BROADCAST ENGINEERING®

An INTERTEC® Publication

May 1995/$5.00

Cover Story:
The all-digital TV station

Also Featured:

- Wireless mics
- Intercoms
- Predicting ATV coverage

VIDEO EXPLORER®

Providing the highest quality digital video for desktop video solutions.

Fox Television, NBC, BBC, ITN, Editel, Post Perfect, the 1994 Winter Olympics, and the Academy Awards – broadcast, post production, design, and multimedia companies worldwide depend on the quality and creative flexibility of the Video Explorer system to provide quantifiable broadcast quality video from a personal computer. The core of complete modular video systems, Video Explorer is transforming the professional video industry with advanced solutions for compositing, animation, graphics, character generation and much more.

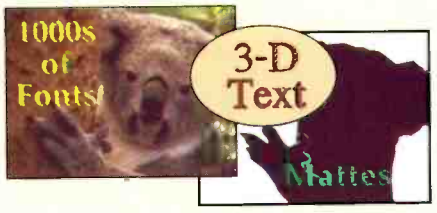
Animation & Graphics

The broad range of available software such as Electric Image™, Linker Systems Animation Stand™, Fractal Designs Painter™, Crystal Graphics Crystal Topaz™, and Adobe Photoshop™, plus the highest quality video input/output, makes Video Explorer the platform of choice for both animators and designers alike. Employ multiple high-end graphics and animation stations for less than the cost of a single dedicated electronic paint system.

Character Generation and Video Tools

Put a Video Explorer and a Macintosh personal computer in your on-line suite to keep edit sessions moving smoothly:

- Directly import/export computer graphics and logos to your switcher or paint system in real time.



- Perform touch-ups on shots and create complex mattes, right in the edit suite, for a fraction of the cost of traditional methods.
- Make thousands of fonts, textures, filters and more available to your electronic paint system.
- Eliminates slow ethernet and Exabyte file transfers.

Compositing & Rotoscoping

Create high-quality, low-cost multi-layer compositing, special effects and graphics over video by integrating Video Explorer with ADI's Digital Magic™ and QuickTime™ compatible software such as Adobe After Effects™ and Adobe Premiere™.

Computer Images

Effects

Video Clips

Composite

Scrolled Type

System Features

- The Video Explorer system provides uncompromised image quality in:
  - **Component Digital** (CCIR 601),
  - **Multi-Component** (including MII, Betacam, SMPTE YUV, & RGB),
  - **RGB**, and
  - **YC/Composite Modules.**
- Achieve **uncompressed digital video** for multiple video inputs and outputs as well as integration with third-party products such as digital disk recorders. All this is possible through VideoBahn®, Intelligent Resources' industry standard real-time video bus.
- Video Explorer configurations support **NTSC, PAL, SECAM,** and Macintosh video rates.
- Requires a Macintosh personal computer with 12 inch NuBus slots.

Systems start as low as **$3995.**

Contact Intelligent Resources at **708-670-9388** for more information and the name of your nearest dealer.

INTELLIGENT RESOURCES

INTEGRATED SYSTEMS

3030 Salt Creek Lane, Suite 100, Arlington Heights, IL U.S.A. 60005-5000
Phone: (708) 670-9388 Fax: (708) 670-0585

Circle (1) on Reply Card

The choice is *crystal* clear.

The new FMR-150 wireless microphone system from Telex offers maximum audio and RF quality with an added feature: noiseless crystal-controlled frequency agility. Our patented Posi-Phase™ true-diversity circuitry gives rock-solid freedom from dropouts and noise-ups, while Posi-Squelch™ auto suppression combines the improved range and audio quality of a true noise squelch, with the security of a tone-coded squelch. The FMR-150 also features a wider range and choice of stock frequencies, with custom frequencies available. This crystal-controlled system utilizes three widely-spaced frequencies that allow the user to instantly select a clear channel in the event of interference. You'll feel confident recommending a system that's designed and built in the U.S.A. with our exclusive 3-year warranty. And behind it all is our reputation for reliability and performance. Just what you'd expect from a sound company like Telex.

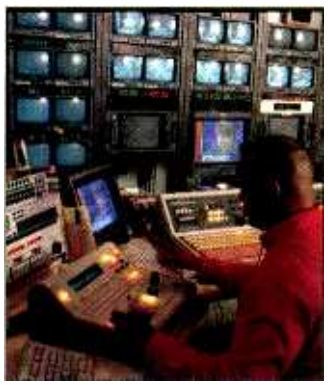
Telex®

9600 Aldrich Avenue South • Minneapolis, Minnesota 55420 USA • 612-884-4051 Fax 612-884-0043

Circle (41) on Reply Card

BROADCAST® engineering

May 1995 • Volume 37 • Number 5



30

48

THIS MONTH...

54

66

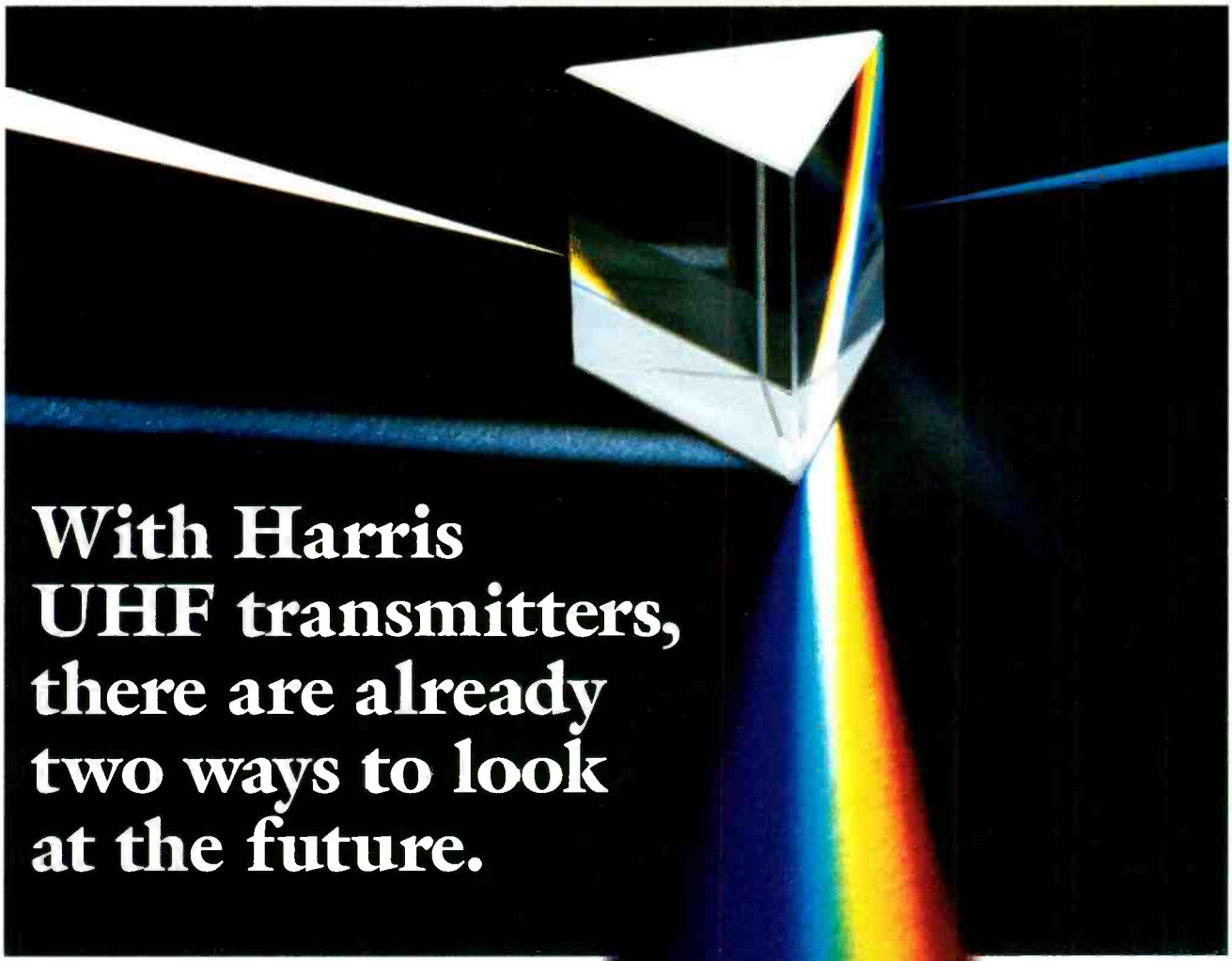
DEPARTMENTS:

24

COLUMNS:

ON THE COVER:
Photos courtesy of Dick Stephen and Pam Francis.

BROADCAST ENGINEERING (ISSN 0007-1994) is published monthly (except semi-monthly in November) and mailed free to qualified persons within the United States and Canada. Second-class postage paid at Shawnee Mission, KS, and additional mailing offices. POSTMASTER: Send address changes to *Broadcast Engineering*, P.O. Box 12902, Overland Park, KS 66282-2902. CORRESPONDENCE: Editorial and Advertising: 9800 Metcalf, Overland Park, KS 66212-2215. Phone: 913-341-1300; Editorial fax: 913-967-1905. Advertising fax: 913-967-1904. © 1995 by Intertec Publishing. All rights reserved.



With Harris UHF transmitters, there are already two ways to look at the future.

When it's time to choose a highpower UHF transmitter, the worst option is to have no options at all. That's why Harris offers two outstanding ways to achieve uncompromising performance today, while preparing for the challenges ahead.

Harris Sigma™ Series is our line of 15-240 kilowatt IOT transmitters. For maximum system flexibility, combined amplification and externally diplexed versions are available. Simple to operate and maintain, Sigma offers outstanding efficiency and performance today plus the linearity and headroom for ATV transmission in years to come.

That's where some manufacturers stop. Not Harris. Our UM Series of 60-280 kilowatt Depressed Collector Klystron transmitters has been used successfully in ATV tests and also has the best field record of any current UHF transmitter. With UM, you benefit from dramatic reductions in energy costs, proven dependability of klystron technology, and tube life exceeding 40,000 hours.

We also keep your options open with IOTs or klystrons from multiple sources. And both transmitters are backed by the Harris support network—the most extensive and responsive in broadcasting.

Two high power UHF transmitters, two ways to look at the future, one trusted source to help you make the best choice.

▲ Harris UM Series

▲ Harris Sigma™ Series

U.S. and Canada:
Telephone 217-222-8200
or fax 217-224-1439
International:
Telephone 217-222-8290
or fax 217-224-2764

HARRIS ALLIED

© 1995 Harris Corp.

Circle (5) on Reply Card

By Dawn Hightower, senior associate editor

FCC proposes digital data transmission in video portion of TV signal

The FCC, in response to a request initiated by WavePhore, has proposed to amend its rules to define the rights and responsibilities of TV broadcast licensees with respect to providing ancillary digital data service within the video portion of the broadcast signal. The FCC also is seeking comment on whether specifying a particular method of embedding such data would make it easier to provide this service to the public.

WavePhore has developed TVT1, a high-speed, wireless multimedia datacasting system for distributing digital data via the existing TV broadcasting infrastructure. The product enables broadcasters to transmit digital data with the broadcast analog transmission signals without any discernible degradation of the video signal.

NAB urges reduction in FCC fines

NAB is proposing changes to the FCC's enforcement philosophy and its fine schedule. This would include a 50% reduction for most fines imposed for lesser offenses. NAB believes the FCC could better achieve rule compliance without inflicting unreasonable penalties on broadcast stations.

In July 1994, a federal appeals court in Washington, DC, threw out the commission's fine schedule, finding it was illegally created by the agency without first seeking public comment. NAB is urging regulators to take a fresh look at its enforcement options. NAB believes the FCC should take a new approach to enforcement of its rules, instead of just lowering fines.

The NAB states that the commission should not issue fines for first occurrences of lesser offenses (those that do not involve threats to safety, evasion of the FCC's regulatory process or serious interference).

For lesser offenses and violations, the FCC should issue a warning and an explanation on how the station can achieve compliance. If the station still fails to comply, it would be subject to a base fine and greater sanctions for repeated violations.

NAB also urged that potential EEO fines be addressed in a future rulemaking, one that would focus specifically on the commission's substantive EEO policies.

WCA comments on industry deals

According to Robert L. Schmidt, president of the Wireless Cable Association International, the deal between two Regional Bell Operating Companies and three wireless cable system operators is good news. Schmidt commented that the telephone industry sees the ability to reach consumers from a wireless TV platform, and this validates that wireless cable is a player in the national information superhighway.

Wireless cable is a multichannel subscription TV service that delivers addressable multichannel TV programming and other interactive communications services over a terrestrial microwave platform. The systems (sometimes known as MMDS) are growing rapidly. They now serve 2.8 million customers in 56 nations and in 175 U.S. systems.

To open competition within the United States, the WCA was a leading advocate for the 1992 Cable Act that allowed U.S. wireless and direct broadcast satellite systems to have fair access to satellite-delivered subscription TV programming for the first time. This year, the industry will reach one million customers. The flexibility and low cost of the platform are making wireless cable the technology of choice internationally.

SBE membership campaign

The Society of Broadcast Engineers invites you to participate in the "One New Member" campaign. It will run through May 31. You can be eligible to win prizes if you recruit new members during the membership campaign. The grand prize is a trip for two to the SBE Engineering Conference and World Media Expo in New Orleans, Sept. 6-9.

All you need to do is recruit one new Member, Associate Member or Sustaining Member and your name will be entered in the special prize drawing, which will be held on July 8.

Members will earn $10 credit toward the registration fee for the SBE Engineering Conference for each new member application received and approved, that they sponsor. The new member recruited by the grand prize winner will receive one complimentary registration to the SBE Engineering Conference/World Media Expo.

Contact the SBE national office by phone at 317-253-1640 or by fax at 317-253-0418 for membership applications.

SCTE votes in favor of name change

At the annual election of the board of directors of the Society of Cable Television Engineers (SCTE), the membership voted in favor of a referendum to change the name of the organization. The name has been changed to The Society of Cable Telecommunications Engineers.

In additional news, the 1995 Cable-Tec Expo will be held June 14-17 at the Las Vegas Convention Center in Las Vegas. The Expo begins June 13 with preconference tutorials and officially opens June 14 with the Annual Engineering Conference. The show will continue with the technical workshops and the exhibit hall on June 15 and 16. The engineering conference and workshops will not conflict with exhibit hall hours.

For those interested in receiving a registration package or more information on Expo '95, contact SCTE's Special Projects Department at 610-363-6888.

Communications Act requires telcos to comply with FCC cable rules

According to NAB, when a telephone company offers video programming directly to subscribers, the Communications Act establishes that the telco is subject to cable regulations including must-carry, retransmission consent and program non-duplication rules.

According to NAB, the Communications Act envisions only common carriers that exclusively provide transmission capacity and cable systems that offer video programming. Once telcos provide video programming, the language of the act and a recent court decision make clear that they become cable operators subject to cable regulations.

However, this does not preclude the FCC from tailoring its regulations to the particular circumstances of a telco's proposal to provide video programming in conjunction with video dial-tone service.

According to NAB, because channel positioning and other rules developed for the cable model may not readily apply to the telephone company environment, new types of regulations dealing with menuing, navigation and software systems may have to be adopted.

NAB agrees with the FCC's tentative conclusion that it would be constitutional to retain the prohibition on telephone companies' purchase of in-region cable systems that have no multichannel competitor. ■

Coming June 9-13
International Television Symposium in Montreux, Switzerland
(+41 21 963 32 20)

One Superior Transmitter After Another.

Superior Solid State UHF Television Transmitters. Now To 10kW Output!

Since 1989, Acrodyne has been the leading U.S. manufacturer of solid state UHF television transmitters. We introduced the first U.S. produced solid state 1kW UHF system back then and have delivered over 300 systems based on that design. Now, we proudly present our complete line of 4th generation products based on the most advanced power transistors available.

We've developed an 800W capable common amplification (10% aural) power amplifier module which is the building block for our new 500W, 1kW, 2kW, 5kW and 10kW power output systems. We've applied several new ideas to enhance our success with our proven design to further improve product dependability and performance and lower your cost per watt of power.

Broadcasters are choosing Acrodyne solid state UHF TV transmitters because they are economical solutions for critical transmitter needs– for sites that are across town, or across country.

Configurations are available for all FCC and international television standards, including Full Service, LPTV, TV translator, and Wireless Cable requirements.

So if you need dependability, redundancy, and air cooling, from a supplier that offers 24-hour experienced technical support– a supplier that understands broadcaster's needs today and the digital transmission needs of tomorrow, line up with hundreds of other broadcasters and look to Acrodyne.

