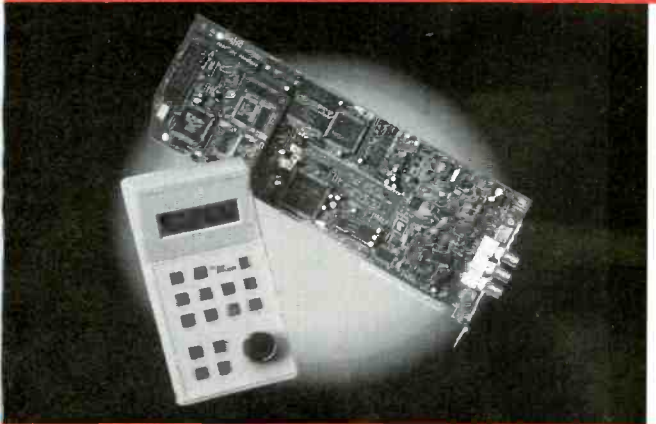


Penta

A/V Delay



Model 50II



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list prices of $499.

The new 4.2-ounce Kodak digital camera, which fits in a shirt pocket, can store eight to 16 color pictures, depending on the image resolution. It operates like a simple pocket camera with three buttons: a power button to turn the camera on and off; a shutter button to take pictures; and another button to erase all the pictures.

Although professional digital still cameras deliver resolution and features far surpassing Kodak's DC20, these high-end models — often priced at $10,000 and up — have been beyond the budgets of many production operations and consumers with high-quality standards. Sony's new DKC-ID1, sold by the company's Business and Professional Products Group, represents the breakthrough in price and performance many have been awaiting.

The DKC-ID1 is a professionally featured digital still camera with a near-consumer price, including functions associated with 35mm cameras. At $1,795, the model delivers full-color, high-resolution 768x576 images, complete with a built-in color LCD viewfinder that lets users review stored images. From a recent demo, the model displayed image quality usually only found in more expensive electronic still cameras.

Weighing 26 ounces, the DKC-ID1 is designed to be hand-held and can store up to 140 images on a 10MB PCMCIA card through standard JPEG compression. Images can be downloaded directly from the Sony unit to a PC through a SCSI port, delivering a faster transfer rate than serial port connections. An optional PCMCIA card reader — that also connects to the PC's port — provides another way to download images.

Other DKC-ID1 features include a 12X zoom lens with macro, a 450K-pixel progressive scan CCD for speeds from $^1/_{15}$ to $^1/_{1,400}$ of a second and a built-in flash guide. The DKC-ID1 offers two storage modes: fine, for storing 40 images on a 10MB PCMCIA; and normal, which permits 140 to be stored.

Although this model doesn't incorporate FireWire, Sony says it's considering support for the digital transfer protocol in the future. Also expected in the future from Sony is at least one model aimed at the consumer market.

> For professionals using notebooks for road work and presentations, the good news is the gap between desktop and portables is nearly closed.

The battle to succeed the floppy heats up

Another computer product taking the industry — and Wall Street — by storm is Iomega's Zip drive. The Zip provides a solution to the portable storage problem posed in today's new media world of mega-megabyte Windows 95 and Internet files: How do you store and transport giant files on mere 1.44MB floppies?

Although hundreds of computer models have come and gone since Sony introduced the 3.5-inch diskette in the

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Circle (48) on Action Card

early 1980s, up until the Zip, the conventional floppy ruled as the primary portable storage media for PCs.

First introduced as a stand-alone peripheral in 1995 — that could be easily connected to a PC or Mac — the Zip drive stores 100MB of data on a new type of floppy. Slightly thicker and larger than a 1.44MB unit, the 3.5-inch Zip's magnetic media was developed with Fuji. With millions of Zip drives and disks grabbed up at retail and the company holding rights to the drives and the blank media, it's no wonder Iomega's stock has soared during the past year. A major reason for Zip's popularity is its price: the drive costs $199 ($150 through a current rebate), with the 100MB floppies often selling at a $15 street price.

The appeal and practicality of the Zip Drive — also handy for backing up on systems without tape drives — has led Hewlett-Packard, Packard Bell, IBM, NEC, Acer, Unisys and Micron to incorporate the drive in some desktop models. Sony, while not offering the drive in its new home PC line, has indicated plans to add some Zip (drives) in the future, with the company currently joining Iomega, Fuji and TDK in marketing blank Zip disks.

At PC Expo, Iomega announced an internal version of the Zip for laptops. Designed to slip into the modular bay available on many notebooks, the low-profile Zip will be available at the beginning of 1997.

However, Iomega is facing competition from another company, once a mainstay in the pro video business, with its own challenge to replace the floppy. Although many of us miss the name "3M" in our own industry, the company will be making a comeback — but not in audio- or videotape or even under the 3M name. In July, 3M's data media division was officially spun off as Imation, a publicly traded company, marketing its own entry to replace the floppy, the LS-120.

Developed by 3M with Matsushita-Kotobuki and Compaq, the LS-120 taps magnetic and optical technology to deliver a compelling advantage over the Zip drive: it is backward compatible with conventional floppies. LS-120 drives can write and read not only its 3.5-inch floppies, but also conventional 1.44 MB and 720KB diskettes.

Compaq — the only PC brand at this point supporting the new drive — is incorporating the LS-120 as a replacement for the conventional floppy drive on its business-oriented Deskpro PCs. Another difference between the Zip and the LS-120 — as its sometimes difficult-to-remember-name suggests — is that the LS-120 stores 120MB of data, with its blanks selling for about the same as Zip disks. Maxell recently announced it would also market LS-120 disks, with the primary supplier 3M (a.k.a. Imation).

On the other hand, the Zip's main advantage, besides arriving first, is its price, a situation likely to continue. Because of its dual-format, read-and-write feature, the LS-120 will probably always cost more to manufacture. Zip drive kits can be added to PCs for $99, with the LS-120 drives running at about double the price. External LS-120 drives, when they arrive later this year, will probably cost nearly $300, at a time when the Zip's price could be cut to below $150.

This price difference for the external drives could prove to be decisive at retail, which is selling to the huge installed base of computer owners who already own a PC with a 1.44MB drive. Another factor going in the until-recently-unknown Iomega's favor is the growing list of big name companies — including Apple and Bandai (for its upcoming Pippin) — incorporating built-in Zip drives.

LS-120's backers are promising more announcements from computer brands planning to offer the drive in new models. And there is also a low-profile version for laptops slated for introduction. Still yet to be introduced is an LS-120 version for the Mac.

Regardless of which of the successors to the floppy actually becomes the new defacto standard, until low-cost optical storage becomes a reality, the Zip and the LS-120 are here, priced for professional and consumer budgets. And they are ready to store and transport all those desktop videos, digital audio projects, PowerPoint presentations, web pages and other mega-megabyte files common in the world of new media.

Trade shows converge in '97

As technologies converge, so do trade shows. In some cases, to everyone's delight, they are meeting at the same place and time. However, in two cases, unfortunately, popular shows will be convening at the same time in different cities.

Next year, for the first time, spring CES and spring COMDEX will colocate in Atlanta from June 2-5, adding a new show called Interactive Content World, focusing on products at the convergence. Two other shows also planned for the same venue are Windows World, which has been part of spring COMDEX for many years, and Expo Comm, focusing on telecommunications. The combination plans to move to Chicago in 1998 for a 10-year run.

For professional video hardware companies that have started exhibiting at COMDEX, the bad news is that Infocomm is also scheduled next year from June 3-7, but in Los Angeles. And for anyone who is interested in the latest in computers and electronic entertainment products, next year's PC Expo in New York will run June 17-19, overlapping with the Electronic Entertainment Expo, slated for Atlanta from June 19-21.

We have to say it: That's show business. ■

Marjorie Costello is a broadcast and video industry consultant and Broadcast Engineering *contributing editor based in New York. Respond via E-mail: MACostello@aol.com.*

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SURPRISE!

By Don Markley

Tower lighting and marking

One of the more ignored areas of broadcast engineering is that of the lighting and marking of towers. Usually, the station's consulting engineer will deal with the FAA in determining the manner in which the tower will be lighted and painted. The station staff then simply tries to maintain the prescribed system. However, new construction and new regulations can throw the staff into the fray.

The basics of marking and lighting

A tower can be lighted in three basic ways:

1. Red lights with paint;
2. White lights (strobes); and
3. A mixture of the two (dual lighting).

Unfortunately, some engineers have taken the position of strobes-only without regard to anything else. Their rationale is that strobes are cheaper in the long run because they avoid the problem of having to periodically consider repainting the tower. This position, if always applied, is much like the old position of industry where all unwanted liquids were simply dumped into the nearest river or sewer. Strobe lights are not environmentally friendly, especially in residential areas.

Many zoning codes have become restrictive with regard to strobes. Although there seems to be no significant problem during daylight hours, many people find the white flashers objectionable at night. As a result, the FAA and the FCC have become reluctant to specify only strobes in order to avoid public comment (which can be read as nasty letters from members of Congress.) The FCC may require justification concerning the use of strobes, especially if the structure is in a build-up area.