ACRODYNE

More Power To You.

© 1995 Acrodyne Industries, Inc. All rights reserved

Acrodyne Industries, Inc. 516 Township Line Road, Blue Bell, Pennsylvania 19422 • *Phone:* 800-523-2596 / (215)542-7000 *Fax:* (215)540-5837

Circle (12) on Reply Card

Mean time between disasters

You've probably read the specifications of modern hard-disk drives, you know, 2,000,000-hour mean time before failure (MTBF). Today's hard drives are fast, inexpensive and reliable. In fact, hardware and software product manufacturers often bust their vest buttons bragging about how reliable and fast their systems are. Unfortunately, often times the desire for bragging rights can result in misleading claims.

When manufacturers cite MTBF figures of years for their systems it sounds great, but such statements belie the truth. Although the drive media may not fail for 10 years, other system components, including software, typically fail earlier and sometimes, often.

Today's production systems require that all components, not just the drives, operate reliably. In fact, the weakest link in many of today's production systems isn't hardware at all...it's the software.

I've coined a new term MTBD, *Mean Time Between Disasters*. This term refers to the average time between system lockups or fatal errors, which cause the loss of data or the user's work.

After talking with many DTV users, I found that MTBD can often be measured in days or hours, not years. One expert, who is charged with testing desktop systems for his network, described the typical MTBD for some desktop systems at about four hours. So much for productivity!

Remember the Pentium flap? The computer community practically ripped Intel to shreds because the Pentium chip was faulty. This event re-emphasized that while computer *hardware* errors are considered unacceptable, error-prone, unreliable and bug-infested *software* is considered a fact of life.

How many of you have purchased software only to find that it contained bugs. Fixes may have been available, but only if you complained, and sometimes, only if you paid for an upgrade. Version 6.01 of a famous piece of software contains numerous bugs. Yet, unless you complain to the company, they'll never tell you about the fix — or provide the tens of disks it takes to remedy them. (Demand a copy of Version 6.01a.)

I've challenged computer types who suggest the way to handle system crashes is to simply reboot the system. One told me to not bother him with the problem unless my system crashed more than twice a day. "Just turn it off and start over," he said.

Engineers understand the difference between properly operating systems and defective ones. And it is possible to build digital production equipment that performs well. For instance, the Ampex ADO would never have become the DVE standard of the industry if it was as unreliable as some of today's digital production systems.

The term broadcast quality has always connoted reliability as well as production quality. In today's digital environment, just because a desktop computer has become the basic platform shouldn't mean that users have to accept a lowering of those standards or compromised performance.

Brad Dick

Brad Dick, editor

SYSTEM TWO

INTRODUCING

Audio Precision, the trusted name in audio test & measurement presents the System Two Dual Domain audio analyzer, featuring the world's most complete testing capability for the AES/EBU digital audio interface.

Audio precision

P.O. Box 2209
Beaverton, OR 97075-3070
(503) 627-0832 , 800-231-7350
FAX: (503) 641-8906

INTERNATIONAL DISTRIBUTORS: **Australia:** IRT Electronics Pty. Ltd., Tel: 2 439 3744 **Austria:** ELSINCO GmbH, Tel: (1) 815 04 0e **Belgium:** Trans European Music NV, Tel:2 466 5010 **Brazil:** INTERWAVE LTDA., Tel: (21) 325-9221 **Bulgaria:** ELSINCO, h.e. Strelbishte, Tel: (2) 58 61 31 **Canada:** GERRAUDIO Distribution, Tel: (416) 696-277E **China, Hong Kong:** A C E (Int'l) Co. Ltd, Tel: 2424-03E7 **Croatia:** AVC Audio Video Consulting, Tel: (41) 624 622 **Czech Republic:** ELSINCO Praha spol. s.r.o., Tel: (2) 49 66 89 **Denmark:** npn Elektronik aps, Tel: 86 57 15 11 **Finland:** Genelec OY, Tel: 77 13311 **France:** ETS Mesureur, Tel: (1) 45 83 66 41 **Germany:** RTW GmbH, Tel: 221 70913-0 **Greece:** KEM Electronics Ltd., Tel: 01-6478514/5 **Hungary:** ELSINCO KFT, Tel: (1) 269 18 50 **India:** HINDITRON Services PVT, Tel: 22 836-4560 **Israel:** Dan-El Technologies LTd., Tel: 3-6478770 **Italy:** Link Engineering s.r. , Tel: 0521/648723 **Japan:** TOYO Corporation, Tel: 3 (5688) 6600 **Korea:** B&P International Co., Ltd., Tel: 2 546- 457; B&P (Kumi Office), Tel: 0546 53-7347/8 **Malaysia:** Test Measurement & Engineering Sdn. Bhd., Tel: 3 734 1017 **Netherlands:** Heynen b.v., Tel: 08851-96300 **New Zealand:** Audio & Video Wholesalers Tel: 7 847-3414 **Norway:** Lydconsult, Tel: (47) 66-988333 **Poland:** ELSINCO Polska sp. z o. o., Tel: (22) 39 69 79 **Portugal:** Acutron Electroacustica LDA, Tel: 1 9414087 / 9420862 **Singapore:** TME Systems Pte Ltd., Tel: 747-723E **Slovakia:** ELSINCO Bratislava spol. s.r.o., Tel: (7) 784 165 **South Africa:** SOUNDFUSION Broadcast, Tel: 11 477-1315 **Spain:** Tekelec Electronics, S.A., Tel: 1 531-7101 **Sweden:** TTS Tal & Ton Studioteknik AB, Tel: 31-803 620 **Switzerland:** Dr. W.A. Ganther AG, Tel 1 910 41 41 **Taiwan R.O.C.:** Cha Wei Electric Trading Co., Tel: 2-5612211 **Thailand:** Massworld Company Ltd., Tel: 662-294-4930 **United Kingdom:** Thurlby Thandar Instruments, Ltd., Tel: (1480) 412451

Windows is a trademark of Microsoft Corporation.

Circle (10) on Reply Card

By Harry C. Martin

FCC to close monitoring stations

Within the next six months, the FCC plans to close 10 of its 13 high-frequency (HF) manned monitoring stations across the United States. The only monitoring stations that will continue to employ local personnel will be those in Anchorage, Honolulu and San Juan. The other 10 will be operated by remote control from the Compliance and Information Bureau's (CIB) headquarters in Laurel, MD. (The CIB is the reorganized successor to FOB.)

The facilities being closed monitor emissions in the 500kHz to 30MHz range. Broadcast stations in the immediate areas of the monitoring stations are sometimes monitored, but the primary mission of the facilities is to monitor short-wave emissions. These functions will continue to be performed, but all monitoring will be done through remote-control direction finders interconnected with CIB's Laurel headquarters.

The closing of these facilities is part of a larger FCC initiative aimed at cost savings and increased efficiency — consistent with Vice President Gore's initiative to "reinvent government." The monitoring station closings are the biggest part of the FCC's reinvention as far as field operations are concerned. Many former FOB employees are being offered "buy-outs" in return for early retirement and others are being transferred from the monitoring stations to CIB field offices.

All FCC field offices, which are responsible for monitoring rule compliance by broadcast stations, will remain open except those in Miami, Buffalo and Baltimore. The Miami office will be consolidated into the facility at Tampa, and the Baltimore field office will be moved to Laurel, MD. The Buffalo office will be closed.

The proposed closures and relocations are still in the planning stage and will not be implemented until final approval by the FCC commissioners. Such approval is expected later this year.

Main studio violation

The FCC has ordered the licensee of a TV station in Texas to forfeit $15,500 for violations of the FCC's main studio, public inspection file and ownership reporting rules. The main studio rule (Section 73.1125) requires each station to maintain a "meaningful management and staff presence" at its main studio location. This includes stations that rely upon time brokers to provide their programming.

In the Texas case, the main studio was found to be improperly staffed on four occasions. On each of these occasions, FCC inspectors seeking access to the studio during normal business hours found the facility unattended. In addition, the public inspection file was missing several categories of items, and the licensee had failed to file an ownership-related agreement with the FCC.

The CID originally proposed a $20,000 fine, but the commission reduced the fine to $15,500. The amount was reduced because the original fine was based on guidelines that were set aside by the U.S. Court of Appeals.

DATELINE: JUNE 1

On June 1, broadcast stations in the following states must file their annual ownership reports: Arizona, Washington DC, Idaho, Maryland, Michigan, Nevada, Ohio, Oklahoma, New Mexico, Texas, Utah, Virginia, West Virginia and Wyoming. May 31 is the deadline for filing annual employment reports (FCC Form 395-B) for all radio and TV stations.

The "meaningful management and staff presence" standard requires each licensee to have present at the main studio two employees during normal business hours. The management presence requirement may be fulfilled by a person having one of the following titles: president or other corporate officer, general manager, station manager, program director, sales manager, chief engineer with managerial duties, news director, personnel manager, facilities manager, operations manager, production manager, promotion director, research director, controller or chief accountant. However, the FCC's emphasis is on job duties rather than job titles.

"Presence" in the context of management attendance does not mean full-time physical presence. Rather, the FCC expects the manager to report to work at the main studio on a daily basis, spend a substantial amount of time there and use the studio as a home base. Employing a part-time manager would be insufficient, while employing a full-time manager who isn't physically present at the studio all day would meet the requirement.

With respect to the "staff presence" requirement, the FCC has ruled that the staffer may be shared (e.g. with another station) or otherwise be part-time. The key is to have at least one licensee representative on the premises of the main studio facility during normal business hours. An off-premises answering service, even if interconnected to the main studio on a full-time basis, would not pass muster.

The main studio requirement is enforced by the FCC, often with $20,000 fines. The problem is often identified through anonymous complaints to the FCC by a competing station. These complaints develop when a suburban station moves its main studio to a nearby city without continuing to maintain a staffed studio facility within its city-grade contour.

FCC proposes amending NCE hearing criteria

The FCC has asked for comments relating to the possible modification of the criteria used to select from among competing applicants for new noncommercial educational (NCE) TV broadcast facilities.

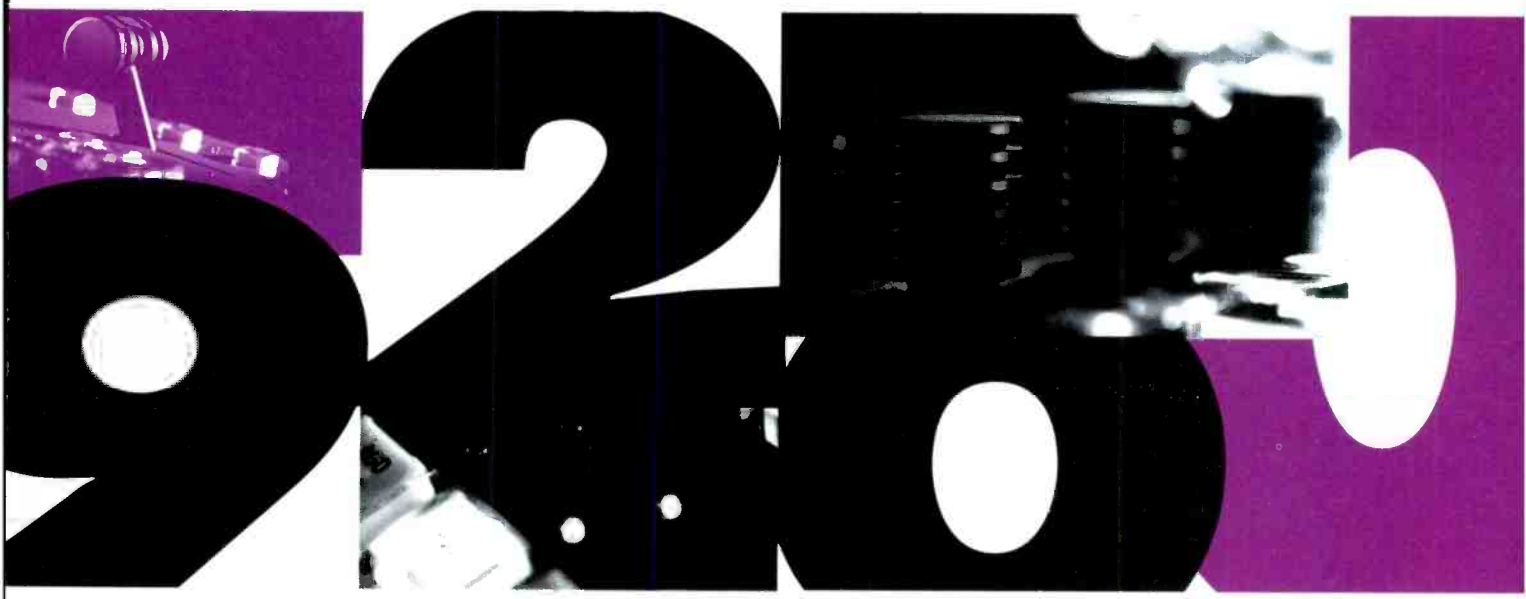
In 1992, the FCC initiated a proceeding to reform the criteria used to select among mutually exclusive applicants for new broadcast facilities. The FCC noted that the standard for comparison used in NCE comparative proceedings was vague and difficult to apply and tentatively concluded it should be eliminated.

The standard comparative issue designated in NCE proceedings inquires into the extent to which each of the proposed operations will be integrated into the overall cultural and educational objectives of the respective applicants. The FCC also asks whether other factors in the record demonstrate that one applicant will provide a superior NCE broadcast service. Between 1970 and 1988, NCE applicants were also compared on the manner in which their proposed operation met the needs of the community to be served.

The proceeding is being opened because the one initiated in 1992 did not produce useful proposals regarding the NCE comparative criteria. The FCC wants greater participation by interested parties and in the new proceeding plans to focus solely on NCE comparative hearings. ■

Harry Martin is an attorney with Reddy, Begley, Martin & McCormick, Washington, DC. Respond via the *BE* FAXback line at 913-967-1905 or via E-mail to be@intertec.com.

As the manufacturer which performed the world's first installation of a full digital studio back in 1985, THOMSON BROADCAST is proud to introduce the 9200, the newest member of its digital switcher family. This unit is the crowning achievement of a design team that boasts almost a

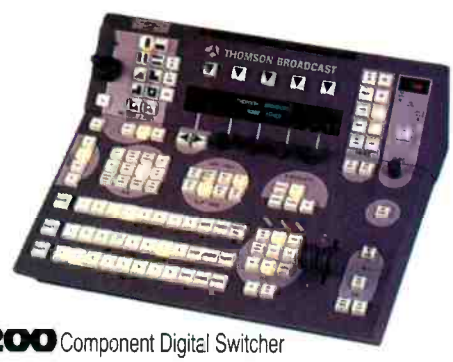


decade of experience in conceiving, manufacturing and delivering only component digital switchers. **The 9200** is a compact 1M/E + DSK with functional innovations that blow away the standard limitations of switchers of this size : M/E or multilayer, video or key freeze, fluorescent display, double transition, input level correction, source memory Mem Box with keyframes and sequences, timeline control, 6 auxiliary busses, and more. Besides being feature-rich, the 9200 switcher is ergonomically designed and interfaces easily with existing equipment. THOMSON has funneled its years of experience to produce a powerful, innovative component digital switcher within an affordable package. We used our expertise to do the hard work, so you won't have to.

MBAYE, GADIGO & ASSOCIES

THOMSON BROADCAST

State of the digital art



9200 Component Digital Switcher

Circle (11) on Reply Card

THOMSON BROADCAST - 17, rue du Petit-Albi - B.P. 8244 - 95801 Cergy-Pontoise Cedex FRANCE - ☎ (1) 34.20.70.00 - Fax : (1) 34.20.70.47. - Telex : 616 780 F
USA - THOMSON BROADCAST, Inc - 49, Smith Street - P.O. Box 5266 - ENGLEWOOD NJ 07631 - USA - ☎ (1 - 201) 569 1650 - Fax : (1 - 201) 569 1511
UNITED KINGDOM - THOMSON BROADCAST, Ltd - 18, Horton Road - DATCHET - BERKSHIRE SL3 9ES - ENGLAND - ☎ (44 - 753) 581 122 - Fax : (44 - 753) 581 196

By Curtis Chan

Personal chemistry, part 3

In a topic that's dear to our hearts, Part 3 will discuss budgeting for growth. A budget provides management with a control mechanism to help in attaining goals. This month, we'll discuss *fixed*, *flexible* and *zero-based* budgets.

Fixed budgets are good for companies that have a stable sales history, little or no upcoming plans for change and depend on historical data for budgeting purposes. Companies with multiple services and products with wide fluctuations in sales might need a more flexible budgeting process. For companies that believe they can plan more realistic budgets if they don't depend on historical performance, the option of a zero-based budget is usually the most attractive.