Filing forms

The station can get trapped in the middle of a nasty power fight, depending on the state. Some states pay no attention at all to towers, allowing the FAA to guard the navigable airspace within its boundaries. That works because the FAA has a good professional staff that makes sure that any new structure doesn't create a hazard. Other states do their own studies and may specify how a tower is to be marked or lighted. This is a problem because the state boards are often appointed and vary widely in the way in which they evaluate towers. The decisions are too often based on personal opinions and preferences that have little relationship to the FAA rules.

The scenario goes like this. First, FAA Form 7460-1 must be filed with the FAA. It identifies the structure, its location and the proposed use. The FAA will then perform a study to see if the proposed structure complies with its rules. If the tower exceeds any of the standards, which is always the case with towers more than 500 feet AGL, an additional study will be performed that includes calling for comments from interested parties in the area of the tower. If all goes well, a "No Hazard" determination will be issued and the FCC will be notified. As part of that notification, the FAA will "recommend" how the tower is to be marked and lighted. This is important — the FAA does not issue the directions on lighting, but only recommends a preferred method to the FCC, which usually concurs with the FAA.

The FCC, when it grants a permit for construction, which includes a tower, will specify how the tower is to be lighted and marked. As an FCC licensee, the FCC is the final decision maker in this matter, which is where the power play problem originates. The state agencies sometimes feel that they are the final authority, and the regulations in individual states may try to support that position. So who does the individual station listen to? The usual approach is to go back to the FCC with the state decision and request that the construction permit be modified. As long as that request is properly supported and the environmental concerns are addressed, a modified CP is usually granted. If that doesn't work, get the lawyers involved and appeals are in order.

Clearing with the FCC

The important point is that the station cannot simply comply with the state directive without clearing everything with the FCC. The commission expects the lighting and marking to comply with the CP and license. Otherwise, nasty fines will follow along with rather pointed comments from the station management.

Next, everyone is or should be familiar with the need to monitor the tower lights and to notify the FAA of any irregularities. In the past, the commission has required everyone on a tower to be responsible for maintaining the lights. They have finally changed that policy to one that makes much more sense. If a tower exceeds standards for FAA notification, it now must be registered with the FCC . If there is any question about whether a tower must be registered, the criteria is available on the Internet at www.fcc.gov/wtb/antstruc.html.

If a tower must be registered, it can be done on FCC Form 854, which can be obtained from the Internet address, from the forms distribution center at 800-418-FORM, the FCC Office of Operations at 800-322-1117 or from Fax-On-Demand at 202-418-0177. To get the form in that manner, use the handset on your fax machine and request the index to find the document number for Form 854.

Something to remember — the coordinates of each tower, along with the height above ground and mean sea level, should not simply be copied from the license. Part of the purpose of the tower registration is to clean the errors out of the FCC database. The height values should be determined to the nearest foot and the coordinates to the nearest tenth of a second. To do this, you will need the services of a registered land surveyor. Contrary to popular folk theory, a GPS receiver does not meet that accuracy, even with a differential receiver attached. Surveyors do have sophisticated GPS systems that will give you submeter accuracy, but they are extremely expensive ($20,000+) and are complex to use.

Tower owner responsibilities

Once each tower is registered, other users of that tower are not primarily responsible for maintaining the lighting. That duty lies with the tower owner. Just to be safe, it still would be advisable to monitor the lighting. Notify the FAA of any problems and notify the owner at the same time. Remember, if a plane hits your antenna on a tower, you can expect to see lawyers all over the place without regard to who owns the tower. If you see a light out, cover your appendages (or something like that).

A major problem that may arise occurs when a change is made in the tower — for example, if an increase is made in the height by adding a pylon for an FM antenna. It is not enough simply to add on the new section and move the light to the top. The tower regulations state that the paint, if used, is to be in seven equal-width bands with the top and bottom band being aviation orange. Therefore, if the height is changed, the tower must be repainted to even up the bands. For minor changes, it is possible to have the strict requirements of this rule waived by contacting the appropriate FAA office.

A related problem concerns old intermediate beacons. The FAA rules have been changed and a single beacon at the intermediate levels is no longer satisfactory. Older lighting systems are grandfathered until a change is made. Then, the lights have to be modified to bring them into compliance with the new rules. On old towers, the condition of the lighting conduits and wiring, as well as the fixtures, may make a new lighting system necessary. That is the time to consider the various systems for initial costs and upkeep. If you decide to change the lighting, remember that you have to go back to the FCC for approval and modification of any construction permits before making any changes. ■

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

sbe update

By John F. Schneider, CBRE

Maintaining a vibrant local chapter

Congratulations. You've won the election. You are now the chairperson or an officer of your chapter. How do you structure your chapter to ensure that it will become a thriving organization that will offer meetings and programs that people will want to attend? Here are some ideas from the national office:

1. **Don't try to do it all yourself.** You'll burn out and the job will be so monumental that no one will want to take over the reins when your term expires. The most successful chapters divide the duties into as many small functions as possible. In this way, the responsibilities are not so daunting. Also, when someone must resign from a position, the impact to the organization is not as great. It also allows more members to be actively involved, creating a larger pool of workers to draw from when a key position becomes vacant.

A delegation of Russian broadcast engineers addresses Seattle SBE Chapter 16.

2. **Rotate people through the positions, culminating in the chairman's post.** Your chapter will keep its best workers longer. By the time they reach chairman, they will know all aspects of the operation. This will help prevent the chapter from making the same mistakes due to excessive turnover.
3. **Hold monthly board meetings outside your regular chapter meetings.** Don't bore the rank and file with the minute details of operating your chapter.
4. **Schedule a regular meeting time and place each month.**
5. **Offer informative, interesting programs.** This is one of the toughest jobs. Assign the job to at least two people, preferably one radio and one TV person. Give them the responsibility of scheduling alternate months so they don't feel the pressure of having to start looking for another program as soon as the last one is completed. Keep a good balance of topics. ■

John Schneider is president of RF Specialties of Washington, Inc. He is an SBE board member and the past chair of Chapter 16 in Seattle.

Program topic ideas

The easiest way to find a program is to invite the local equipment salesman to pitch his or her latest product. One of the SBE's foremost goals is to provide continuing education for its membership. The most successful chapter programs present technology, as well as products, so listeners will come away with new knowledge that they can apply in their profession.

If you want to go beyond the basic sales pitch, following are some idea starters that might be helpful in locating your next program.

- Select an important technology and ask someone who is an expert on the subject to give a mini-course. This could include long-established fields, such as antenna theory and wiring techniques, or could delve into the emerging fields, such as digital audio broadcasting and high-definition television. Don't limit yourself to broadcast technologies — there are many parallel communications disciplines that people have a curiosity about, such as cellular and satellite communications. Don't limit yourself to looking for a professional from the industry in question. You will probably find expertise on a number of topics within your own membership.
- The broadcast industry is a highly regulated industry on the local and state, as well as national level. Select an area of regulation and ask a regulator to explain it. This can go beyond the FCC, delving into UL approval, ANSI standards, PCBs and your state's new EAS plan.
- No one knows all that they need to know about computers. These increasingly complex devices are finding their way into every aspect of broadcasting and it usually falls upon the engineer to keep them running. Why not present a class on PC troubleshooting or on computer network basics? Demonstrate software applications that can make an engineer's life easier or demonstrate useful web sites.
- Tours are always a popular attraction. Instead of going to the same old restaurant or TV studio, visit an interesting local site where your members can see technology in action. These include local broadcast facilities or tower sites; manufacturing facilities; local centers of the public infrastructure, such as telephone or power switching centers; a satellite uplink facility or a CATV distribution center.
- Have one of your members describe a particularly challenging or interesting remote broadcast.
- Ask a member to describe his or her visits to the broadcast facilities of another country. Or, invite visiting broadcasters from another country to describe how things are done in their country.
- Have the project engineer describe the construction of a major new local broadcast facility.
- Arrange for a panel discussion of a general-interest topic using either your own chapter members or outside professionals. One example would be a panel of advisors for independent contract engineers, including an attorney, a CPA and an insurance agent.
- Provide training for your members in emergency preparedness. Give a class in CPR or emergency first aid, with emphasis on steps to follow in the event of electrocution. Or, review fire prevention for broadcast facilities.
- Discuss local broadcast station history. Invite an "old-timer" in your chapter to describe broadcast engineering as "it used to be." Or tell the history of your chapter and recognize its founding members.

Hopefully, these few ideas will start you thinking about others. A complete list of suggested topics is available for downloading from the SBE's web site at **www.sbe.org** or on the SBE's computer bulletin board at (317) 253-7555. ■

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Circle (40) on Action Card

By Todd S. Roth

Fibre channel video servers in the modern broadcast facility

It is no surprise that broadcasters and cable operators worldwide are using computer-based technologies to increase productivity and reduce operating costs. Stations have embraced computer-based systems for most of their operational, administrative and accounting tasks; but it's only been in the last few years that computer-based video-handling systems, i.e., digital disk recorders and video servers, have become prevalent in broadcast facilities.

Fibre Channel solution

Up until now, the major missing piece of hardware has been the networking and storage interface capable of supporting the high bandwidth needed for virtualization across the entire broadcast facility. A new serial interface called Fibre Channel (FC) goes a long way toward alleviating the bandwidth dilemma. FC supports the high bandwidth storage required by broadcast video servers. In fact, FC is the fastest interface available, supporting a net bandwidth of 800Mb/s (Mb/s = 1,000,000 bits per second, or 125,000 bytes per second.)

ASC's VR Virtual Recorder System.

FC offers differing topologies: 1) *point-to-point*, a basic topology in which a link is dedicated to transferring video data between two devices; 2) *arbitrated loop (AL)*, which allows up to 126 devices to be connected to a single FC loop; and 3) *fabrics*, a switching interconnection, similar to a telephone switching scheme.

Fiber channel arbitrated loop

Many disk drive and adapter vendors will support arbitrated loop topology. For broadcasters and cable operators, the typical FC-AL implementation connects RAID storage systems to broadcast video servers. (See Figure 1.)

FC is a hierarchical, multilayered interface. These layers are called services and range from FC-0, the physical interconnection, which can be copper or optical, to FC-4, the upper-level protocol layer where different software command sets can be mapped. The lowest (FC-0) and uppermost layers (FC-4) are the most intriguing when considered as part of a server-based broadcast.

FC-0 allows for a combination of optical and copper interconnections within a facility. This allows the use of low-cost copper connections for distances of up to 25M. The cabling is simply two video coax pairs using a combination of BNC and TNC connectors. This interconnection method supports the full bandwidth of FC and is ideal for short distance requirements.

FC-4 standards allow network and channel (typically storage) protocols to coexist and be concurrently transmitted over the same physical interface.

This high degree of compatibility with new and existing standards gives FC the framework and infrastructure to allow for high levels of integration among varying equipment provided by different vendors.

Video servers: An FC-AL application

ASC has adopted the arbitrated loop topology for use with its VR line of video servers. FC-AL can deliver multiple streams of broadcast-resolution video, in real time and without interruption, for instant random access to thousands of commercials, bumpers and news stories.

The typical VR system using FC-AL consists of two main components: 1) one or more VR video servers and 2) a central bank of shared RAID storage. This configuration allows all users in the facility to have simultaneous access to any piece of video data.

The VR advanced video server

VR video servers support single- and multichannel operations. RAID storage can be configured to meet the individual needs of the customer. The VR video server is the basic building block of a VR system and features PCI bus motherboards with Intel Pentium Pro processors and run under the Windows NT operating system. VR supports dual compression/decompression channels and can be integrated together in a shared storage environment.

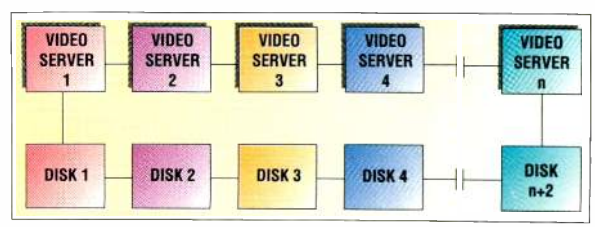

Figure 1. Fibre Channel Arbitrated Loop Implementation multilayered interface.

Standard hardware includes analog component, composite and Y/C inputs/outputs. CCIR-601 serial digital component inputs/outputs with embedded audio are optional. VR video servers support RS-422 (Sony, Odetics, Louth and Pioneer protocols) and TCP/IP system control. ASC's Brilliant Image Compression supports 1.6:1 (mathematically lossless) to 20:1 Motion JPEG.

Features include:

- Full CCIR resolution (including the vertical interval);
- Split audio and video, supporting "scattered" record (with no fragmentation issues);
- 0 - 109 IRE video response;
- 10-bit internal video resolution;
- NTSC/PAL compatible;
- Half-line shifter for smooth and stable slow-motion/variable speed playback;
- Four main and two monitor audio channels per video channel (balanced, +4dBu); and
- VITC/LTC reader/generator with character generator output per video channel.

RAID fault-tolerance technology

The number of VR channels that can share common storage is equal to the storage bandwidth (less overhead) divided by the video data rate (determined by user-selected compression ratio) of a channel.

VR systems are configured with an FC-AL storage system. By taking advantage of Fibre Channel's 800Mb/s (approximately 680Mb/s after overhead) bandwidth and ASC's patent-pending Offset Data-Striping technology, VR systems can support up to 12 channels (at 3:1 compression). FC increases VR's storage capacity to 126 devices, allowing more than 40 hours of video to be shared among 12 channels using current disk-drive density (at 3:1 compression). Due to the nature of this architecture and the capabilities of the Pentium Pro processor, RAID can be supported without any additional hardware controllers.

Virtual Access Architecture

Virtual Access Architecture is ASC's patent-pending storage technology that allows multiple VR disk recorders to share RAID storage, making the entire media bank accessible to every video channel simultaneously. This technology eliminates the need for local buffers or data transfers from one set of storage to another.

ASC's Recorder System, a VR disk-based broadcast system.

VR storage features include:

- Fibre Channel storage platform;
- ASC's Virtual Access Architecture for true multichannel access to common or "shared" storage;
- Multiple redundancy strategies including RAID fault-tolerance technology;
- Up to 40 hours of on-line capacity (at 3:1 compression);
- Support for removable media; and
- Support for digital tape backup systems including robotics libraries.

The future of Fibre Channel

ASC is one of the first vendors to offer FC-AL storage for use with broadcast video servers. However, as the advantages of Fibre Channel and arbitrated loop topology become better known in the broadcasting and cable fields, others will rush to incorporate FC-based storage. One thing remains clear: The future of Fibre Channel for use with video servers and broadcasting applications looks bright, well into the next millennium. ■

Todd Roth is vice president, research & development, ASC Audio Video Corporation, Burbank, CA .

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Circle (64) on Action Card

industry briefs

Business

Sony, Park Ridge, NJ, announced the sale of 29 Betacam SX DNW-A50 hybrid recorders to CNN's Sports Illustrated channel (CNNsi).

Also announced was a $1 million purchase of Betacam SX equipment by WCYB-TV, Bristol, VA, for the station's all-digital newsroom.

The Genie 3D digital video effects technology from Pinnacle Systems, Sunnyvale, CA, was chosen by JVC Victor Company of Japan for incorporation in its nonlinear editor systems, currently under development.

Philips BTS, Simi Valley, CA, announced the sale of its Quadra CCD Telecine to the Atlanta film laboratory CineFilm.

Tektronix, Inc., Beaverton, OR, and Matsushita Electric Industrial Company, Secaucus, NJ, announced they are cooperating on a 4x faster real-time DVCPRO interface to the Tektronix Profile Professional Disc Recorder.

Panasonic Broadcast Europe, London, announced the development of two proposed industry interface standards for distribution of compressed signals.

The first, DVC Serial (DVCS), allows distribution of compressed signals of up to 200 meters at 36Mb/s. The other, Compressed Serial Digital Data Interface (CSDI), allows distribution of DVCPRO compressed data in an existing 270Mb/s serial digital infrastructure.

JVC, Elmwood Park, NJ, announced that its Digital-S has been chosen as the house videotape format of FOX Sportsnet, a joint venture between FOX Sports and TCI/Prime Sports.

Industrial Acoustics Company, New York, has installed an Accu-Tone video studio suite at the National Gallery in London. ■

Farewell to a Friend

On Sept. 5, 1996, Jason Perlman died. If you are an advertiser in this magazine, you probably knew Jason. If you are a reader, you probably did not. Either way, Jason's contributions to *Broadcast Engineering* over the many years he was associated with the magazine were far reaching. He made a positive difference in what you read and see each month. He worked tirelessly to improve the magazine for readers and advertisers. He was a hard worker and a good friend.

Jason served for the past 12 years as the marketing representative for *Broadcast Engineering* in the Western states. In that capacity, he worked with advertisers to showcase their products, technologies and ideas. He was far more than simply a salesman. He understood that selling a product or service is the art of communication and cooperation. He knew that the best way to sell a product is to improve and refine that product. In the end, everyone wins: the publisher, the advertiser and — certainly — the reader.

Jason, although an easygoing and outgoing individual, was also quite private. He was dedicated to the publishing business and to his job, but not obsessed or consumed by it. Jason was convinced of the need for a clear differentiation between business and personal lives. You could have an honest disagreement with Jason over some business decision and, after 5 p.m., be discussing vintage automobiles.

Jason's ability to forge compromises to complex situations earned him the respect of his fellow workers at Intertec. No business runs perfectly. No business is without its share of conflict. Jason was a master at finding a middle ground that all parties could accept.

As a marketing representative for *Broadcast Engineering*, Jason provided an important bridge between management and customers — both advertisers and readers. Being on the front lines of the business, he offered valuable and welcomed input to the editorial department.

Business aside, Jason was a good friend. His association with Intertec goes back more than a decade. And though his death left us shocked and saddened, we are also left with a rich inventory of memories. Jason was a world-class storyteller, virtually without peer. He was always a pleasure to see and always upbeat. No one could liven up a business gathering better than Jason. When we think of Jason Perlman, it is most often with a smile or a laugh.