Fixed budgets

In a fixed budget, actual costs are compared with budgeted costs without taking into consideration business volume. Fixed budgets are great for operations where business volume is relatively constant, or where it fluctuates in expected and predictable patterns. This style of budgeting is useful when management is focused on an operational area that is stable and predictable. Fixed budgets are based on the single best-estimate method in which a single goal of sales is projected. Based on this goal, best estimates are then made for all items related to it, such as the cost of goods, general and administrative expenses, taxes, profits, etc. There's a down side, however. Expanding companies that don't know their major profit centers from year-to-year, or that serve erratic demand or growth markets, can usually do better with a more flexible budgeting scheme.

Flexible budgets

In flexible budgets, management looks at individual cost items to determine which items can be "flexed," and how much each needs to be altered in order to accommodate variations in sales levels. Key benefits include a continually updated budget, adaptability, accountability and realistic guidelines.

First, managers aren't forced to work with an outdated budget. Second, the flexible budget is adaptable because it allows the company to take advantage of unforeseen opportunities. Third, flexible budgets tend to hold managers more accountable for their actions. This is because when circumstances change, the budget should change accordingly. In contrast, the greatest drawback to a fixed budget is that it allows managers to disclaim responsibility by placing blame on the ineffective fixed budget system. Finally, a flexible budget results in realistic guidelines because expansion and contraction of the markets and economy are the control mechanisms used in the decision-making process.

A budget provides management with a control mechanism to help in attaining goals.

Three types of flexible budgets include *unaveraged*, *simple-average* and *weighted-average*.

- *Unaveraged flexible budget.* Three levels of net sales are forecast based on three potential sales estimates — optimistic, realistic and pessimistic. The estimates are not averaged but stand on their own as forecasts. This type of budget works when you feel reasonably sure that one of the three estimates are accurate and that you simply want additional information (such as time and expense) for potential deviations. There are some potential pitfalls, however. Management tends to be biased toward one of the three scenarios. No probabilities of occurrence are assigned to the estimates that further reduces the validity and accuracy of the forecast.
- *Simple-average flexible budget.* This scenario uses the same three averaged estimates of sales, costs and profits. The main drawback is that management assigns equal weight to each of the three projections, assuming that each has an equal probability of occurring. This is highly unlikely since sales levels depend upon a variety of variables, including the economy, competition and sales efforts.
- *Weighted-average flexible budget.* In this process, management assigns a level of probability to each of the three projections. This makes the method more complex because it requires research into variables like past experience, estimates of future performance and the health of the industry and economy.

The fixed budget is the least complicated and is appropriate in an environment of certainty and stability. The unaveraged flexible budget is used for analyzing variances in manufacturing overhead costs. The simple-average flexible budget is used when the probabilities of various projections are equally distributed. Last, the weighted-average flexible budget is more appropriate where risk and capital requirements fluctuate unpredictably.

Zero-based budgets

What fixed or flexible budgeting fails to provide is efficiency evaluations of current operations. As a result, management has a hard time prioritizing allocated funds among various departments. This penalizes profit-making departments while less-profitable departments are encouraged to increase their activity. The result is a company budget that doesn't reflect company objectives.

Zero-based budgeting (ZBB) avoids these problems by requiring each department manager to become involved in the budget process. ZBB is based upon need because it forces a company to evaluate all activities at all levels of operation to arrive at new and realistic budgetary plans.

Traditional budgeting often fails because its projections are based on past data, albeit highly modified at times. Consequently, inefficient operations continue year after year, while new areas of potential profit are often deprived of funds because the previous period's budget is assumed to be a valid base from which to work. Because conventional budgeting focuses on cost center line items, the process doesn't alert management to what can be expected from the elimination or reduction of a budget item. This makes it harder to determine which operations are the most cost effective.

When implementing ZBB, it is assumed that a business is conducted in terms of activities, rather than on cost centers. Therefore, it is assumed that last year's budget isn't valid and all business activities must be justified from the ground (zero-base) up. ZBB enables management to weed out marginal activities and prioritize funding levels for the necessary and profitable activities. It also requires managers to analyze each activity as currently performed, come up with at least two alternative methods of accomplishing that activity and then rank these alternatives on their relative merits. Thus, inefficient operations are isolated and exposed, and better alternatives for achieving company objectives are initiated.

Curtis Chan is president of Chan and Associates, a marketing consulting service for audio, broadcast and post-production, Fullerton, CA. Respond via the *BE* FAXback line at 913-967-1905 or via E-mail to be@intertec.com.

© 1995 Matsushita Electric Corporation of America

DIGITAL LEADERS.

TCI SEES 6,000 PLUS HOURS OF HEAD LIFE WITH PANASONIC D-3.

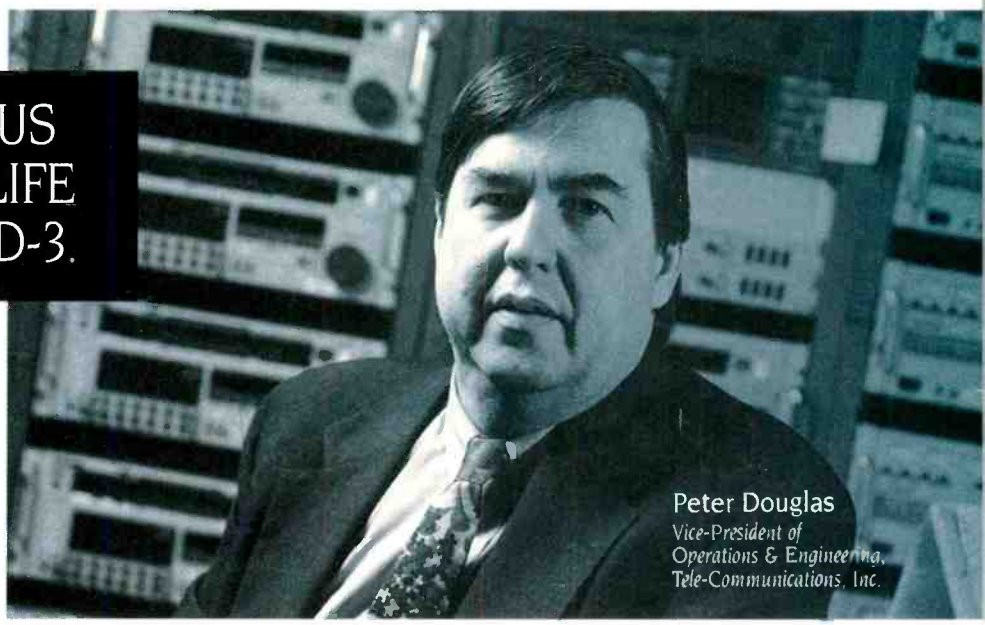
"At TCI's National Digital Television Center, we have adopted D-3 as our primary format for on-air playback. Sixty Panasonic AJ-D340 D-3 recorder/players are used for our Pay-Per-View services—PrimeStar and Request TV—that the Center distributes.

Twenty-one AJ-D350 D-3 studio VTRs are used for editing and mastering all promotional/interstitial programming for Request TV.

"TCI purchased the D-3 VTRs for their digital video quality, serial digital interface and four-hour tape recording time to record movies more than three hours in length.

What we had not anticipated was the dramatic cost-savings we are realizing with the 3000-6000 hours of head life the AJ-D340s are averaging.

"Many of the AJ-D340 VTRs are in use 15 hours a day, seven days a week. No AJ-D340 video heads have worn out since putting them into service more than 18 months ago. Several AJ-D340s have more than 6,000 hours of head life. One machine has more than 8,500 hours on its original head! While the AJ-D350s are not as forgiving as the -340s because of the different application, we're seeing terrific longevity with their heads as well.



Peter Douglas
Vice-President of Operations & Engineering, Tele-Communications, Inc.

"We had budgeted 2,000 hours of head life on the Panasonic equipment; clearly it has performed well beyond that. Our head wear and general maintenance requirements with D-3 are virtually nil.

"The AJ-D340 is simply a great movie-playing machine."

Panasonic engineered the D-3 format with a low tension tape path to enhance head life, a specification that is more than delivering on its promise at TCI. Just the sort of performance in critical applications that you can expect from Panasonic.

First in Digital Video.

Panasonic
Broadcast & Television Systems Company

For more information call: 1-800-528-8601 (Upon request enter product code 04) One Panasonic Way, Secaucus, NJ 07094.

By David Cox

Managing multiformat signals

The last few years have seen the advent of serial digital video and audio formats. As a result, users have had to accommodate existing analog formats while anticipating the accommodation of new ones. However, before any capital equipment investment is made, expectations must be set and the technical issues addressed. This article discusses some of the major points associated with multiformat routing systems.

Physical size

Perhaps one of the first pictures conjured up when thinking of multiformat routing is how much rack space will the system occupy and will each frame be totally dedicated to supporting a single format? Fortunately, surface-mount techniques coupled with smart architecture allows the fabrication of smaller matrix frames. These frames are capable of accommodating analog and digital formats. In addition, they reduce rack space to levels previously unimagined.

Now that smaller frames are available, it prompts us to ask further questions: Can the frames effectively be broken down into smaller submatrices? Are the frames capable of accommodating analog signals today and digital circuit modules in the future or perhaps both simultaneously? This depends on the hardware and the control system's software.

Control systems

The heart of all routing systems is the controller, therefore, this area will have special importance to the system manager and the operators. Today, most of the equipment in use will probably be analog, although tomorrow's equipment will be digital. For now and for the foreseeable future, they will coexist, so consideration of what is needed today and tomorrow will always be in the minds of new equipment purchasers. It's this consideration that requires a tight relationship between the routing system's hardware and software.

Today's users need the ability to switch analog inputs to digital outputs and vice versa. In the longer term, they must be provided with an upgrade path to an all-digital signal environment. How can this be accommodated? By using single frames that support analog and digital video formats and frames that support analog audio and AES-EBU formats, appropriate circuit modules can be located in the frames. With a matrix- mapping technique, these circuit modules can be mapped to provide suitable hardware boundaries, i.e., analog and digital video boundaries (matrices) within the same frame.

Today's users need the ability to switch analog and digital formats.

Much of today's hardware architecture is designed around 32 x 32 building blocks because it provides high component packing density resulting in cheaper fabrication costs. With the aid of intelligent control panels these hardware boundaries can be partitioned into smaller segments, i.e., the analog video matrix modules can be configured to switch analog composite and analog component signals. Equally, the digital matrix boundary can be segmented to support 143Mb/s, 177Mb/s (composite digital PAL), 270Mb/s and 360Mb/s, all of this within the same frame, if required.

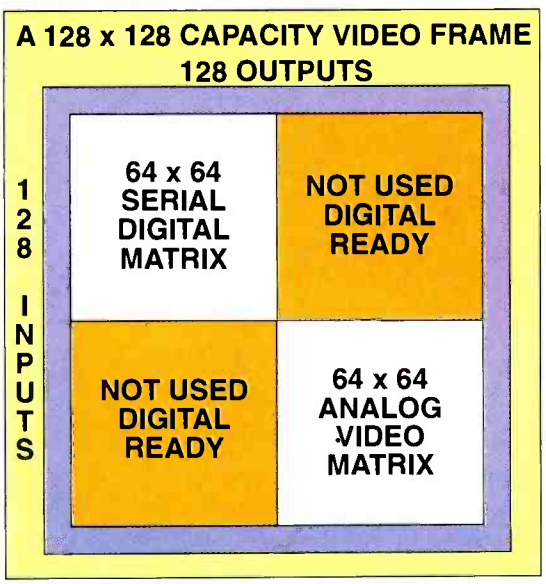


Figure 1. A video frame with a capacity of 128 x 128 can be mapped into two 64 x 64 matrices, one for analog, another for digital.

Matrix mapping and tie lines

Let's look at a situation where we have an analog requirement, but expect to go serial digital in the future. We assume that the video frame is capable of accommodating a 128 x 128 matrix that supports analog and digital modules as shown in Figure 1.

Each of these sections can be mapped further (segmented) in software. For example, we can map the analog matrix to accommodate RGB and composite video signals. Equally, the serial digital video matrix can be mapped to accommodate composite serial digital video signals and component serial digital video signals. (See Figure 2.) The ability to control each of these matrices or levels would be determined by the features empowered to each control panel.

The same rules would apply to audio, i.e., an analog audio matrix can be segmented to provide stereo audio and time code. Thus, at a later date, the upgrade to an all-digital installation would require only module changes in the matrix hardware.

If we were to take this matrix mapping a stage further, there is often a requirement for an analog machine to be switched to a digital machine and vice versa. It requires the operator to know where the appropriate inputs and outputs are located on the matrices and the location of appropriate format converters. Smart router control systems and intelligent control panels should make this type of operation transparent to the users. A typical operation is shown in Figure 3. Equally, if distributed matrices were required, a similar intermatrix tie line principle can be applied.

Serial digital video matrices

The first serial digital router was developed in France and processed signals at a data rate of 243Mb/s. The first 270Mb/s component serial digital matrix was developed in the United Kingdom in 1987. Serial digital routers can be broken down into the recognized conventional building blocks of input, crosspoint and output blocks, however, significant at-

tention to detail is required when designing digital signal processing.

The main criteria behind serial digital routing should be to maintain or improve signal fidelity and keep the signal processing to a minimum. Source equipment will be connected to the serial digital matrix inputs and this interconnection should use good-quality shielded coax. If this is the case, then the only degradation the incoming signal should be subjected to will be the high-frequency attenuation from within the coaxial cable. Therefore, a high-gain, high-quality automatic input equalizer circuit will restore the waveforms to their original shape. Automatic cable equalization circuits should be able to accommodate input cable runs of up to 300m (Belden 8281).

The equalized signal will then be subjected to further signal processing in the form of the serial digital crosspoint. This signal processing is facilitated by it passing through emitter coupled logic (ECL) circuits. As the signal passes through these circuits, asymmetrical rise and fall times can be generated, thus distorting the mark/space ratio of the signal. Although its amplitude and rise times may appear within the specifications, this is a serious problem because the phase comparitor in the clock recovery circuit translates it to an instantaneous frequency change.

In order to minimize the asymmetrical distortion, differential signal processing should be employed. Therefore, the output of the equalizer should provide a differential output which, in turn, is handled by differential crosspoint circuitry. The signal quality is totally dependent upon the design of the serial digital crosspoint and associated logic circuits. Other factors that can contribute to asymmetrical errors are poor terminations and poor return loss.

Any residual asymmetrical rise times (jitter) can be further eliminated by adding an output reclocking circuit prior to the true 75Ω output BNC connector.

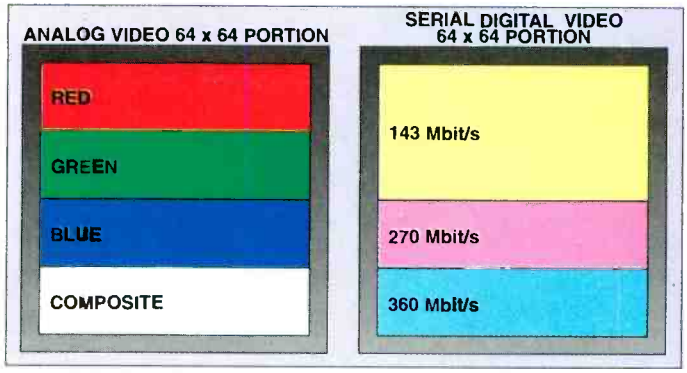


Figure 2. With intelligent router control, the analog and digital sections of the router shown in Figure 1 can be further mapped to allow for different video formats.

Input reclocking and error handling

Input reclocking is only necessary when the incoming signal or the router design dictates it. Early designs used reclocking as a safety measure to allow for poor input signal recovery or signal processing within the router itself. However, if good design rules are followed, then input clocking may not be necessary.

Error signals, for detection purposes, can be embedded into the serial digital video datastreams and are put there to show up any inadequacies in the signal path. These error signals are referred to as error detec-

tion and handling (EDH) signals. They are part of the serial digital signal format and are designed to assist in troubleshooting. Serial digital routing switchers are not expected to change the signal in any way as far as EDH monitoring is concerned, but they should be capable of passing these signals, enabling them to be switched to respective external monitoring points.

This concludes our discussion on routing system management, planning matrix mapping and serial digital routing techniques.

Next month's column will look at digital audio formats and physical control systems. ■

David Cox is a senior product specialist with Dynatech Video Group, Newbury, Berkshire, England. Respond via the *BE* FAXback line at 913-967-1905 or via E-mail to be@intertec.com.