Time will surely dim our sense of loss, but it will not dim our appreciation for having known Jason Perlman.

Cam Bishop
Senior vice president
Intertec Publishing Corporation

Jason's family has requested that all personal notes and contributions in his memory be sent to the Juvenile Diabetes Foundation, 1030 S. Arroyo Parkway, Ste. 204, Pasadena, CA 91105.

The GALLERY

new products

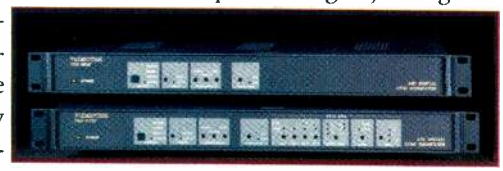
By Deanna Rood

Windows-based interface for iNFiNiT!
Chyron

• WiNFiNiT!: a graphical user interface that provides a Windows NT front-end for the iNFiNiT! family of character generators; Chyron offers a new keyboard, keyPC with WiNFiNiT! that incorporates a Pentium-based CPU and has direct connections for an SVGA color prompt monitor and SCSI-based peripherals.

Chyron, 516-845-2182; www.chyron.com
Circle (264) on Action Card

Serial digital sync generators
Videotek Inc.



•VSG-201D & VSG-202D: serial digital sync generators that provide the same basic features required in digital, analog or hybrid analog/digital facilities; the high stability temperature-controlled crystal oscillator makes either unit ideal for use as a master sync generator; by using either sync generator as a slave, the four blackburst outputs that follow the infinite timing range of the gen-lock, provide an easy and affordable way to deal with difficult system timing issues when interfacing digital equipment.

Videotek, 243 Shoemaker Rd., Pottstown, PA 19464; 800-800-5719 or 610-327-2292; fax 610-327-9295
Circle (267) on Action Card

Stills & graphics system
Quantel

• Combo: a unique still-store with built-in graphics facilities capable of handling every aspect of graphics production and transmission from creation to on-air presentation; Combo is designed for maximum productivity at minimum cost; a three-channel machine, it has a dedicated graphics channel and two transmission channels that allow simultaneous graphics production and transmission.

Quantel, 85 Old Kings Hwy. N, Darien, CT 06820; 203-656-3100; 203-656-3459; www.quantel.com; quantel@quantel.com
Circle (265) on Action Card

Range of modules for interfacing
Snell & Wilcox

• Kudos IQ modular range: a complete modular system developed to solve multiformat interface problems and facilitate the transition from analog to digital; all modules are designed to a uniform size and fit into a common 3RU or 1RU enclosure, using a common power supply and delivering high packing density; the system also allows any combination of analog, digital, video or audio modules to be fitted into the same enclosure.

Snell & Wilcox, 6 Old Lodge Place, St. Margaret's, Twickenham TW1 1RQ, UK, +44 (0) 181 607 9455; fax +44 (0) 181 607 9466
Circle (256) on Action Card

IOT
Thomson Tubes Electroniques

• TH 760: a high-gain IOT that delivers up to 60kW in vision-only amplification and 40kW in common amplification mode; it features a simple plug-in design so that its I/O circuits are easy to install; the input circuit has a tetrode-like cavity that eliminates spurious resonance; also, the tube-and-cavity roll-in rack unit is interchangeable with other models.

Thomson Tubes, +33 (1) 3070 3643; fax +33 (1) 3070 3650
Circle (266) on Action Card

A/D and D/A converter
Harris Broadcast Division

• A2D2A: an A/D and D/A converter that can perform A/D and D/A conversions simultaneously; while providing superior stereo imaging and clarity, the A2D2A's oversampling 20-bit delta sigma technology gives 100dB of A-weighted dynamic range in analog-to-digital and digital-to-analog signal paths; when connecting to digital gear, the A2D2A supports AES/EBU and S/PDIF formats.

Harris, 800-622-0022 or 317-735-1704
Circle (252) on Action Card

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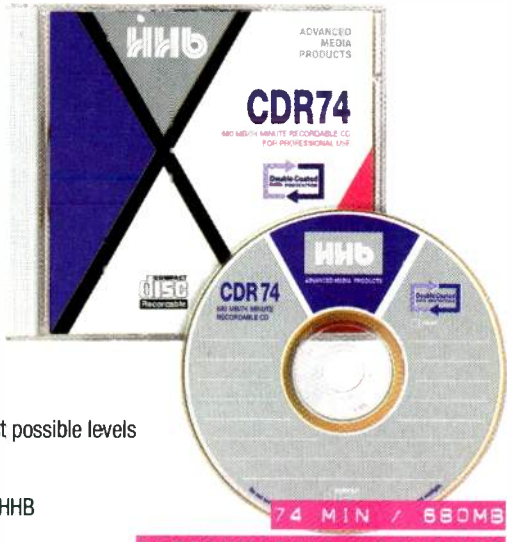

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HHB

Video server with Fibre Channel technology
ASC

• VR 300: a video server that features Fibre Channel Arbitrated Loop (FC-AL) as a storage option; when configured with an FC-AL storage system, the VR 300 takes advantage of Fibre Channel's 800Mb/s (720Mb/s after overhead) bandwidth and ASC's patent-pending Offset Data Striping technology to support up to 35 channels; VR's storage capacity is increased to 127 devices, allowing up to 120 hours to be shared among 35 channels.

ASC, 3816 Burbank Blvd., Burbank, CA 91505; 818-843-7004; fax 818-842-8945.
Circle (253) on Action Card

Pedestal
Vinten

• Quattro: a four-stage studio/OB pedestal with a low height of 41cm for lower camera angles and tight shots; the unique ergonomic and triangular structure of the column is designed to provide maximum rigidity, stability and robustness while minimizing torsional twist.

Vinten, Western Way, Bury St. Edmunds, Suffolk, UK, IP33 3TB; +44 (0) 1284 752 121; fax +44 (0) 1284 750 560
Circle (254) on Action Card

Computing systems
Silicon Graphics Inc.

• O_2: a family of desktop workstations designed for high-end video and graphics applications; the systems are based on a new architecture that uses 64-bit, 180MHz, R5000 and R10000 MIPS processors.

• Onyx: a range of systems that provide a scaleable architecture; each module consists of R10000 CPUs, graphics and I/O systems; multiple modules can be combined into a single computer system; the systems can handle simultaneous streams of uncompressed digital video as well as digital audio.

Silicon Graphics Inc., 2011 N Shoreline Blvd. MS 2L-455, Mountain View, CA 94039-7311; 415-390-5016; fax 415-960-2457
Circle (250) on Action Card

Embedding/extracting products for serial digital interface video applications
MetaWave

• MW21 is a digital audio extractor that extracts 20-bit AES/EBU digital audio signals within the SDI video path; the unit conforms with SMPTE 272M-A and features exceptionally high density design — up to 16 MW21 cards can be contained within a single 2RU rack-frame.

• MW25: an advanced digital audio embedder; the MW25 embeds 20b AES/EBU digital audio signals within the SDI video datastream; the complementary MW21 extractor reverses the process by separating the embedded audio signals from the SDI path.

• MW31: an analog audio extractor designed to simplify complex broadcasting applications by extracting 20-bit AES/EBU digital audio signals from within the SDI video path finally converting them into analog audio.

MetaWave Limited, 11 Kingsclere Park, Kingsclere, Hampshire RG20 4SW, UK; +44 1635 299 000; fax 01635 299 299
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QUICK DIAL 74

anton bauer

Logic Series DIGITAL Gold Mount Batteries

The Logic Series DIGITAL batteries are acknowledged to be the most advanced in the rechargeable battery industry. In addition to the comprehensive sensors integral to all Logic Series batteries, each DIGITAL battery has a built-in microprocessor that communicates directly with Anton/Bauer InterActive chargers, creating significant new benchmarks for reliability, performance, and life. They also complete the communications network between battery, charger and camera. With the network in place, DIGITAL batteries deliver the feature most requested by cameramen: a reliable and accurate indication of remaining battery power.

DIGITAL PRO PACS

The Digital Pro Pac is the ultimate professional video battery and is recommended for all applications. The premium heavy duty Digital Pro Pac cell is designed to deliver long life and high performance even under high current loads and adverse conditions. The size and weight of the Digital Pro Pac creates perfect shoulder balance with all cameras/camcorders.

- **DIGITAL PRO PAC 14 LOGIC SERIES NICAD BATTERY** 14.4v 60 Watt Hours. 5 1/8 lbs. Run time: 2 hours @ 27 watts, 3 hrs. @ 18 watts
- **DIGITAL PRO PAC 13 LOGIC SERIES NICAD BATTERY** 13.2v 55 Watt Hours. 4 3/4 lbs. Run time: 2 hours @ 25 watts, 3 hours @ 17 watts

GOLD MOUNT BATTERIES

Logic Series Gold Mount batteries are identical to the respective DIGITAL versions with respect to size, weight, capacity, IMPAC case construction, and application. They are similarly equipped with micro-code logic circuits and comprehensive ACS sensors. They do not include DIGITAL microprocessor features such as the integral diagnostic program "Fuel Computer", LCD/LED display and InterActive viewfinder fuel gauge circuit.

- **PRO PAC 14 NICAD BATTERY** (14.4v 60 Watt Hours)
- **PRO PAC 13 NICAD BATTERY** (13.2 v 55 Watt Hours)
- **TRIMPAC 14 NICAD BATTERY** (14.4v 40 Watt Hours)
- **TRIMPAC 13 NICAD BATTERY** (13.2 v 36 Watt Hours)
- **COMPAC 14 NICAD BATTERY** (14.4v 40 Watt Hours)
- **COMPAC 13 NICAD BATTERY** (13.2v 36 Watt Hours)

QUICK DIAL 72

sachtler

VIDEO 14/100 FLUID HEAD

- Sachtler Touch and Go System
- Integrated sliding battery plate
- Strengthened dynamic counterbalance in 2 steps
- Frictionless leak proof fluid damping with three levels of drag
- Vibrationless vertical and horizontal brakes
- Built in bubble for horizontal leveling

HOT POD TRIPOD SERIES

Especially developed for use in ENG, the Hot Pod tripod is the fastest in the world. The central locking system is activated on all three legs at the same time, while the pneumatic center column easily makes it possible to have the lens at a height of over 7 feet. The elevation force of the center column is factory set and doesn't require any setup. When moving to another location it can be carried by its handle located at the center of gravity.

ENG TWO-STAGE TRIPOD SERIES

Sachtler two-stage tripods have an enlarged height range (lower bottom and higher top position) so they are more universal. Legs can be locked in seconds with Sachtler's quick clamping. There are also heavy duty versions for extra stability. The heavy duty aluminum has a 20mm diameter tube vs. 16mm and the heavy duty carbon fiber has a 24mm diameter tube vs. 22mm. All heavy duty two-stage tripods have a folding tripod handle.

NEW ! Sachtler CADDY Systems

Now Sachtler quality is available to low budget users. The price of a CADDY system includes the new 7-step dampened CADDY fluid head, ultra-light but rugged carbon fiber tripod, lightweight spreader and either a soft bag or cover.The CADDY fluid head features an adjustable pan arm, 7 step adjustment for quick counter balance and the self-locking Sachtler Touch and Go System.

CAD 01
Single-Stage ENG Carbon Fiber System:
- CADDY Fluid Head
- ENG Single-Stage Carbon Fiber Tripod
- SP 100 Lightweight Spreader
- Transport Cover 100

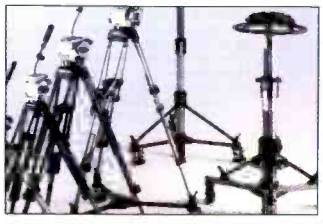
CAD 2A
2-Stage ENG Carbon Fiber System:
- CADDY Fluid Head
- ENG 2-Stage Carbon Fiber Tripod
- SP 100 Lightweight Spreader
- Soft padded ENG Bag

Vinten

Vision SD 12 and SD 22
Pan and Tilt Heads with Serial Drag

The Vision SD 12 and SD 22 are the first heads with the "Serial Drag" pan and tilt system. The system consists of a unique, permanently-sealed fluid drag and an advanced lubricated friction drag. Now you can achieve the smoothest pans and tilts regardless of speed, drag setting and ambient temperature.

- Patented spring-assisted counter-balance system permits perfect "hands-off" camera balance over full 180° of tilt.
- Instant drag system breakaway and recovery overcome inertia and friction for excellent "whip pans".
- Consistent drag levels in both pan and tilt axis.
- Flick on, flick off pan and tilt caliper disc brakes.
- Greater control, precision, flexibility and "touch"
- Touch activated, time delayed illuminated level bubble.
- Working conditions from as low as -40° up to +60°C.
- SD 12 weighs 6.6 lbs and supports up to 35 lbs.
- SD 22 weighs 12.7 lbs and supports up to 55 lbs.



Vision 12 Systems

All Vision 12 systems include #3643 SD 12 dual fluid and lubricated friction drag pan/tilt head, single telescoping pan bar and clamp with 100mm ball base.

SD-12A System
- 3364-3 SD-12 Pan and tilt head
- 3518-3 Single stage ENG tripod with 100mm bowl
- 3363-3 Lightweight calibrated floor spreader

SD-12D System
- 3364-3 SD-12 Pan and tilt head
- 3513-3 Two-stage ENG tripod with 100mm bowl
- 3314-3 Heavy-duty calibrated floor spreader

Vision Two Stage ENG and LT Carbon Fibre ENG Tripods

The ultimate in lightweight and innovative tripods, they are available with durable tubular alloy (Model #3513) or the stronger and lighter, axially and spirally wound carbon fiber construction (Model #3523). They incorporate torque safe clamps to provide fast, safe and self-adjusting leg clamps.

- "Torque Safe" requires no adjustment. Its unique design adjusts itself when required, eliminating manual adjustment and maintenance and making for a much more reliable clamping system.
- New hip joint eliminates play and adds rigidity.
- They both feature 100mm levelling bowl, fold down to a compact 28", and support 45 lbs.
- #3513 weighs 6.5 lbs - #3523 CF (Carbon Fibre) weighs 5.2 lbs.

Vision 22 Systems

All Vision 22 systems include #3386-3 SD-22 dual fluid and lubricated friction drag pan and tilt head, single telescoping pan and clamp with dual 100mm/150mm ball base.

SD-22E System
- 3386-3 SD-22 Pan and tilt head
- 3219-52 Second telescoping pan bar and clamp
- 3516-3 Two-stage EFP tripod with 150mm bowl.
- 3314-3 Heavy-duty calibrated floor spreader

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Pro Video Equipment & Accessories	74	Pro Audio Equipment	8
Non-Linear Editing & Computer-based Video	731	**Used** Video Equipment	75

QUICK DIAL 74

JVC

GY-X2B
3-CCD S-VHS Camcorder

- Newly designed three 1/2" CCD image sensors deliver 750 lines of horizontal resolution & superb signal-to-noise ratio of 62dB
- New micro-lens technology provides exceptional sensitivity of F8.0 at 2000 lux and LOLUX mode lets you shoot with almost no light! Shoot superb footage with excellent color balance at a mere 1.5 lux
- Variable Scan allows flicker-free shooting of a computer screen
- Quick Record Mode - when turned on the camera is set to the auto iris even if lens is set at manual. Also activated is (ALC) Automatic Level Control and EEI Extended Electronic Iris which provides both variable gain and variable shutter. Now you can shoot continuously from dark room to bright outdoors without having to adjust gain, iris or ND filter.
- Full Time Auto White circuit lets you move from incandescent to fluorescent to outdoor lighting without changing white balance or the filter wheel. •Dual output system allows camera output to be connected directly to an external recorder

Panasonic

Broadcast & Television Systems

AG-DP800H SUPERCAM

S-VHS 3-CCD Digital Signal Processing Camcorder

- Three high-density 380,000 pixel CCDs with half-pitch pixel offset achieves over 750 lines of horizontal resolution, a S/N ratio of 60dB and remarkable sensitivity of f8 at 2000 lux. Additionally the Frame Interline Transfer (FIT) CCDs minimize vertical smear, so you maintain impressive picture quality even in very bright illumination.
- Some of the DSP circuits and their functions:
  - CHROMA DETAIL - This function compensates for poor resolution in the high chroma areas of the picture.
  - DARK DETAIL - Determines optimum degree of contour enhancement in dark areas to deliver crisp, natural-looking images
  - HIGHLIGHT COMPRESSION - Expands the dynamic range of the highlighted areas and prevents halation. The highlight compression circuit allows a wide dynamic range producing detailed images even against bright backlight or daylight.
  - FLARE CORRECTION CIRCUIT - Compensates for unsteady black caused by light or by a subject's movements.
- Six Scene File modes. There are two user modes for custom digital parameter settings including Horizontal Detail, Vertical Detail, Chroma and Dark Detail, and Color Correction. The four preset modes are normal, fluorescent, special and sparkling.
- In addition to regular AGC (Automatic Gain Control), Supercam has a Super High Gain mode. At F1.4 this enables shooting under illumination as low as 2 lux while retaining detail and color balance.
- Synchro Scan function allows flicker-free shooting of computer monitors. Electronic shutter increments can be set variably from 1/61 seconds to 1/253 of a second.
- Built-in internal time code generator lets you record with SMPTE LTC/VITC (Longitudinal/Vertical Interval) time code
- Two hi-fi stereo audio channels with a dynamic range of 80 dB, as well as two linear audio channels with Dolby NR. Normal/Hi-Fi recording is selectable. Uses XLR connectors to further ensure high-quality sound.
- Has a 26-pin connector on the back that outputs a composite or component video signal. This enables convenient backup recordings using an additional VCR equipped with a 26 or 14-pin connector
- Phantom power can be supplied to an optional microphone. Power can be switched off to prevent battery drain when not in use.