For more information on multiformat routing systems, circle (302) on Reply Card. See also "Switchers, Routing" on p. 74 of the BE Buyers Guide.

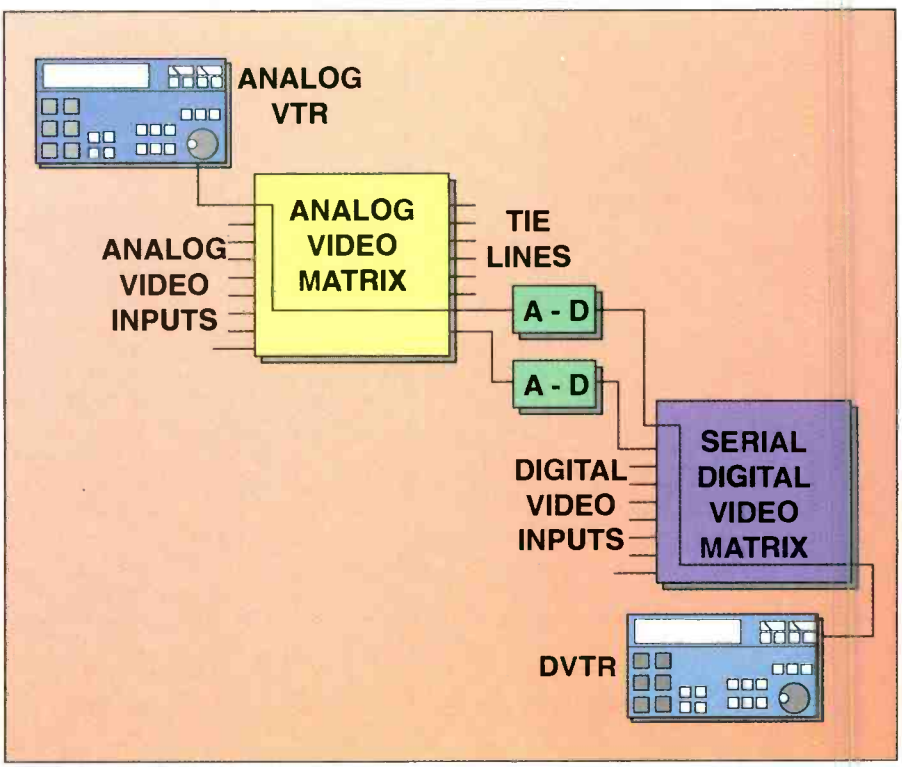


Figure 3. *Using intermatrix tie lines and intelligent control, format conversions can be made transparent to the user.*

Snell & Wilcox.
"Your essential guide to digital."

"THIS MUST BE THE LEGENDARY ANALOG'S GRAVEYARD..." GUESSED SNELL.

Do you really need to dump your existing equipment to change to digital?

"THEY OBVIOUSLY WENT DIGITAL TOO ABRUPTLY" GASPED WILCOX.

Does changing to digital have to be so daunting?

"WHEN THE WORLD WENT DIGITAL THEY GOT LEFT BEHIND" SNELL EXPLAINED.

Don't get left behind! Come and explore the way ahead with Snell & Wilcox.

Buy "Your essential guide to digital" only at address below.

SNELL & WILCOX

Engineering with Vision

Circle (6) on Reply Card

Telephone: US (408) 734 1688. Fax: (408) 734 4760. UK +44 (0) 181 607 9455. Fax: +44 (0) 181 607 9466. Email: Info@Snell.co.UK

By Peter Bryenton

Location lighting

Anyone used to the luxury of a studio lighting system has a few surprises in store when they go out on location for the first time. Wherever you want a lamp, you have to put it there. It must be rigged using a variety of fancy metalwork called grip gear. Each lamp also needs power. All of this equipment has to be transported to the location, so if you're a one-person operation, you'll want to keep things simple.

New directions

The current generation of portable broadcast cameras has brought video into a new era of electronic photography. The latest chips and lenses are capable of producing outstanding results in a variety of challenging light environments. There has been a corresponding leap forward in TV lighting techniques in order to take full advantage of these new freedoms, such as improved contrast handling capabilities and noise-free shadows.

Traditionally, video has had an attribute of looking "lit." This artificial approach had its rightful place back in the pioneering days when merely getting a picture out of a camera was a feat in itself. Many dedicated craft professionals tried their level best to make simple, clean and effective lighting setups. To their eternal credit, they routinely succeeded in winning the battles for technical and aesthetic supremacy. They regularly covered live multicamera shoots leaving viewers mostly unaware of the unavoidable compromises.

The tried-and-trusted formula of overhead key, fill and backlight are gently but firmly being replaced as the creative possibilities of lighting for a single camera are recognized by a wider base of contemporary professionals.

The trend wherever appropriate nowadays is to try to make the images look as though they are not lit at all. Because no camera is as good as the human visual sense, there is still a requirement for lighting, but it can now be more subtle. The concept of enhancing what is (or would be) naturally available in any situation is at last a technical reality and has gained popularity with many professionals. If the camera can make good use of less light, then a considerable amount of time and effort can be saved all round.

On reflection

Light can be captured and directed in a variety of ways, and it does not always have to start out from a specific lamp. There is a wide range of lightweight reflectors on the market. At the low-cost end are simple sheets of white polystyrene (styrofoam or foamcore), sometimes referred to as *poly*. These boards can be held in custom grip gear to provide exactly the right amount of contrast control (fill). They do this by catching some of the wasted light coming from the main light source (the key). This technique puts detail back into the shadows for the camera creating an image on screen that more accurately represents what we expect to see. (Note that polystyrene is illegal for *indoor* lighting use in many areas because of the toxic gases it emits upon combustion.)

The key can be whatever is available. If it is the sun, orient your shot so that the sun is behind and a little off to one side of a person talking to the camera. A reflector can be positioned close to the camera lens to "balance" this. Such a setup is lightweight, quick to rig, self-balancing in terms of color temperature and easy to control. It also leaves no telltale specular highlights or a second set of hard shadows. Where tight sync sound is required, the boom swinger will appreciate the extra freedom.

The light coming from polystyrene reflectors has a soft quality. For a harder feel, you can use reflective boards with different surfaces. There are plenty of materials available to choose from. They modify the quality of the reflected light along a scale that ranges from an almost perfect mirror to softer, golden glows.

Classic approaches

If there is not much available light, it is tempting to use a lightweight portable tungsten lamp, available from a number of manufacturers. These are typically open-face (lensless) lamps made from fiber glass and aluminum. For their price, size and weight, they give out a fearsome amount of light. Used with a modern camera, they are capable of extended covering power. The quality of light is none too refined, but that's the price for leaving out the controlling but heavy, expensive and inefficient Fresnel lens.

In some situations, these lights' optical characteristics can make shadows with double edges. Used *neat* (untreated or raw), they are an extremely cruel thing to point at a face, starkly revealing all our human imperfections. For this reason, many location lighting camera operators never use a "naked" lamp, preferring instead to treat the front of the lamp with a diffuser. This often takes the form of a flameproof tissue, commonly called *silk*. The result is seldom as soft as it should be because the physical area of the light source remains relatively small. Simply opening out the barn doors in order to hold a bigger piece of silk immediately nullifies the doors' original purpose.

Bouncing that same raw light source off a diffuse surface transforms it into something much kinder. A range of flexible photographic reflectors and accessories can be used when traveling light (so to speak).

Newer methods

Another way to create a softer look is to fix a portable soft-box onto the lamp. These started life in the photographic world as attachments for studio flash. Modern materials and methods of construction now mean that a relatively large tent-like hood can be fastened onto the front of a small, portable light quickly and safely.

Discharge lamps are another possibility. Watt for watt, discharge lamps offer several times the effective light output of a tungsten source, but with the penalty of greater size, weight, complexity and cost. If you regularly need a lot of "daylight-on-a-stick," however, it is well worth looking at the current crop of flicker-free, variable-output *HMI* (Hydrargyrum Medium arc-length Iodide) type of discharge lamps.

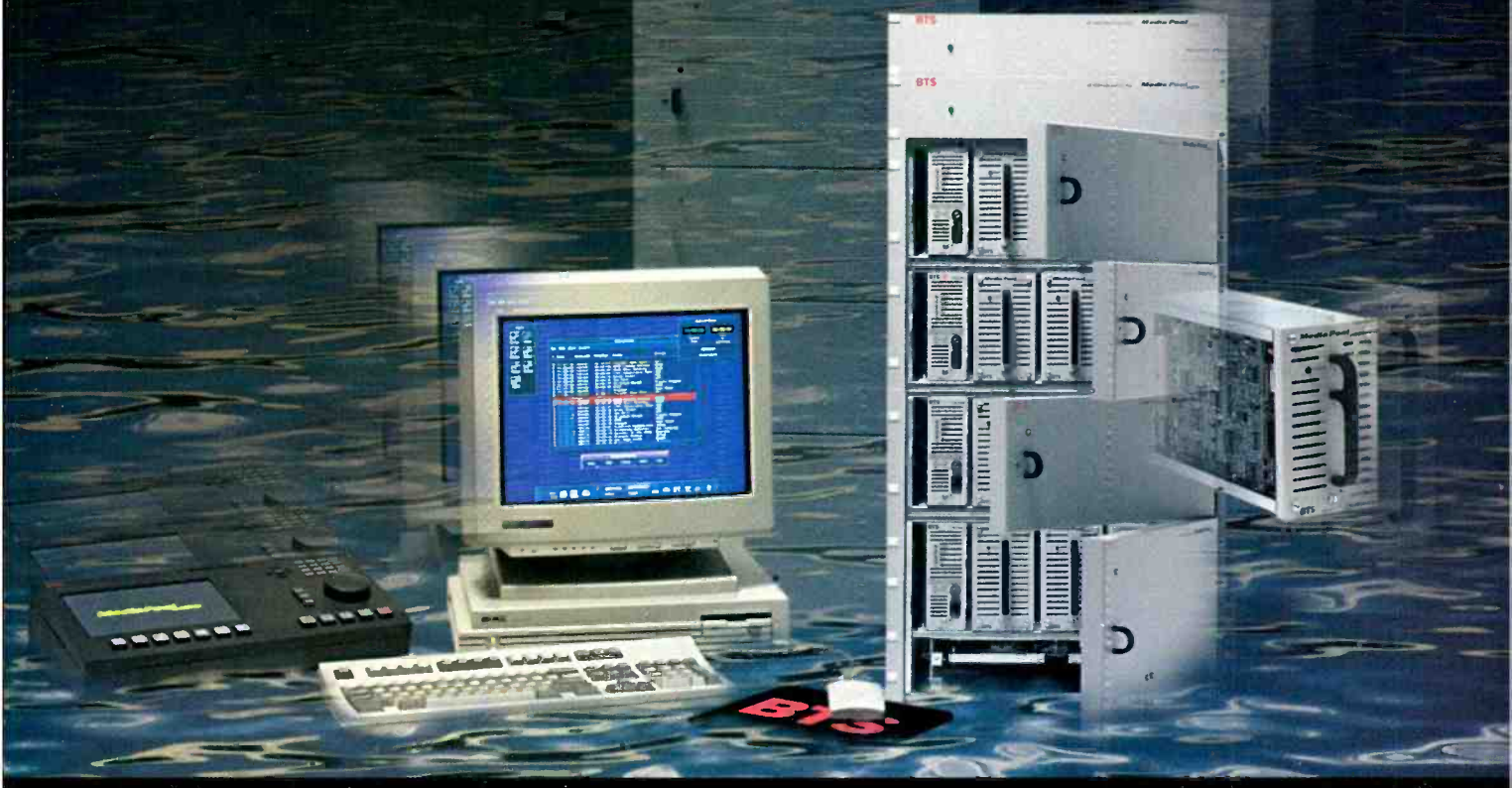
Location lighting gear means that you have to carry it about. It has to be light, quick and able to withstand repeated setting and striking without falling apart. Location lighting techniques often require resourceful and elegant solutions to everyday production requirements. If no one notices your efforts (except perhaps those of us passionately interested in lighting), then you have done the job well. ■

Editor's note: Thanks to Alan Walker of Alan Walker Associates, Los Angeles.

Peter Bryenton is a lecturer at the BBC's Centre for Broadcast Skills Training, where he specializes in TV lighting. The views expressed by the author are not necessarily those of his employer. Respond via the *BE* FAXback line at 913-967-1905 or via E-mail to be@intertec.com.

For more information on portable lighting equipment, circle (304) on Reply Card. See also "Lamps, Studio & Projection" and "Lighting Instruments, Kits," p. 72 of the BE Buyers Guide.

Finally, technology has caught up to your imagination.



Media Pool for Broadcast

Imagine putting the finishing touches on a news story moments before the director calls for it - or even editing the ending while the beginning is being aired.

Imagine editing a commercial spot minutes before traffic has it scheduled - it's as if you could edit inside your cart machine.

Imagine having all video and audio media available simultaneously - wherever and whenever it's needed.

Imagine a system where quality is never compromised - component digital video and better than CD audio quality.

Imagine recording full bandwidth, or using our variable compression option - choose the level of space-saving DCT compression - 2:1, 3:1, 20:1, you name it - every time you record.

Media Pool gives you the storage, the common access, the bandwidth, the resource management tools, the interfaces, and the video know-how to turn your imagination into reality.

BTS

Call toll-free (800) 962-4BTS
Outside the U.S. and Canada, call (805) 584-4700

A PHILIPS COMPANY

Circle (7) on Reply Card

By Marcos Sanchez

E-mail me, we'll do lunch ...

While sorting through 40 E-mails the other day (that's one day's worth for me), I noticed an interesting announcement. American Airlines will be adding E-mail retrieval to their beverage service. It seemed to me that E-mail had finally made it to the big league, there is no escaping it. Seeing that E-mail has become so ubiquitous, I thought this column would be a great place to talk about it.

It may not surprise you, but the vast majority of traffic over the Internet nowadays is not coming from the much-talked-about World Wide Web, but from E-mail. In the interest of understanding E-mail, I'll outline a quick sketch of what E-mail is and how it works.

Getting to know E-mail

E-mail that is sent out over the Internet is sent via a distributed electronic postal system. Much like our telephone system, this distributed network has nodes all over the country and the world. Once E-mail is composed, it is sent along to another computer (this could be AOL, CompuServe or your Internet access provider) that acts as a gateway to the Internet. After being sent through the gateway each message bounces from server to server on the Internet. Each time the message is screened to see if the addressing on the message matches that of the computer looking at it. Once the address on the message and that of the server match, the message is deposited in a mailbox that is later sorted by the server.

This system of bouncing around may seem awkward and inefficient at first, but there are several reasons why this works best. Most important, the Internet is based on a common protocol, the Transmission Control Protocol/Internet Protocol (TCP/IP). This simple protocol invented in the '70s allows normally incompatible machines with different protocols to speak to each other in a coherent language. So if you are on a Macintosh-based LAN using Apple Talk and your colleague is on a Unix LAN, you can communicate with each other via machines that speak both your language, Unix and Apple Talk, as well as TCP/IP. The other important reason is there are simply too many addresses in Cyberspace to keep track of them all in one place.

Tools for sending E-mail

An important aspect of E-mail is its ability to allow us to cooperate on projects and communicate between long distances quickly and inexpensively. This brings up some problems. For instance, you may want to send a picture in a format other than U.S. American Standard Code for Information Interchange (ASCII). The picture you want to send is in Graphical Interchange Format (GIF) (unlike ASCII which uses 7-bit U.S. ASCII characters representing a printable character of the alphabet, ampersand or a control function) are in a binary data format that requires all eight bits per byte. So instead of representing a letter of the alphabet, it is a part of an image. When decoded, an ASCII program will display meaningless gibberish (it may even miss large chunks of data that don't correspond to any ASCII characters).

One of the most important aspects of E-mail is its ability to allow us to cooperate on projects and communicate between long distances quickly and inexpensively.

In an attempt to solve this problem, several programs have been created for encoding binary data into ASCII so it looks like text to a mail system. The most popular of these is *uuencode*. First you run your GIF file through the *uuencode* utility and it creates a file that includes only ASCII text. When you are done, you simply include the entire text in your E-mail. On the receiving end, using the *uudecode* utility, you can decode the ASCII back into binary data (the first line of your file contains information for the *uudecode* program to decode the file). Other utilities that do this type of coding to ASCII are: *btoa* and *atob*, and *tarmail* and *untarmail*.

Equally important to sending files over E-mail is the ability to make files small enough to fit mailers that limit the size of messages. There are two popular programs that can compress files that can then be converted to ASCII if necessary; *compress* and *uncompress*, and *gzip* and *gunzip*. Essentially, these programs use complex algorithms to compress files to half or less of their original size. With both these programs, the receiver will need the decoding programs to decompress and then decode the file that is being sent to them.