SONY COLOR MONITORS

PVM-1350 13" Presentation Monitor

- Employs a P-22 phosphor fine pitch CRT to deliver stunning horizontal resolution of 450 horizontal lines.
- Beam current feedback circuit eliminates white balance drift for long term stability of color balance.
- Has analog RGB, S-video and two composite video (BNC) inputs as well as 4 audio inputs.
- Automatic Chroma/Phase setup mode facilitates the complex, delicate procedure of monitor adjustment. Using broadcast standard color bars as a reference, this function automatically calibrates chroma and phase.
- Chroma/Phase adjustments can also be easily performed with the monochrome Blue Only display.
- Factory set to broadcast standard 6500K color temperature
- On power up, auto degaussing is performed. There is also a manual degauss to demagnetize the screen.
- Sub control mode allows fine adjustments to be made on the knob control for contrast, brightness, chroma and phase.

PVM-1351Q 13" Production Monitor

Has all the features of the PVM-1350 *PLUS* -

- A multisystem monitor, it accepts NTSC, PAL and NTSC video signals. NTSC 4.43 can also be reproduced.
- Equipped with a SMPTE 259M Serial Digital Interface. With optional serial digital interface kit BKM-101C for video and the BKM-102 for audio the PVM-1351Q can accept SMPTE 259M component serial digital signals.
- Equipped with RS-422 serial interface. With optional BKM-103 serial remote control kit, all of the monitor's functions can be remotely controlled.
- Inputs include analog RGB, S-video, component, 2 composite video (BNC) and 4 audio for complete flexibility.
- Aspect ratio is switchable between 4:3 and 16:9 simply by pressing a button.
- Underscan and H/V delay functions.
- Color temperature switchable between 6500K/9300K/User preset. 6500K is factory preset. 9300K is for a more pleasing picture. User preset is 3200K to 10,000K.

PVM-1354Q/PVM-1954Q 13" and 19" Production Monitors

All the features of the PVM-1351Q *PLUS*:

- SMPTE C standard phosphor CRT is incorporated in the PVM-1354Q/1954Q. SMPTE C phosphors permit the most critical evaluation of any color subject. Provides over 600 lines of horizontal resolution.
- The PVM-1354Q mounts into a 19-inch EIA standard rack with the optional MB-502B rack mount bracket and SLR-102 slide rail kit same as PVM-1351Q. The PVM-1954Q mounts into a 19-inch EIA rack with the optional SLR-103 slide rail kit.

SEVEN-DAY CUSTOMER SATISFACTION GUARANTEE

Circle (60) on Action Card

production

Continued from page 20

work downlinks. Other value-added services may also be available, such as interactive communications and on-line viewer polling. The old rap about satellites being a one-way service has gradually disappeared, as providers and clients adopt interactive support systems.

Finally, it's also become easier for clients to access satellite providers. Full-service communications facilities offer uplinks that are integrated with the "local loop" (or "first-mile") component, so it's not necessary for the client to worry about getting programming to the uplink location. The local transmission element may include fiber and fixed or portable microwave service from the client's location or the provider may offer transportable uplink service. In some cases, the client may purchase studio/production support at the service provider's venue.

While improved system performance remains a primary goal, satellite service providers also are adopting new ways to compete with alternative delivery technologies in an expanding communications market. As long as these trends continue, program distributors and BTV clients will consider satellite delivery as a serious option when they seek the best mix of performance, reliability, flexibility and value for the backhaul and distribution of their programs. ■

Mark Durenberger is general manager of Group W Network Services/Teleport Minnesota, Minneapolis.

new products

Rack-mountable computer monitor

Barco

• CBM 5051: a computer monitor for a variety of broadcast applications requiring the display of high-resolution images from computer sources; the unit has been especially designed to be used in combination with Barco's Vivaldi 2x2 digital video display system; the CBM 5051 fits into a 19-inch rack for integration of the display in studio monitor walls or CB-van racks; equipped as standard with multisync circuits, the monitor automatically accepts incoming signals from most common computer platforms.

Barco, Th. Sevenslaan 106, B-8500 Kortrijk, Belgium; +32 56 386 493; fax +32 56 386 293
Circle (251) on Action Card

Desktop VTR for desktop video

Panasonic

• AJ-D230: a compact DVCPRO VTR; with RS-232 interface for PC control and a future Firewire interface (IEEE 1394), the system is designed for non-linear editing and multimedia applications; the unit is less than half the width of normal rack-mounted VTRs allowing use on desktops alongside PCs or two can fit side by side in a standard 19-inch rack.

Panasonic, 800- 524-0864 or +44 (0) 1344 853870; 100427.1536@compuserve.com
Circle (259) on Action Card

Editing system

Tektronix

• Lightworks V.I.P. 4500: an editing system aimed at replacing conventional multiple-VTR online tape-based editing systems; it provides users with significant productivity and efficiency benefits for typically less than one half the cost of conventional tape-based systems; the system features recording and playback configurable via multiple fully-assignable broadcast-quality video channels; real networking, suitable for most applications, is available using CCIR-601 serial digital video and digital or analog audio.

Tektronix, 14180 SW Karl Braun Dr., MS 50-216, Beaverton, OR 97077; 800-426-2200 or 503-627-4697; fax 503-627-5593; www.tek.com/measurement
Circle (260) on Action Card ■

atv update

Continued from page 24

issues of great importance to broadcasters. For example, are digital signals in the lower VHF band more susceptible to degradation due to man-made and atmosphere noise? No formal study has been presented with proof of this fact, and yet the FCC says it has reached a tentative conclusion affirming this proposal.

How should you react?

Remember that the original purpose behind the FCC assigning the second channel is to allow broadcasters to "jump-start" the HDTV market. We must continue to ensure that we don't get shortchanged on our DTV assignments and potentially reduce our NTSC service area.

There are ongoing battles for our spectrum being waged in Washington. The affect of these battles can be found in the new FCC DTV assignment table. Broadcasters cannot attack the commission's goal of spectrum reclamation; in fact, there may be business reasons for some broadcasters to support the commission's goals. The broadcast community, as well as individual broadcasters, must evaluate the FCC plan based on its own merits, including the ability of the DTV channel to one day fully replace the NTSC channel without audience loss. The FCC is giving us another channel so that in the future, when our existing NTSC channel is "returned" to the FCC, we have a service area we can live with for many years to come.

Participate in the process

The final FCC plan must be embraced by the majority of broadcasters. This draft table is a good beginning, but by no means should we be satisfied until our questions are answered. In principle, we all agree with the FCC that it is important to use spectrum that is the most appropriate and technically suitable for DTV operation. We must bear in mind that any new interference is audience and that is our only business. ■

Louis Libin is director of technology for NBC, New York.

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KPTM FOX 42 is currently accepting applications for Maintenance Engineer. The successful candidate should have an educational background in Broadcasting and five years Broadcast Maintenance experience. Duties include maintaining and trouble shooting transmitter and studio equipment. This includes computers, building equipment and proprietary broadcast equipment. The ability to work across departmental lines as well as working with minimal supervision is a must. Please send applications or apply in person to: KPTM FOX 42, Attention: Personnel, 4625 Farnam Street, Omaha, Nebraska 68132. No phone calls please. KPTM FOX 42 is an equal opportunity employer. M/F/H.

KFXK FOX 51 is seeking an assistant chief engineer. Duties include chief operator transmitter, Studio, microwave. Associate or equivalent degree in electronics, FCC LGRT or SBE CBETV preferred. Send or Fax resume to Ted Small, DOE, 701 N. Access Road, Longview, Texas 75602, 903-753-6637.

ASSISTANT CHIEF ENGINEER Looking for ACE with hands on experience, qualified in all areas of TV broadcast engineering transmitter and studio maintenance; SBE certified, FCC general license required. Send resume w/salary requirements to Classified Ad Coordinator, Broadcast Engineering, Dept. 780, 9800 Metcalf, Overland Park, KS 66212-2215. EOE.

DIRECTOR OF ENGINEERING. New network television facility in Janesville, WI has a unique opportunity for an out-of-the-box thinker to develop new state of the art operation. Solid background in UHF, digital, computer, studio and RF systems. Competence in personnel, budgeting, and strategic planning. Knowledge of FCC, FAA and EBS regulations. Send resume to Media Properties Inc., 483 N. Mulford Rd., Rockford, IL 61107. EOE.

CATV/VIDEO TECHNICIAN Responsibilities include the maintenance and some operations of the University's two Cable-TV systems along with maintenance in other video and audio areas of WKU's Educational Television Service including WKYU-TV, Ch-24. Qualifications: Good organizational, communication, and writing skills; the ability to work independently; working knowledge of DOS/Windows, IBM compatible PCs, two years of format training in electronics or equivalent experience in electronics. Experience with Data Networking and the Internet preferred. Applications for this position are available at the Department of Human Resources, Wetherby Administration Building, Room 42, Western Kentucky University, 1 Big Red Way, Bowling Green, KY 42101-3576. Applications must be received by November 5, 1996. Women and minorities encouraged to apply. Western Kentucky University is an Affirmative Action/Equal Opportunity Employer.

ENGINEERING TECHNICIANS Keystone Communications, the largest provider of international satellite transmission services, has immediate openings in New York and Los Angeles for RF and audio/video systems engineering technicians. SBE certificate and broadcast industry experience a plus. Fax resume plus salary req. to 801/595-6023. No phone calls please.

CHIEF ENGINEER: KNOP-TV is seeking a hands on leader with strong maintenance background. Primary responsibilities include installation and maintenance of video, audio, and computer equipment to include Odetics Spotbank at growing Midwest NBC affiliate. Experience in television and previous experience with RF equipment, U-matic/Sony 1", Beta/SVHS, Grass Valley production equipment is a must. Must be energetic, and capable to troubleshoot technical problems throughout facility. We offer the latest test equipment, an excellent benefit package to include an aggressive Profit Sharing Plan and Medical benefits. Salary is negotiable. Fax resume to Station Manger 1-308-532-9579 or call KNOP-TV 1-308-532-2222. Mail KNOP-TV, Box 749, North Platte, NE 69101. This is an immediate opening. KNOP-TV is an Equal Opportunity Employer.

SATELLITE UPLINK ENGINEER - Sure Shot has immediate openings for candidates with 2 years uplinking experience or related Television Production/News Operations experience. Must be willing to travel with good driving record. Please fax resumes to (330) 542-1020.

BROADCAST ENGINEER: Installation, maintenance, repair of UHF TV transmitter, translators, U-Matic tape deck and broadcast equipment. Two years experience required. EOE. Send resumes to: WUBI-TV, Attn.: Beth, PO Box 1080, Baxley, GA 31513-7080 or Fax to (912) 367-5299.

VIDEO TECHNICIAN/MASTER CONTROL OPERATOR Duties include evening/night master control operation; maintenance/repair of production equipment. Associates degree in electronics or related field required with 1-2 years experience in equipment repair/maintenance. Applications available from the City of Irving, 825 W. Irving Blvd., Irving, TV 75060. Call (214) 721-2532 for more information. Closing date: October 30, 1996

MAINTENANCE ENGINEER -Well equipped Texas NBC Affiliate is looking for an experienced maintenance engineer. Must be proficient with Sony equipment including Betacam decks, cameras, and Betacart. The successful candidate will be a professional who takes pride in his/her work. Females and minorities are encourage to apply. Send resumes and salary requirements to Chief Engineer, KAMR-TV, P.O. Box 751, Amarillo, TX 79189. NO PHONE CALLS PLEASE. KAMR-TV is an Equal Opportunity Employer, M/F.

ASST. CHIEF ENGINEER: Opening for an assistant chief engineer with an eye on the future. RF background needed. Extensive studio maintenance experience a requirement. Send resume to: Dave Hendricks, ACE1-BE, Box 44227, Shreveport, LA 71134-4227. EOE.

VIDEO MAINTENANCE ENGINEER: Rainbow Network Communications, a division of Rainbow Programming, is seeking an experienced Maintenance Engineer with the ability to troubleshoot and repair analog and digital equipment down to component level. A solid knowledge of video and audio signals, betacam VCRs, monitors, switchers, routers, digital paint boxes and still stores necessary. This is an ideal opportunity for a self-starter who requires minimal supervision and has the flexibility to work all shifts and weekends. Competitive compensation commensurate with experience. Please send resume and salary requirements to: PO Box 999-VM, Woodbury, NY 11797. We are an equal opportunity employer.

BROADCAST ENGINEERS CAREER OPPORTUNITY

Bloomberg Financial Markets, a pioneer in multimedia news operations, is seeking television and radio engineers to join its team on evening and weekend shifts. The positions involve providing support and assistance to operations staff, troubleshooting and correcting equipment failure and/or system outages. Candidates who understand that in broadcasting, "getting the spare" is good troubleshooting and "pulling out the scope" is not, are invited to apply. Requirements include:

- Familiarity with television and radio equipment including cameras, robotics VTRs, digital recorders, routing equipment and/or production switchers and mixers, computer control and automation systems and power distribution systems.
- Knowledge of the maintenance and construction of wire and cable assemblies
- Thorough understanding of PC equipment and operations
- Ability to work independently in high-pressure situations

Please forward resume to: Howard Horder, Human Resources, Bloomberg L.P., 499 Park Avenue, New York, NY 10022, or fax: 212-940-1954.

Qualified candidates will be contacted.
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Turner Broadcasting System, the leading News, Sports, and Entertainment system in satellite communications, has career opportunities for engineers with **broadcast maintenance** experience. These positions demand an extensive background in television engineering and at least two years of training in electronics technology. Turner Broadcasting System offers an excellent benefit and compensation program.

Send resumes to:
Mr. Jim Brown, Corp. Engineering
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(404) 827-1835 fax

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HELP WANTED

TELEVISION ASSISTANT CHIEF ENGINEER

Responsibilities include supervising the technical operations relating to all studio functions. Responsible for supervising the maintenance and repair of all studio related equipment. Must participate in establishing technical needs and crew requirements for programming and news related events. Oversee various technical and operating procedures to troubleshoot and solve potential problems prior to air. Serve as Engineering Department liaison between the Sales, Traffic, Programming and Promotion Departments.

Associate Degree or equivalent in Engineering or Communications. Five years television and technical operations experience required. Three to five years of management experience and strong interpersonal skills a must.

Submit Resume To:
Dale Werner
Director of Broadcast Operations & Engineering
KPRC-TV
8181 Southwest Freeway
Houston, TX 77074

KPRC HOUSTON

No phone calls please.
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POST-NEWSWEEK STATIONS, INC

PENSACOLA JUNIOR COLLEGE, Pensacola, FL Assistant Director of Engineering and operations. Job #0665. $22,000 - $43,000. A bachelor's degree with major course work in electronics, and four years full-time experience in a broadcast television facility, of which three years must have been performing maintenance of sophisticated broadcast quality equipment; at least two years supervision of personnel required; OR graduation from high school or GED and eight years of full-time experience in a broadcast television facility, of which four years must have been performing maintenance of sophisticated broadcast quality equipment, and at least two years must have been in supervision of personnel required. Possession of a current Federal Communication Commission General Radiotelephone Operator License required. Prefer knowledge of Broadcast automation systems, computer operating systems, word processing skills, non-linear editing systems and video disk servers and basic knowledge of KU-Band uplinking and SNG truck operations. Open until filled. PJC - An Equal Opportunity Institution. Minorites are encouraged to apply. For official application material please call (904) 484-1799.

TELEVISION: ASSISTANT CHIEF ENGINEER Experienced in UHF Transmitter maintenance. Strong in Studio System design, video tape repair. FCC General License. Management skills helpful. Excellent opportunity for rapid advancement in growing operation to qualified person. Send resume to: Chief Engineer, WICD 250 S. Country Fair Dr., Champaign, IL 61821, EOE.

CHIEF ENGINEER

Encore Media is seeking a seasoned, motivated Chief Engineer to lead its engineering department. Responsible for the engineering and maintenance of Encore's all digital post production facility consisting of five component digital On-Line edit bays; AVID media composer, Audiovision, and Air-Play edit systems; Quantel Henry and Hal graphics systems; Digital Betacom (VTR's), digital audio mixers, video production switchers and editors; digital and analog routing switchers, and related video production equipment. Also responsible for the design and project management of the installation of video production equipment and systems, the generation and maintenance of accurate documentation of the technical facilities, supervision of the technical maintenance staff, budgets and capital planning and construction scheduling of future facilities expansion with an emphasis on operational efficiency and productivity.

Candidates must be current on new technologies in production, post production, video tape operations, graphics platforms, playback and uplink. Also, successful candidates require a minimum of 5 years experience as an executive supervising the design, documentation and technical maintenance of broadcast systems and equipment, along with hands-on experience in technical maintenance of broadcast video, audio, and automation equipment Candidates must have good written and oral communication skills and be multi-task oriented with the ability to crisis manage. An understanding of digital compression technology including MPEG1, MPEG2 is a plus. College degree required. Please send resume and salary history to: Chief Engineer, #182, P.O. Box 4917, Englewood, CO 80155. Drug test required for successful candidate. EOE.

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BROADCAST MAINTENANCE ENGINEER

Thirteen/WNET seeks an individual to repair 1" Betacam SP, D-2 machines, and maintain editing (linear & non-linear) and broadcasting systems. Knowledge of studio equipment with extensive experience in component level troubleshooting a must. Qualified applicants must have an Associate's degree in Electronics or the equivalent, 2+ years of experience in broadcast maintenance, and be PC and MAC computer literate. FCC or SBE certification a plus. For consideration, please send/fax resume and salary requirements to:

Thirteen/WNET
Attn: Manager, Compensation & Staffing
PSCH-0316
356 West 58th Street
New York, NY 10019
Fax: 212-582-3297
No phones. No agencies, please. EOE.