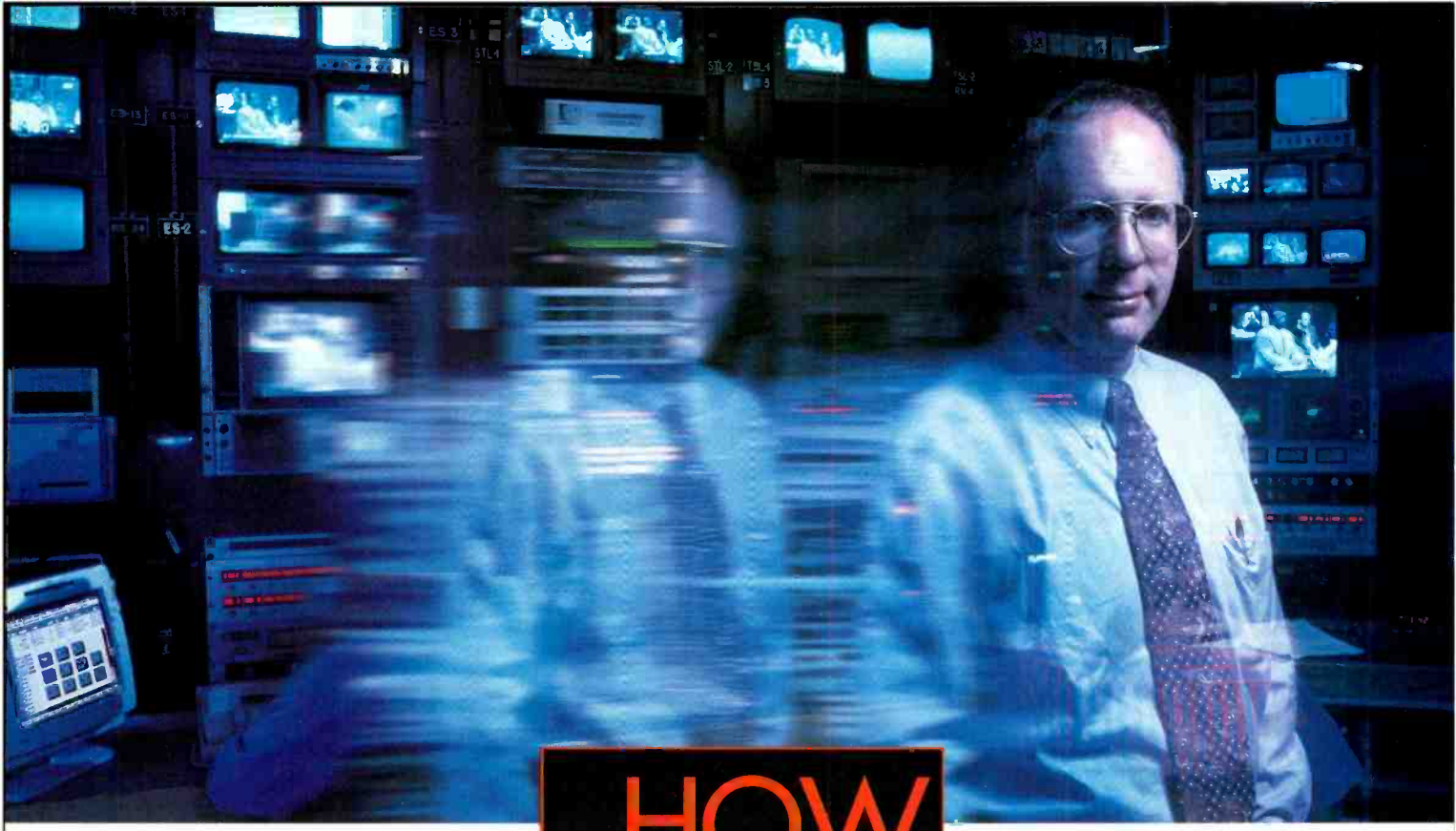
The last of the important tools for sending files is the Multipurpose Internet Mail Extensions (MIME) that lets you add graphics, sound, and complicated text to E-mail. Unlike *uuencode* and *gzip*, MIME allows you to enclose files without going through several steps. This is done by implementing standards so that a mailer that is MIME compliant can decode a message that is sent by any other MIME-compliant mailer.

There are quite a few other tools out there giving us more power by harnessing the information overload that we call work. From intelligent agents that know what we want to look at, to E-mail that includes the hyperlinking capabilities of the World Wide Web, there's something for everyone. Utilizing the various tools can help people work together over long distances, and as we have seen the E-mail address invade the business card, we will also see it invade our everyday lives. Who knows, maybe our virtual assistants will meet in Cyberspace to arrange a mutually convenient time for us to have our next lunch meeting? ■

Marcos Sanchez is an account executive and professional WWW surfer at Niehaus Ryan Haller, San Francisco. Respond via the *BE* FAXback line at 913-967-1905 or via E-mail to be@intertec.com.

Coming next month:

Client software for getting on the Web. Learn about browsers, helpers and the future of client software.



HOW FAST CAN YOU DISKO?

IF you want to make the move from tape to disk, Ira Goldstone has a few quick words of advice:

Q: As Director of Engineering at Tribune Broadcasting, you're in the midst of updating your entire system. How do you deal with the pressure?

A: *Carefully.*

Q: Right. So did you choose the Louth ADC-100 automation system to bridge to disk or give you future flexibility?

A: *Yes.*

Q: Meaning you liked Louth's ability to control all types of different devices?

A: *Yes.*

Q: And you weren't worried about any problems with proprietary automation software or choosing any disk vendor you wanted?

A: *No.*

Q: So if you were to give advice on how to make the transition to disk, without worrying about where your station goes in the future, what would it be?

A: *Louth.*

Q: And what about the multi-casting environment?

A: *Louth.*

Q: Of course, you'd still need a media management and traffic interface system to tie it together. Any final words of advice?

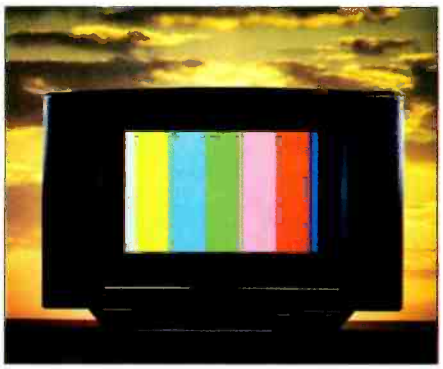
A: *Louth.*

LOUTH AUTOMATION

CORPORATE OFFICE: 545 MIDDLEFIELD ROAD, SUITE 160, MENLO PARK, CALIFORNIA 94025 (415) 329-9498 FAX: (415) 329-9530
REGIONAL OFFICE: 8400 NORTH UNIVERSITY DRIVE, SUITE 309, TAMARAC, FLORIDA 33321 (305)722-5116 FAX: (305)722-5104

Circle (8) on Reply Card

By Louis Libin



Where are we today with ATV?

The HDTV standard-setting process has always been and will continue to be a public, open process. Currently, the Grand Alliance (GA) is working with the FCC's Advisory Committee to complete the standard and launch HDTV. The result of this teamwork is a prototype system that will mark the end of an 8-year process.

For chief engineers and general managers, this means it is time to prepare for the roll-out of HDTV. Since 1987, NBC and the other networks have been working on the development of ATV and planning for the distribution and broadcast of HDTV pictures. The introduction of ATV will be a gradual process, and initially, the ATV market will be small. But as ATV broadcasts begin, viewer interest and demand for ATV receivers will increase. By the year 2002, the price of ATV receivers and set-top converters should bring ATV within reach of a mass market.

ATV forecast

In early 1995, the Advisory Committee will conduct extensive laboratory tests of the entire system in the United States and Canada to verify that the system meets its expectations. Then, the committee will recommend the system to the FCC and simultaneously begin final field-test verification of the system's performance. In turn, the FCC will consider the committee's recommendation in a rulemaking proceeding that should be concluded in late 1995 or early 1996. In accordance with FCC requirements, the technology can be licensed to anyone on reasonable terms.

Broadcasters then could be assigned a second channel and begin preparing to broadcast an ATV service. Once licensed for the ATV service, many broadcasters will move quickly to commence the new service, which will grow with consumer demand for ATV receivers and set-top converters.

The North American plan

It is anticipated that our Canadian and Mexican neighbors will simultaneously initiate similar, appropriate procedures to assure rapid adoption throughout North America. Moreover, because of early North American implementation, it is hoped that the rest of the world will adopt many of the elements of the North American HDTV standard. On the other side of the coin, unsuccessful North American ATV-spectrum treaty resolution will improve the likelihood of implementation delays.

ATV: The home stretch

By 2002, HDTV receivers should be plentiful and most broadcasters should be up and running with a viable ATV service. NBC is planning for a gradual, non-tumultuous transition to ATV distribution and broadcast. Movies and special events will be produced and distributed in an HDTV format and "downconverted" for NTSC broadcast. Other programming will be "upconverted" to the ATV format.

The secret is out: UHF is the future

The FCC is planning to allocate a second TV channel to each VHF and UHF TV station for an advanced TV system. The allocation of a second channel will allow every TV station to introduce an ATV broadcast service while maintaining its current NTSC broadcast service. In the future, the FCC plans to withdraw the current NTSC licenses so that stations will be required to broadcast only an ATV service. When the ATV broadcast service is introduced, the relative coverage advantages of individual stations will change. The FCC has already announced the intention to allocate *only* UHF channels for ATV. All channels will be equally accessible on the ATV receiver and most ATV channels will have coverage comparable to their NTSC population coverage. This means that from a service area perspective, most channels will be equally valuable.

NTSC signal strengths, a closer look

In order to fully appreciate the propagation characteristics of ATV, it is necessary for us to understand how NTSC signals work. Because of its analog nature, the quality of the received NTSC picture deteriorates gradually with decreasing signal-to-noise ratio as distance from the transmitter increases. Beyond the Grade B contour, viewable pictures can generally be obtained only by means of high-gain receiving antenna systems such as ones employed by cable TV headends. Because NTSC television is an amplitude-modulated system, the signals are also subject to multipath "ghosts" as well as natural and man-made electrical

ZONE 1 Maximum Permissible NTSC Television Station Facilities

				DISTANCES TO COVERAGE CONTOURS		
BAND	CHANNELS	ERP	HAAT	CITY GRADE	GRADE A	GRADE B
		(kW)	(meters)	(km)	(km)	(km)
Lo-VHF	2 - 6	100	300	42.1	54.4	103.6
Hi-VHF	7 - 13	316	300	52.3	64.1	95.3
UHF	14 - 69	5000	600	69.0	81.5	106.6
UHF*	14 - 69	5000	300	55.4	64.5	82.8

* Limited HAAT; not maximum facilities

Table 1. The basic parameters for NTSC channels: the Zone I ERP and HAAT limits for each channel group, along with the distances to City Grade, Grade A and Grade B contours. FAA concerns, zoning restrictions and costs frequently act to limit antenna height for UHF stations to less than the maximum permissible 600 meters.

PERFECT PICTURES

PICTURE PERFECT

DIGITAL VIDEO OVER FIBER







IMTRAN®

Multi Channel Digital
IMage TRANsmission
From IPITEK®

Broadcast Quality
Multiple Stereo Channels
Data Signaling Channel
Drop and Insert
Multimode or Single Mode
1310 or 1550 Nanometers
Channel by Channel
Upgradable
Digitally Repeatable
Baseband In/Baseband Out

IMTRAN® applications include *Broadcast Video, CATV, Distance Learning, Security and other uses* requiring high video and audio quality over long distances. Call our Application Center for more information.

Call today to discuss your IMage TRANasmission needs.

IPITEK® FIBER OPTICS
A TACAN COMPANY

2330 Faraday Avenue
Carlsbad, CA 92008
Phone: (619) 438-8362
FAX: (619) 438-2412

See us at SCTE, Booth #917

noise that shows up as annoying sparkles and lines in the picture.

NTSC, we sort of got used to it...

For the most part, excellent NTSC pictures are available within a station's City Grade contour. Pictures of good, but not excellent quality, are received within the Grade A contour; and pictures of marginal quality are received out to the Grade B contour. However, this is a gross oversimplification.

Actually, TV reception varies widely from location to location and over time. The different grades of reception are statistically derived on the basis of time and location variability.

During the field tests of the Grand Alliance prototype transmission subsystem in August 1993, a high degree of UHF multipath variability was observed. The received signal strength was found to vary widely over brief time intervals and between nearby locations. Even a fraction of a foot could result in a significant change in signal strength. This variability cannot be attributed to terrain blocking the path; it can only be caused by multipath interference. (See Table 1.)

ERP disparity

The effect of the tremendous disparity in ERP can be seen in today's NTSC City Grade contours. A comparison between the City Grade contours of a low-band VHF, a high-band VHF and a mid-band UHF channel reveals much about the differing propagation characteristic of the different channel groups. *City Grade coverage extends much further for a UHF station than for a low-band VHF station.* The UHF station has greater "brute-force" signal strength to override man-made and natural noise, and thus can provide excellent reception near the transmitter.

On the other hand, because low-band VHF stations can provide Grade B coverage at comparable distances with far less ERP than UHF stations, the low-band VHF station is permitted less ERP to overcome atmospheric and man-made electrical noise. Therefore, a low-band VHF station has far less City Grade coverage than a comparable UHF station.

A typical UHF station may have a HAAT of 300 meters. With this height, a UHF station has a Grade B contour radius of about 85km. This is almost exactly the distance to the horizon for a transmitting antenna height of 300 meters. Beyond the horizon, UHF signals drop off rapidly in strength, while low-band VHF signals fade much more gradually. A 100kW low-band VHF station with 300-meter HAAT provides Grade B service 20km beyond the horizon. In order to achieve a Grade B coverage radius of about 105km (65 miles) with ERP of 5,000kW, a UHF station must employ an antenna height of 600 meters. The horizon for 600-meter HAAT is 113km, so a maximum-facility UHF station's Grade B contour falls 8km short of the horizon, but you can still receive a signal to the horizon. ■

Louis Libin is the director of technology at NBC, New York. Respond via the *BE* FAXback line at 913-967-1905 or via E-mail to be@intertec.com.

Next month: In next month's column, we will begin to analyze ATV signal strength and its relationship to coverage, power, power bills and equipment.

KEEP YOUR VIDEO & AUDIO IN SYNC!

D1 Serial Frame Synchronizer/Proc Amp
- Synchronizes D1 signals to a local analog or digital Reference
- Digital proc amp for Local/Remote level control
- Local/Remote freeze control

Video Delay Detector
- Interfaces directly with frame syncs, color correctors etc. from any manufacturer
- Controls AD2100 for automatic lip sync correction
- Measures up to 8.99 fields of video delay
- NTSC/PAL compatible

Stereo Audio Synchronizer/Delay
- For lip sync correction, pitch shifting, obscenity screening and other audio delay applications up to 6.14 sec
- Variable pitch shifting plus automatic correction during delay changes
- Analog and AES/EBU input and output
- Digital Sample Rate Conversion

See us at Montreux Stand #13526

To learn more about our complete range of video and audio processing products, call Pixel Instruments, or your local distributor today.

China/Hong Kong/Taiwan
Mediatech
Phone 852-2687 1299
Fax 852-2687 0599

South Korea
A.T.I.
Phone 82 02 574-4011
Fax 82 02 574-5800

Italy
C.V.E. S.p.a.
Phone +39 362-220642-3
Fax +39 362-220642

South Africa
Telemedia (PTY) Ltd.
Phone 27-11-803-3353/4
Fax 27-11-803-2534

United Kingdom
GEE Broadcast Systems
Phone +44 256-810123
Fax +44 256-810061

PIXEL INSTRUMENTS CORPORATION Twin Parks Building, 718 University Avenue, Suite 210, Los Gatos, CA 95030 Phone 408-354-9122 Fax 408-354-0122

Circle (15) on Reply Card

Space age CCD-cameras don't fit on iron age pedestals

The new Sachtler Vario Pedestals offer unique features for studio and OB operation:

1 Continuous column stroke, for shooting from sitting to standing person's hight – Vario Ped 2 - 75.

2 Rock steady and 50 kg/110 lb lightweight, to carry ecuipment up to 90 kg/200 lb – Vario Ped 1 - 90.

3 Carriage and column can be disassembled in seconds – compact modules for ease of transportation.

4 Quickfix, allows instant change of fluid heads for flexibility – included.

5 Track width, narrow and wide, symmetric and asymmetric – set in no time and you well can expect precise, easy steering and crabbing, smooth and jerkfree column movement thanks to the patented Sachtler pneumatic system. Test for yourself the optimum camera support for all compact Studio/OB cameras, now!