CUSTOMER TECHNICAL SUPPORT SPECIALIST (1 position): Support Latin American sales and marketing effort by providing technical interface between field sales representatives, customers, and distributors. Advise customers on product and system configuration, specifications, and applications. Provide equipment demonstrations and technical maintenance training at customer and/or distributor sites. Works independently to provide mainly pre-sales support to monolingual Spanish-speaking engineers in Latin America. Travel to customer sites in Latin America approximately 12 times per year for duration of 1-2 weeks. Require: Bachelor's degree in Electronics or Electrical Engineering, with 2 years' experience in the Job Offered or 2 years' experience as an Electrical Engineer in television broadcast equipment industry. Fluent in oral and written Spanish to communicate with monolingual technical personnel at customer and distributor sites in Latin America. $60,000/Year. Hrs: 9AM to 5PM. Submit resume to: Job Service of Florida, 701 S.W. 27th Ave., Rm. 47, Miami, FL 33135-3014. Re: Job Order No. FL-1474483.

CHRISTIAN TELEVISION NETWORK seeking qualified Chief Broadcast Engineer with experience in Transmitter and RF system, Production and Transmitting video systems, and Component level repair of all electronic equipment involved in TV production and broadcasting. The Network is seeking individuals who are goal oriented, quality minded and self-motivated. If you meet our criteria and share our vision and purpose, send your resume to: Tri-State Christian TV-Employment, P.O. Box 1010, Marion, IL 62959. An Equal Opportunity Employer.

MAINTENANCE ENGINEER KNXV-TV, Phoenix, Arizona seeks an individual with repair and installation skills of television broadcast and computer equipment. Should have three years experience in maintaining audio, video, computer and RF broadcast equipment and systems. This position requires a two year electronic technical degree or equivalent, and experience with Beta and CCD ENG camera equipment. Fax resume to Engineering Manager at (602) 304-3000 or send to KNXV-TV, 4625 S. 33rd Place, Phoenix, Arizona 85040. EOE.

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INTERTEC PUBLISHING
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By Paul McGoldrick

Digital video transport technology

Dr. Edward Fink, assistant professor of communications at California State University, Fullerton, teaches courses in television and film. At Viscom 96, he presented a paper on the impact of digital technology on TV production. As part of the study, he followed "American Gothic," produced by Renaissance Pictures and Gothic American Productions, with Universal TV.

The program is shot mostly on 16mm film with some 35mm. The film is telecine-transferred to Digital Betacam, with audio added, at Anderson Video. Dubs (3/4-inch) are edited off-line on Avids at LA Digital Post and then on-lined back at Anderson. Digitized images are also sent over ISDN circuits to Northwest Imaging (Vancouver, BC) for special effects and returned via ISDN for approval. The final Digital Betacam tapes are shipped from Vancouver to Los Angeles. Audio follows similar paths, although in this case, the original is analog, on Nagra, Foley is at Universal and Digital Sound and Picture does the on-line edit. Additional dialog lines are "looped" in North Carolina on DAT, while the music is scored and recorded on DAT Michigan, with approvals again via ISDN.

Not an unusual cornucopia of players with a high-profile production (and even then one was missed: the Merlin images are rendered at Vision Art in LA), but it is a scenario that required some enabling technologies. Perhaps more important, it would have taken more overnighting of tapes for approvals, leaving less time for flexibility and creative editing. Avid, Digital Betacam and Adobe Premiere all play an important part.

Dr. Fink concluded his paper, "Digital technology is a tool: a device that assists in creating a program. It can offer more visual and aural options than other technologies, and it can do so more quickly, and sometimes more cheaply, thereby offering its users greater creative flexibility. Digital technology takes second place to creative thought, but as a tool to assist the creative thinker, it affords more choices in less time with relative ease and often with less expense."

This is something that the engineering community sometimes forget; there is no place in the production and post-production fields for technology that cannot do the job easier, quicker, more reliably and cheaper. Digital technology for technology's sake does not cut it. But, we have a partial technological "out" when it comes to transport. There is no single best solution that will win. We all have our biases and this is an area where we can justify negative comments about any of the systems proposed.

Moving pictures

Last month, this column expressed concern about the possibility of Asynchronous Transport Mode (ATM) carrying digital video. Since then, we have had discussions with developers of 1GHz-capable Ethernet. A distribution standard, particularly on switching to and from lower-grade branches, seems to be extremely close to decision. The association making the decisions wants to get the architecture questions behind it. Several manufacturers could move fast enough and have products available by next year's NAB.

Also, there are strong indications that Synchronous Optical Network (SONET) will be capable of moving upward from its present 1GHz to 2.5-3GHz as new semiconductors get on-line within the next six months; it now appears that the limiting factor in deployment may not be the devices, but the test equipment. As it is, the manufacturers invo d are working with their own homemade setups.

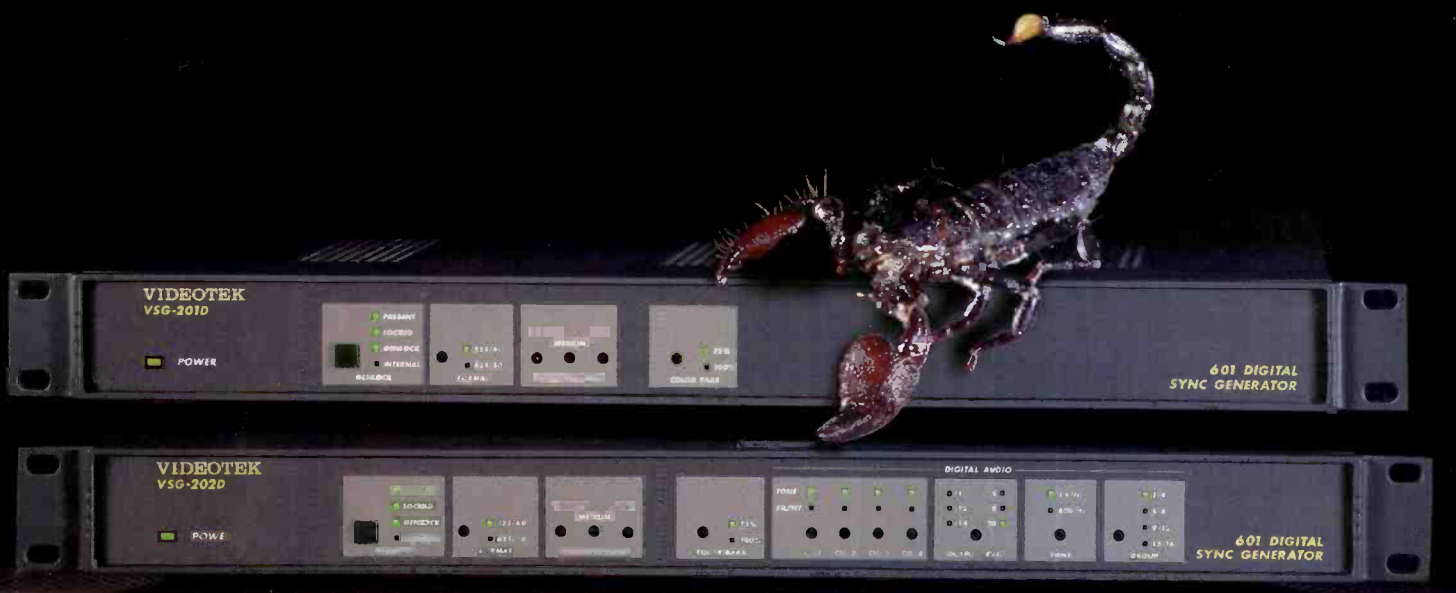
If these bandwidths sound outlandish, remember that if advanced television is going to get off the drawing board and into homes, there must be the means to carry it between studio centers, from remotes, to the transmitters (terrestrial and satellite) and to the cable head-ends.

ATM and SONET are for contribution and delivery circuits. Within a facility there are several choices for distribution, from coax to fiber to twisted pair (for 1GHz Ethernet). Routing switchers will be needed in all the standards if they are to do more than just couple equipment islands. Within a few weeks of this issue hitting your mailbox, there will be a player in the high-frequency crosspoint business. In November, Comlinear (a National Semiconductor company in Colorado) will announce its CLC018 8x8 digital crosspoint switch. The switch is capable of operating at data rates in excess of 1.2Gb/s and has excellent channel-to-channel crosstalk and jitter numbers. It will see service in serial digital video switchers (with expansion to larger arrays), and in many telecommunications/SONET switching areas.

This battle for transport is hardly over, maybe there will be a combination of technologies involved, even in our tiny broadcast niche. But they are core to any progress with digital video. Dr. Fink may never see them discussed in a report with production personnel, but they are, literally, the backbone of our future. ■

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

Basic In-Sync.



Serial Digital Sync Generators

The VSG-201D and VSG-202D: Features you need... prices that won't sting you!

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Whether you're upgrading an analog system, building a new hybrid facility or planning an all-digital plant, both of these sync generators give you killer features: genlock, four analog black burst outputs, digital black, digital color bars and stereo analog tone.

The VSG-201D and VSG-202D are designed and built to exacting standards. A high stability TCXO provides ±1Hz accuracy making either unit perfect for use as a master sync generator. The infinite genlock adjustment range also makes them ideal for use as slave sync generators. This provides an easy, affordable way to deal with system timing issues when interfacing digital equipment.

A Digital System Integration Product

The VSG-201D and VSG-202D are user selectable for 525 or 625 line standards making them suitable whether your facility is NTSC, PAL or both.

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