55 North Main Street
Freeport, N.Y. 11520
Phone (516) 867-4300
Telex 140 107 sac frpt
Fax (516) 623-6844

California office:
3316 West Victory Blvd.
Burbank, CA 91505
Phone (818) 845-4446

sachtler
corporation of america

Circle (14) on Reply Card

SPECIAL REPORT:

Avid/Ikegami CamCutter

By Kenneth Hunold

Non-linear has been a buzz word in the editing world for some time. The benefits of non-linear editing include non-destructive editing (i.e., "cutting" clips does not change the original source material), the ability to re-cut sequences quickly, and quick random access to segments stored in the system. The drawbacks include the high cost of storage media, artifacts of video compression (made necessary partially because of the high cost of storage), and time lost to real-time downloading (digitizing) of material from tape to disk.

One of the top items on the wish list is a method to bypass the digitizing step in the downloading process. The only way to accomplish this is to skip the step of recording on tape and record directly to disk (or other media that could be accessed randomly or "non-linearly"). Taking the output of a camera and connecting it directly to a rack-mounted digital disk recorder or non-linear editing system could accomplish this. However, such a combination, although entirely feasible, is cumbersome at best and not that portable. For field use (either news gathering or field production), a different approach is needed.

The first product to address direct recording to digital disk in the field has been developed by Avid Technology in cooperation with Ikegami Electronics. CamCutter is a disk-based video recorder that can be connected (or docked) to many ENG camera systems. Ikegami is incorporating CamCutter technology into two of its new camera/recorder systems, one for EFP, and the other especially for ENG operations.

CamCutter

Avid and Ikegami have worked together to develop a system of products designed for non-linear field acquisition. This includes news, commercial EFP and other material destined to be edited later on a random access, non-linear editing system. From the beginning, Avid and Ikegami wanted to introduce a system that retained the size, power consumption, familiar operator interface and form factor of the current breed of camcorders, but also put the power of a non-linear editing system in a shoulder-mount package. CamCutter is a fully self-contained editing system that is built into the (former) VTR section of the recorder/camera combination. It is designed to be operated from the control panel on the side of the recorder -- without the need for a mouse or computer monitor.

The control panel starts with the traditional tape transport controls (record, play, search, etc.). Adjacent to this panel is a 320 x 240 pixel LCD display surrounded by 12 "smart keys" allowing direct operation of the editor. A numeric keypad will also be provided to navigate through the clips by either time code or clip number. Editing performance in this mode will be equivalent to a Beta SP "cuts-only" editing system. For more elaborate control functions, an Ethernet and RS-422 interface can be active simultaneously. An output jack allows for an external video monitor to view the material being edited. Estimated cost for the dockable version of CamCutter will be approximately $19,000.

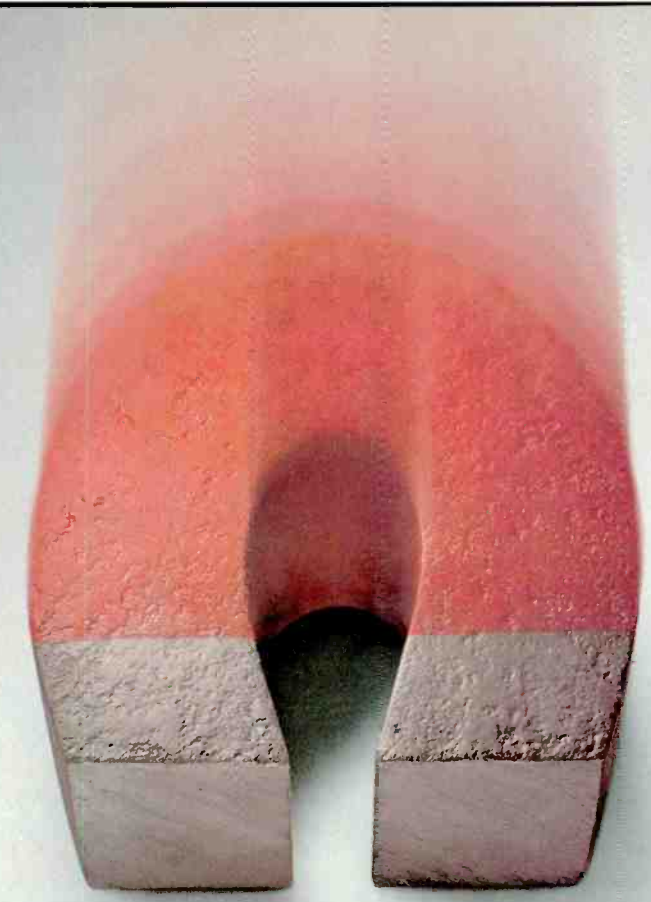
Operators will be able to collect, organize, edit and trim shots in the camera. A unique feature of the CamCutter playback sequencer will be the ability to intercut live camera video with edited video. This will allow complete edited segments (and their live stand-ups) to be aired from the camera, without necessitating an external VTR or editor. Microphone mixing is also automated by the sequencer.

How it's done

CamCutter samples and digitizes the incoming video according to ITU-R (formerly CCIR) recommendation 601. Incoming video is sampled at 13.5MHz at a resolution of 720 pixels/line by 486 lines. (Previous Avid products sampled at 640 pixels/line.) Component video is quantized at 8-bits per sample. This is truly "broadcast quality." Unfortunately, the resulting data rate is too high to pass through the various subsystems and must be compressed to pass through the FieldPak's enhanced IDE interface. Avid uses its proprietary Motion-JPEG (Joint Photographic Expert Group) compression algorithm called AVR-70 and quotes compression ratios of approximately 6:1 or 7:1.

Briefly, here's the math. Luminance video sampled at 720 pixels by 486 lines by 30fps by 8-bits/sample yields 84Mb/s. Add in the two color-difference channels (B-Y and R-Y), each sampled at one-half the luminance sample rate, and you arrive at 168Mb/s. (This is different from the 270Mb/s commonly quoted for 4:2:2 serial component video. When you sample 720 x 486 x 30 at 10-bits/sample, and then add in embedded audio, other ancillary data, and overhead needed for serial transmission, you arrive at 270Mb/s.) Com-

Above photo: CamCutter, a tapeless field acquisition system from Avid Technology and Ikegami Electronics.



Solid. Metal.

The 3M™ BC-Metal Betacam SP™ Videocassette. A positive force that delivers nothing short of a picture-perfect image. A solid performer. One try and you'll see the attraction. Call 1-800-752-0732.

3M *Reliability*

© 1995 3M Audio and Video Products Division, St. Paul, MN 55144-1000

Circle (16) on Reply Card

press 168Mb/s by the quoted approximate compression ratio of 6:1 and you get 28Mb/s. Converting from bits to bytes (eight bits = one byte) gives you approximately 3.5MB/s. The hard disk packs are capable of sustained data rates of 4MB/s, so there should be no problems recording the data rates produced by the compression system.

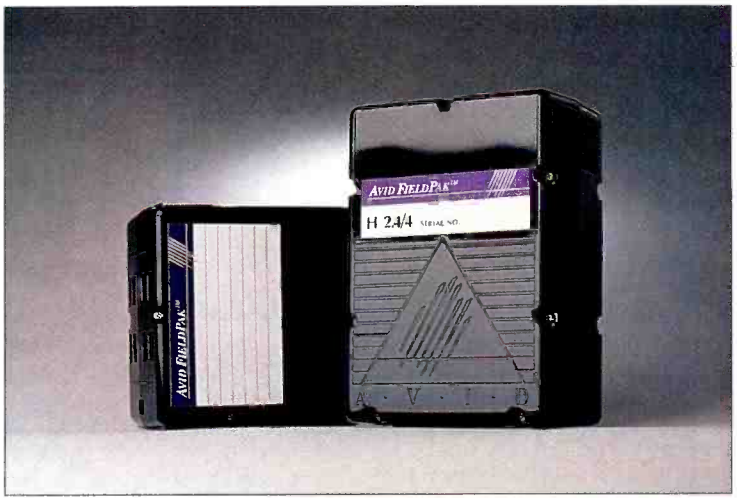
To date, no quantitative specifications have been published for AVR-70 resolution. Typically, descriptions of the video quality of compression systems are subjective (e.g. Beta SP or S-VHS quality). Because the data rate (and the subjective quality) of a JPEG-based compression system varies depending on the content of the video, any compression scheme should be evaluated with representative samples of the material to be passed through the system.

Avid's AVR-70 system uses Discrete Cosine Transforms (DCT) and Huffman encoding to reduce the size of the data file. Some scenes will compress effectively, producing a lower data rate, while other complex scenes will not, resulting in higher data rates. "Psycho-visual" properties could be used to mask noise and distortions generated in the compression process (just as psycho-acoustical properties are exploited in audio data compression schemes like Musicam and Dolby AC-2 and AC-3). Indeed, the 4:2:2 sampling process itself exploits the human visual system's lower perception of color resolution, sampling color information at half the resolution of luminance. The upper limit of signal-to-noise ratio with AVR-70 resolution is designed to be close to the limit of quantizing noise for 8-bit systems (i.e., around 54dB.) The lower limit could be much worse, but may be "masked" by picture content. The level of compression is user adjustable (but no less than 6:1 or 7:1). Considering that digital recording of ENG or EFP is by default an "on-line" process, the digitization and subsequent compression of the acquired video determines the upper limit of resolution and quality for the entire production process.

The CamCutter system will support video and four channels of DAT-quality audio. The audio is sampled at 48kHz and quantized at 16-bits/sample. The audio is not compressed before recording. Level controls are available for input and output. When recording, the output levels are fixed at unity. They are available for mixing the recorded audio tracks during playback and editing only.

FieldPak

If CamCutter is the brain of the digital news gathering system, then the heart of the system is the FieldPak hard drive. FieldPak is the actual recording media and has a capacity of 2.4GB. Currently, the unit consists of two 1.2GB hard drives in a sealed package. (The number and type of the physical drives can and probably will change as hard-disk technology progresses.) With dimensions of approximately 3" x 6" x 4.5" (WHD), it is roughly the size of a typical ENG battery and weighs about 2.25 pounds. FieldPak will provide 15 to 20 minutes of recording time (at AVR-70 resolution) and will cost approximately $2,000 to $2,500.



FieldPaks are the storage medium used in the CamCutter. Currently, two 1.2GB hard drives are contained in the sealed package.

Avid has described FieldPak as rugged, reliable, compact, weather-tight and completely sealed against moisture and dirt. It will hopefully be as durable as a tape cassette. It has been rated as being able to withstand a 2,500G shock (non-operating) or 5G to 15G while in use. The shock mounting on FieldPak will be optimized to be most effective with the type of G-forces typically experienced with camera movement. FieldPak will be able to recover from a near-fatal operating shock in less than one second. It will plug into the CamCutter much as a videotape cassette and connect via a military-style connector with approximately 50 pins.

As with all modern electronic equipment, the capacity of FieldPak is expected to increase. The price is expected to decrease as the technology involved improves. At the present time, however, no stations will be able to buy and use FieldPaks in the volume that they currently consume videotape. Given that, what can be done to maximize the use of the current capacity? Are there any by-products of non-linear acquisition that can be applied to make more efficient use of the recording media?

Avid has addressed this concern with a feature it calls "Retro-loop" recording. Retro-loop recording allows you to set aside a predefined length of time to constantly (and continuously) record incoming video. The recorder will loop back on itself and start over when you have reached the end of the pre-determined segment. When something newsworthy happens, you can then press the record button. The video in the loop will be attached to the beginning of the clip (as if you knew it was going to happen and pressed record just before it did). This will be useful for stakeouts, surveillance recordings, bank robberies, hostage incidents, and other events when you know something is going to happen, but you don't know exactly when. This is a benefit of any disk recording system, not just the CamCutter. The CamCutter is, however, the most appropriate application of this technique to date for news gathering.

A single-frame color bar reference is automatically recorded for each new FieldPak. Clip numbers are sequentially assigned every time you press the record trigger (similar to start IDs and program numbers on some DAT recorders) and can also be inserted manually for ease in locating events on the disk. Each "take" can also be subjectively graded for content ("1" for takes the director loved, "3" for takes that are questionable but may still be usable, etc.). Blown takes can be discarded. Resources that have been discarded are available for immediate re-use. It should be noted that deleted cuts are transferred to the "out-takes" bin (a "bin" describes a collection of files in the computer system) and remain in the out-takes bin until it is deliberately emptied. CamCutter stores the clips as DOS-based files with a mechanism for undeleting an erased clip.

Because CamCutter and FieldPak are essentially computer systems, many of the power conservation features developed for laptop computers could be employed to reduce power consumption and extend battery life. Power consumption for the dockable configuration of CamCutter is targeted for 19W.

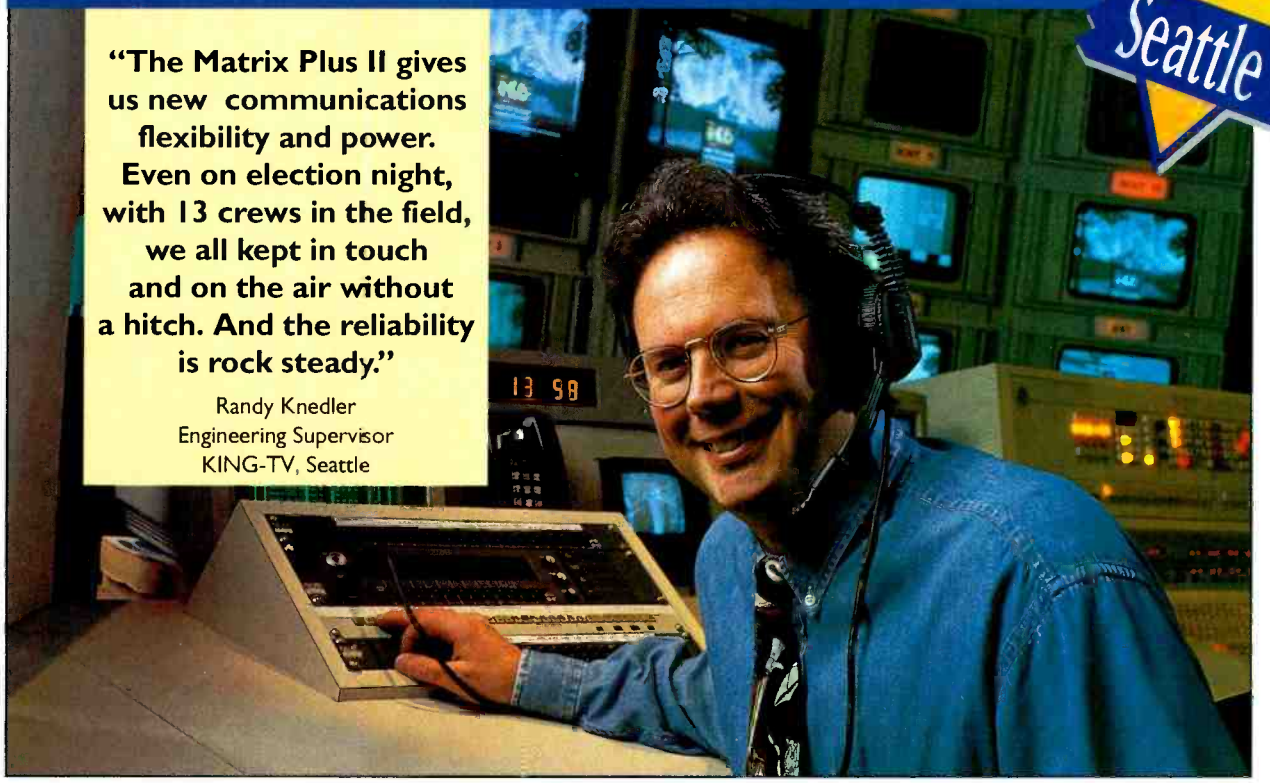
Because CamCutter is an editor, pieces can be rough cut and previewed on-site using various takes to determine how the piece will "cut." The client may have a better feel for how the piece will look if it is possible to see the individual elements edited together. If you have shot all of the elements for your piece, it is possible to edit the final version right in the client's office, if desired.

New camera features

Although most of the hoopla surrounding non-linear field recording is centered on the

THE TALK OF THE TOWN

Seattle



Everybody's Talking About the Power of the Matrix Plus II Intercom System.

KING-TV is the king of Seattle broadcasting; the market's news leader. A team of dedicated broadcast pros puts more than 4½ hours of live TV on the air everyday. At any given time, staffers are in the station, on the street, up in the chopper, or beaming in via microwave and satellite. While they rely on state-of -the-art equipment, they depend on one thing even more: each other. No matter what the situation, they have to stay in touch.

That's why Randy Knedler relies on the Matrix Plus II intercom system. Fully integrated, the system ties everybody together easily and neatly, whether they are on-site or calling in on the phone, the wireless, or via the bird. Many of the system's powerful intercom stations have bright electronically-labeled displays to let everybody know who's on-line and in-touch so that broadcasts go off without a hitch. And since there is no telling what the next broadcast will bring, the system reconfigures quickly to let anybody communicate with anybody...in just seconds.

"Station Identification" is easy with electronic or paper labels

No matter what news breaks in Seattle, Randy knows he can rely on the Matrix Plus II, just like broadcast engineers from San Francisco to Miami and from London to Tokyo. The Matrix Plus II. It's the talk of the town.

Matrix Plus™ II
DIGITAL INTERCOM

Domestic Sales: Clear-Com Intercom Systems
945 Camelia Street, Berkeley, CA 94710.
Tel: (510) 527-6666, Fax: (510) 527-6699

Clear-Com
Intercom Systems

Export Division: Clear-Com International
PO Box 302, Walnut Creek, CA 94597.
Tel: (510) 932-8134, Fax (510) 932-2171

Circle (17) on Reply Card

technology behind the recording process, the introduction of a whole new acquisition system offers an equally opportune time to introduce some enhancements to the camera side of the equation. What new features can camera manufacturers bring to the non-linear party? Ikegami Electronics will incorporate CamCutter technology into two of its new camera/recorder combination units. The company will also offer a system in a dockable form to retrofit existing Ikegami cameras. The first two units to be introduced are the DNS-11 and DNS-101 camcorders. The DNS-11 is targeted for electronic field production (EFP) applications and will cost approximately $50,000 to $60,000. The camera section features three 2/3-inch FIT CCD imaging devices. The DNS-101 is targeted specifically at ENG operations (portable, compact news-gathering applications) and will cost approximately $40,000. The camera section will be based on the new camera introduced at NAB, the HC-390. It will feature three 400,000 pixel 2/3-inch IT CCDs and f/8 sensitivity of 2,000 lux. At this light level the published video signal-to-noise ratio is 62dB. A "supersensitivity" mode of operation will be provided featuring 36dB of gain. Through a special process, it is said not to have as much noise as the 36dB gain spec would indicate. In the "supersensitivity" mode the minimum illumination needed for a 100 IRE video signal would be 1.75 lux (equal to 0.16 foot candles) at f/1.8 (a realistic wide-open aperture when considering the camera lens and the camera prism as a pair). Color correction is all electronic, eliminating the loss of light in the optical color correction filter. Another new feature of the camera is a smooth transition when you switch between the two white balance presets. This could improve the look of a news piece where a subject is followed from indoor (with one preset set for artificial light) to outdoor (with the other preset set for daylight). Power consumption for the DNS-101 is targeted at 29W.

The Ikegami DNS-11 digital disk camera with FIT CCD provides better than 62dB S/N and more than 700 lines of horizontal resolution at f8.0.

The MediaDock is an external adapter that can house up to three FieldPaks, increasing the storage capacity of the editing unit. Several MediaDocks may be joined together. MediaDock handles the conversion of the IDE interface used in the FieldPak system to the SCSI-2 interface used in the rest of the Avid product line. The files created on CamCutter are DOS-based and OMF (Open Media Framework) compliant for use on a NewsCutter non-linear editing system or for transfer over AvidNet. It is not necessary to transfer files to NewsCutter to edit them. It is, however, possible to do so.

For use at the station (or in a more elaborate field setup) Avid is developing a player unit to work with MediaDock. It will be controlled primarily by the Advanced PowerBook interface and can also be controlled by an editing system via an RS-422 port. It can be installed in either a desktop configuration or a 19-inch rack-mounted configuration. The 3-rack-unit (RU) player, when configured with the 2-RU MediaDock, will make up a 5-RU system that can operate on either 12VDC or 120VAC. The video output will be able to gen-lock to an external (station) reference, and digital outputs (in addition to analog composite) are also being considered. Approximate cost of the MediaDock will be $4,000.

There will also be tools for logging the video as it is being recorded. Buttons will be provided for shorthand notation of the video using an abridged user-defined lexicon of production values. If you can generically characterize your shots as long shot, medium shot, close-up, etc., than you can "log as you go" from the camera. Clips can also be recalled by shot description. It has not been decided at the present time whether it will be possible to log clips in real time via the laptop interface by another person (director, production assistant, continuity editor or other person). Also under consideration is some method of taking notes via an operator's mic and attaching the slate audio to the clip as sort of an audio "post-it."

Avid plans one last level of refinement to take place between NAB and this fall, when the first production versions are to be delivered. Refinements are expected to be in the areas of size, weight and power consumption. I suspect that this will also allow the opportunity to incorporate some user feedback into the product specification.

The concept (and prospect) of non-linear field acquisition sets the stage for some dramatic changes in the way electronic field production is structured. Also, it can expand the capabilities of coverage and editing in the field. The "word processor" analogy has been made, comparing the digital acquisition and editing of video and audio to the way documents are created and edited today. The future technology of non-linear digital acquisition could be as different from the current record-edit-playback cycle of today as word processing is from the linear typewriter-based document creation and wholesale revision process of yesterday. Non-linear technology also swings the same double-edged sword that plagued the first word processors. (Remember incompatible word processor file formats, slow floppy disk drives and 80 by 24 character-only displays?)

Unfortunately, powerful tools in the hands of an inexperienced craftsman will not make a better product. Skill, experience and proper training are essential ingredients in any successful and effective production. Haste makes waste. At the present time, non-linear editing is not necessarily faster than editing on linear systems. Although speed is constantly mentioned as a major advantage of non-linearity, the real advantage of non-linear editing is flexibility and capability. With a non-linear system you can quickly generate multiple versions of a story. The first version, however, (what would be the final version in the old linear days) may not be available any faster than with the old, linear system. As time goes by, we will improve our "throughput" and generate edited products in less time, just as we can now generate documents better and faster with today's modern word processor than we ever could with a typewriter. ■

Kenneth Hunold is a technology consultant for *Broadcast Engineering* magazine. Respond via the *BE* FAXback line at 913-967-1905 or via E-mail to be@intertec.com.

For more information on the Avid/Ikegami digital media recorder, circle (303) on Reply Card.

Denon's MD Cart™ Recorders and Players are the modern choice for *any* application that requires repeated recording and playback of audio, from broadcast to post-production. Why? Compared to NAB tape carts, the MiniDisc is free from wow, flutter, jamming, stretching, wrinkling, drop-outs and shedding.

MiniDisc's advantages (including *full* inter-machine, inter-brand compatibility) are quickly making it *the* universal standard. Compared to other digital formats, Denon's MD Cart technology offers the lowest cost per Megabyte of storage, shirtpocket transportability, and non-contact, optical media reliability.

Obviously, once you've chosen MiniDisc, your next decision is which MD to buy. Features like serial and parallel interfaces, digital and analog signal inputs and outputs, external sychronization, and *MD Remote*™ software (see side bar), make Denon MD Cart the obvious choice.

DN-990R MD Cart™ Recorder (shown) and the DN-980R/ DN-995R machines

Denon's MD Remote™ Software, running under Windows™, offers a graphical interface for fast, easy control of all functions and modes on any Denon MD Cart machine, including automatic dubbing of tracks or discs between machines, complete with titles and cue-point information.

YOU'RE STILL USING NAB CARTS?

Denon Electronics Division of Denon Corporation (USA),
222 New Road, Parsippany, NJ 07054 (201) 575-7810

Circle (9) on Reply Card

DENON
The First Name in Digital Audio

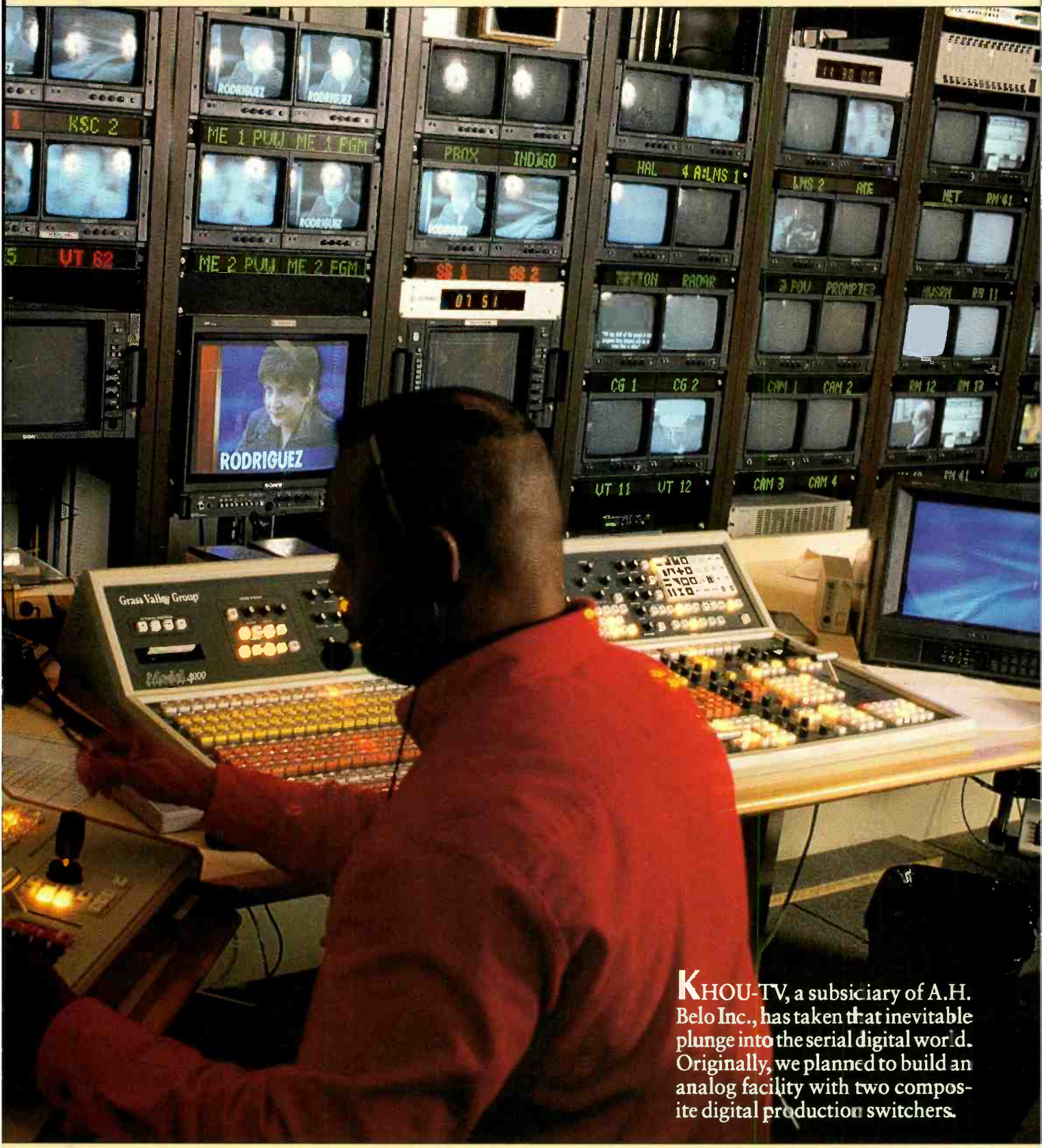
Building digital facilities

It is a learning experience for everyone involved, and one that must be taken to move forward into the next century.

The Bottom Line:

Converting broadcast facilities to digital is a process that has been under way for some time. Until recently, much of the process has taken place inside equipment or as digital islands within an analog facility. Today, a sufficient number of pieces exist to assemble the puzzle. Unfortunately, it isn't a plug-and-play endeavor. Pitfalls exist, but the combined efforts of manufacturers and system integrators are solving these problems. All-digital facilities are the future, and now is the time to begin the conversion process. $

By David Carr, Dick Stephen and Stephen F. Pumple



KHOU-TV, a subsiciary of A.H. Belo Inc., has taken that inevitable plunge into the serial digital world. Originally, we planned to build an analog facility with two composite digital production switchers.

One of the two production control rooms. Color changes on the under-monitor displays are used to indicate tally status and input selection of routable inputs.

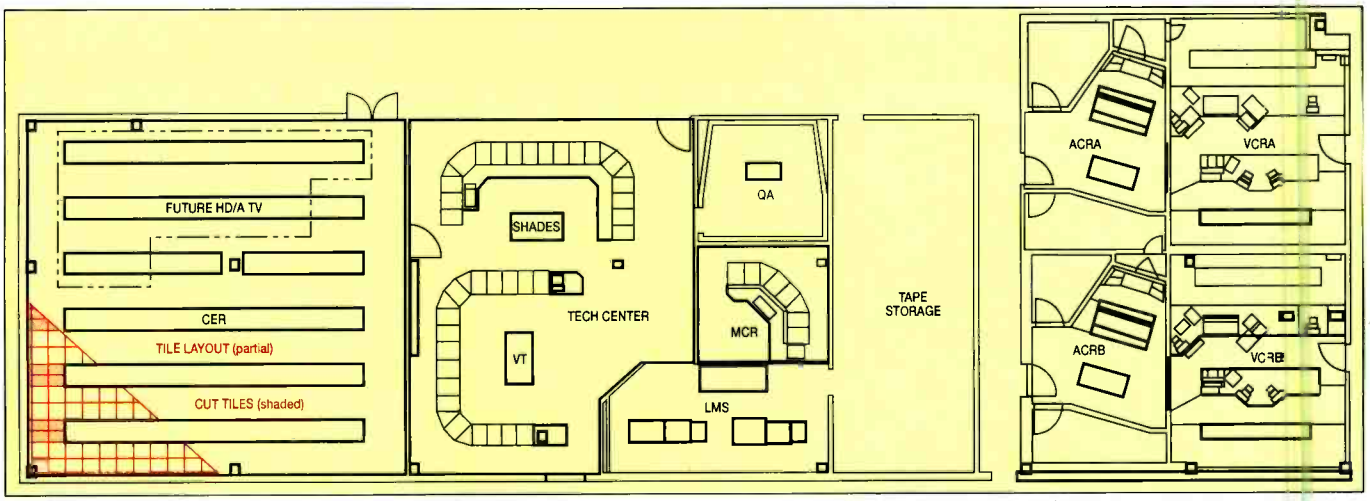


Figure 1. Floor plan of KHOU's technical area. Note the tile layout in the tech center, which provided easy access into racks and required only a few tiles to be cut.

Product availability and equipment costs drove that decision three years ago. With the passing of time, however, new products have been developed and costs have come down. Alternatives to D-1 VTRs are now available. Serial digital production switchers, master control and routing switchers are real today. Digitizers capable of converting most formats into and out of component serial digital are also available. Because of this, a decision was made to build a totally component serial digital facility. In several cases our consultant drew equipment onto the functional diagrams before that equipment was an actual product. Although this created some uncertainty, it allowed us to provide input to the manufacturers. Our intent was not "to buy the latest widget" but rather to maximize the improvements in the technical operations and the operating efficiency of the station.

Goals

Our goals were:

- To install a technically advanced, state-of-the-art digital facility that provides superior signals and paves the way for future conversion to high-definition television (HDTV).
- To provide equipment automation and signal routing to support the infrastructure needed for multichannel output capability.
- To provide dual studios and identical production control rooms that allow simultaneous news and production and permit rapid recovery from equipment failures.
- To provide operational reliability by ensuring uninterrupted power and redundant air conditioning.
- To provide adequate room to support future growth in the technical and operational areas.

Facility layout

The technical center includes a videotape area, a video control area, quality assurance and master control rooms. The multicassette playback systems are located in a separate room beside master control. The quality assurance room allows for audio and video signal evaluation without interfering with the master control operator. This room can easily be relocated to accommodate a second master control if needed. The central equipment room houses most of the electronics of the broadcast center. Architectural considerations made it necessary to have this room at an extremity of the building. In an analog system, the increased length of cable would have resulted in timing and equalization challenges. However, in the digital domain there are no adverse effects. Approximately one-third of the rack space is reserved for future growth and/or HDTV. (See Figure 1.)

The production switchers have programmable mapping between the physical inputs and the buttons and can therefore be quickly reconfigured.

Two identical production control rooms were built. The redundant design reduces costs associated with training and familiarization. Also, it makes simultaneous news and production sessions possible. The production switchers have programmable mapping between the physical inputs and the buttons and can be reconfigured quickly.

Several inputs to the production switcher and to the audio console are fed by the routing switcher. Custom status display units inform the operator as to which source is currently available on each routable input. The intercom can be instantly reprogrammed by the execution of a salvo. A similar salvo directed to the routing switcher can change the sources into the control room monitors and the routable production switcher inputs for any newscast, production or editing session. Programmable under-monitor display units identify the source being routed into each monitor and provide a tally by changing display color.

Routing switcher

All routing, processing and switching in master control and the two production control rooms is done digitally. The main serial digital router is wired to accommodate 256 inputs and outputs although at present it is loaded to the 144 x 144 level. Audio is routed through a 120 x 120 matrix. Additional 60 x 60 video and dual-channel audio layers provide analog routing for the news department and for monitoring purposes. We elected to use a separate audio matrix because unresolved issues remain in the digital switching of the audio signal. The encoding and decoding equipment for AES/EBU audio will be installed when these issues are resolved. A 10 x 10 analog audio matrix, expandable to 60 x 30, has been installed to handle the second audio program (SAP) channel.

Cost is a major factor in the selection of the general contractor and his subcontractors. When the project is put out for bids, invite contractors that have built a broadcast facility before. Building a TV station is different from building office space. The requirements for uninterrupted power and for a technical grounding system are similar to the requirements of a medical facility. If you are unable to find a contractor with broadcast experience, perhaps you can locate one that has built a hospital. The key subcontractors in building a broadcast center are electrical and mechanical. Be selective in these areas because they are the basic building blocks for any technical facility. As with the system integrator, check references.

System integration

Broadcast equipment has evolved considerably in recent years. Today, the purchasing decisions are not what black box to buy, rather they are dependent upon the combination of equipment, functionality and availability of operating software that supports a station's unique operations.

Once the elements of the system are identified, work can begin on the functional drawings. Our consultant also aided in the design and provided drawings for custom equipment consoles. As the installation began, wiring lists were generated. In this particular project, the technical consultant also provided most of the labor to install the system. At the completion of the project, every wire will be labeled, exist in the wiring list and on the functional drawings. At the conclusion of the project, the system integrator will provide all drawings and wire lists on paper as well as disk. This will allow us to maintain the records as the system evolves in the future.

The requirements for uninterrupted power and for a technical grounding system are similar to the requirements of a medical facility . . .

Another real, but intangible, advantage that our integrator offered was the broadcast background of his staff. No matter how hard you train your staff on a new system, there is always important information that does not transfer. Following each cutover to a new subsystem, the integrator's technical installation staff served as a valuable resource to the operations staff. On several occasions their detailed knowledge of the subsystem enabled them to assist our staff at critical times.

Often management may make the decision to go digital long before it allocates money or other resources to the project. From this time forward, equipment purchases should be cleared through the engineering department, or better a consultant, to ensure compatibility with the future digital system.

Our first decision was to push analog against the wall. Digital-to-analog and analog-to-digital conversion equipment was placed near the analog source or load. This shortens the analog cable runs and minimizes the degenerative effects of cable on analog video signals. Many paths had separate audio and video. It was decided to keep audio distribution in the analog domain. More important, once autho-

VISIBLE RESULTS.

NEW BELDEN® DIGITAL VIDEO CABLES SUPPORT EXTENDED DISTANCE TRANSMISSIONS UP TO 400 METERS.

Looking for a new interconnect cable for component or composite Serial Digital transmission? One that exceeds the SMPTE distance requirements of 300 meters? And provides exceptional picture definition as well as eliminates problems resulting from periodicity? Well, look at new Brilliance® Low Loss Coax Cables from Belden.

Belden No. 1694A and No. 1695A (plenum version) are 75 ohm precision cables specially designed to handle the high data speeds of Serial Digital video distribution at 270 or 360 Mb/s, allowing you to experience the full benefit of digital technology. They are also suitable for interconnection from camera to monitor and for analog video distribution.

The cables are RG-6U size, so they're smaller, require less space, and weigh less than standard precision video cables. They also offer 20% lower loss at Serial Digital frequencies, and 33% lower loss at 1 GHz than standard precision video cables.

Specify the cables that will go the distance for you. Call **1-800-BELDEN-4** and request New Product Bulletin No. 105.

ISO REGISTERED

Belden

© Copyright 1994, Belden Inc.

Circle (19) on Reply Card

motors. These units, although slightly larger than single coil and motor units of the same capacity, fit within the available space. Should we lose a motor or coil, we simply switch on the other motor or reroute the chilled water to the alternate coil with a set of manually operated valves.

Selecting the right people and equipment

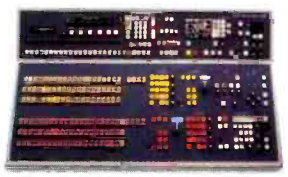
Selecting a good broadcast consultant and system integrator is essential. They must be experienced in the design and integration of the type of systems to be constructed. Take the time to check references, you will be relying on their advice and living with the results for years to come. Our integration company had its consultant come into our facility and observe the operation. The consultant offered several suggestions, some were accepted and have been incorporated into the design. Functional diagrams based on operations, equipment availability and goals were generated. The consultant and his engineers helped evaluate the new equipment and prepared specifications.

For example, studio floors are a study in themselves. Only recently have good methods been developed for specifying the flatness and levelness of studio floors. Fortunately, the high bay warehouse industry has done for the broadcast industry what it has not done for itself. Good methods now exist for specifying and certifying the flatness and levelness of studio floors. The trend to incorporate robotic systems in studios mandates particular attention to these issues as well as hardness because floor wear in a robotic studio is nonrandom. We decided on an epoxy surface supported by a hard cement-like overlay on a concrete substrate.

The tape operations area where machines of various tape formats are available for dubbing and on-air operations.

ow in television history.

© 1994 The Grass Valley Group, Inc.



1987
Model 200

1988
Kadenza

1992
Model 3000

1993
Model 4000

Often imitated but never duplicated, our family of innovative switchers have, over the years, developed a reputation for both the way they "feel" and the confidence they inspire in the people who use them every day.

It's a reputation that only comes with time; a reputation that only comes from Grass Valley.

Today, we're still working to develop and introduce production switchers that provide the kind of performance and advanced features you're looking for.

If you'd like more information on our family of switchers, call us today at 1-800-474-8889 ext. 400.

Grass Valley. We're still making history.

Grass Valley
A TEKTRONIX COMPANY

Circle (18) on Reply Card

Automation

Automation is employed in operational areas where it offers an improvement in the flow and efficiency of the station operations. The system accepts information from the traffic department and downloads the playlist into the two multicassette playback systems. The first holds 500 cassettes and plays back spots, promos and commercials. The second holds 80 program-length tapes. It plays programs and acts as a backup to the spot player. Each multicassette machine has six internal decks and operates with compilation software. The spot machine compiles an analog tape for each commercial break. Both machines are also equipped with software that enables them to record from external sources. The automation system enters all air events in an as-run log and can also download a record log. It uses this information to orient satellite antennas and tune receivers. The system determines which video recorder is not in use, routes the signals into an available tape machine and initiates the recording.

Power system

A 1.5MW auxiliary generator was installed to back up the local utility. This unit is capable of supporting 80% of the full building load. Because that includes the lights and air conditioning in both studios as well as all future equipment, the generator is capable of powering the entire building most of the time without load shedding. The 8,000-gallon diesel tank can supply the generator for three days under emergency conditions.

Automation is employed in operational areas where it offers an improvement in the flow and efficiency of the station operations.

A 450kW uninterruptible power supply (UPS) supplies power to all technical equipment. The UPS will maintain the technical load until the diesel starts and comes on line with a safety factor of 10 minutes.

All technical equipment fed by the UPS is on technical ground that is isolated from earth ground except for a single point where they are joined. The access floor grid is grounded to the earth ground, and to provide isolation the equipment racks were installed on a wooden frame constructed of two-by-fours. After attaching the racks to the wood, we discovered that the fire retardant in the wood made it electrically conductive in Houston's high humidity. A Teflon strip installed between the wood and the racks, combined with plastic washers on the securing bolts, solved the problem.

To ensure air flow through the equipment racks, a sheet-metal hood was built over each row of racks and extended to the ceiling. A plastic insulator was used between the metal enclosure and the ceiling grid. There is a lesson here: A small air gap would have been better than the plastic insulator. The bypassing would not have been significant and it would have been much easier to inspect. During the installation a ground fault alarm monitored any violations of the technical ground system. Before applying power, we removed the alarm and connected the technical ground to the earth ground. All power outlets using technical ground are salmon colored to differentiate them from utility outlets. This grounding system pre-

25 years at the same job and what do we have to show for it?

The master control area at KHOU-TV. Despite using switches that allow a single keyboard to be used with several computers, keyboards tie up considerable desktop workspace.

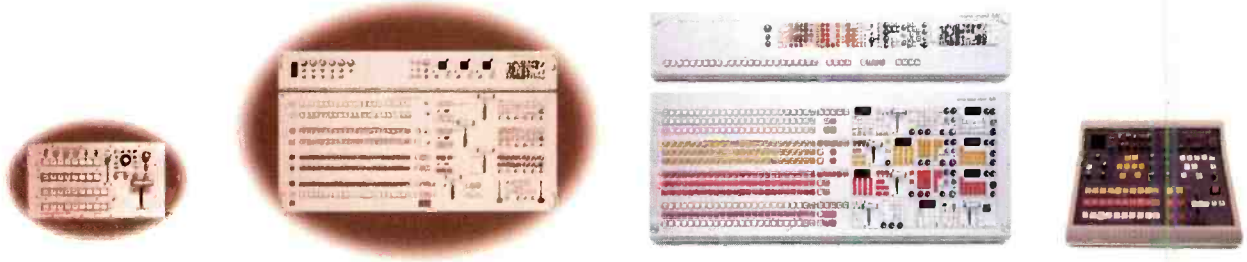
vents the noise generated by vacuum cleaner motors and other non-signal-processing equipment from entering technical equipment. It also prevents stray and fault currents in the building frame from flowing through signal paths.

Redundant A/C

In designing the air-conditioning system for the two studios, we were faced with a dilemma. We needed to have a backup system that allowed continued operations in the studios in the event of an A/C system failure. The cost of having two air handlers for each studio was prohibitive. There wasn't enough building space to house all the equipment nor did we want to roof mount the air handlers because of acoustical considerations. The next option was a tridundant system, three air handlers that would serve two studios. The third unit would be used to cool a studio whose air handler had failed. This system required a common duct between the two studios. The acoustical consultant felt noise transmission between studios through this duct would severely compromise acoustic integrity. The solution was a custom-made air handler for each studio. Each unit has two coils and two drive

We discovered that the fire retardant in the wood made it electrically conductive in Houston's high humidity.

The longest running sh



1969
1400 Series

1974
1600 Series

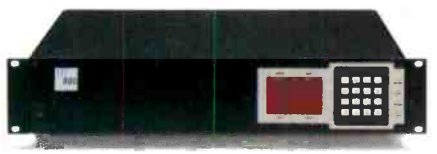
1979
Model 300

1985
Model 100

AT GRASS VALLEY, we've spent the last 25 years designing, creating, and producing the advanced switching systems you've come to know and love. Switchers that have brought you everything from Apollo 11 touching down at Tranquility Base to the sledgehammers taking down the Berlin Wall. Switchers that have become the premiere choice of video professionals throughout the world.

Over the years, we've developed a host of technical innovations–such as our award-winning E-MEM® effects memory technology–that have dramatically improved the production process, making it possible for you to exercise more creative control.

But nothing matters more to us than what our customers have to say about our switchers.



Constant Change.

Constant.

ADC's New LightSwitch™ – The "Future-proof" Digital Router.

As digital formats come and go, so does a lot of expensive equipment. But while changing formats often requires upgrading cameras, decks and other source equipment, it doesn't have to affect your switching system.

Introducing the new LightSwitch digital router from ADC. A switching system that literally doesn't care what format you use. By avoiding internal reclocking, the LightSwitch router is able to switch any true digital signal, regardless of format–even ones that don't exist yet! It can interface with either coax or fiber and features on-site matrix mapping, group takes, chop mode and RS232/RS485 control panel interfaces.

So, regardless of what digital format the future holds–from D1 to HDTV–turn on the LightSwitch router from ADC. For more information about LightSwitch or our digital video and audio fiber optic links and DAs, call us at **1-800-726-4266** or circle the reader service card below.

ADC Telecommunications®

Circle (23) on Reply Card

rized to build a component digital distribution system, we decided to do as many conversions as possible between component analog format and component digital thus reducing the cost per conversion and the signal damage caused by decoding from NTSC.

. . . If you are unable to find a contractor with broadcast experience, perhaps you can locate one that has built a hospital.

Some short NTSC signal paths remain. All signals arriving from electronic sources, such as satellites, telco and other common carriers are, of course, NTSC encoded. They are immediately decoded into component digital format and synchronized to house timing by component digital frame synchronizers. (See Figure 1 in the related article, "Timing a Digital Facility," p. 46.) No non-synchronous signals pass through the routing system. The digital signal is reconverted to NTSC just before the closed-captioning and subcarriers are added for transmission on the STL.

Because existing equipment will continue to be used, a variety of recording formats must be accommodated. Each needs different treatment. The digital signal is encoded into NTSC immediately before recording on D-2 or 1-inch composite machines and decoded to component digital afterwards. Machines with analog component I/0 are kept in the component domain with translation between analog and digital directly before and after the machines. Component SDI machines need no special treatment. Sufficient extra length of digital cable has been left in the VTR center to provide for replacement of non-digital VTRs by digital machines in the future.

The outputs of consumer-level video machines, such as home VTRs and laser disk players, do not convert well to a digital format of any kind. The lack of a defined SCH relationship at the output requires that the signal be time-base corrected before decoding into component digital format. Some low-end computer-based graphics devices, such as traffic maps, also fit into this category.

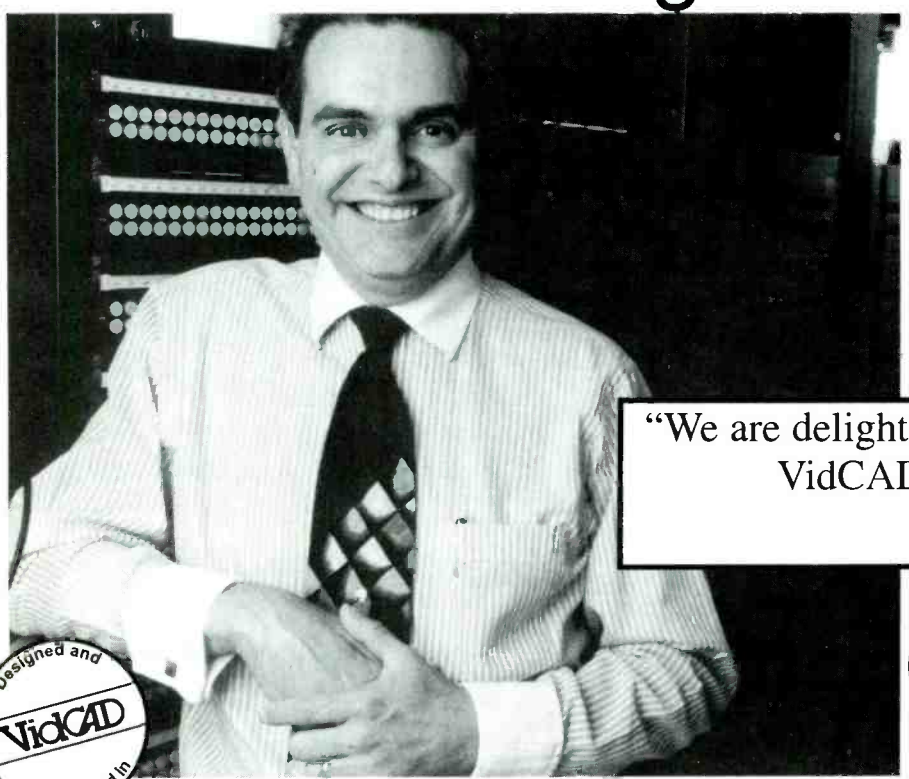
In the central equipment area, the floor is laid on a 15-inch spacing at the ends of the rack rows making it unnecessary to cut many floor tiles.

Monitoring

Although there are a few component digital video monitors in the control

Congratulations IMMAD and KHOU!

First U.S. all digital T.V. station



Thanks for making VidCAD a vital part of the design, documentation and installation operation!

"We are delighted with the quality of our VidCAD documentation"
David Carr, Director of Engineering
KHOU TV, Houston, Texas

Designed and VidCAD Documented in

800-VidCAD-6
to see how VidCAD will help you

VDP, Incorporated•749 Carver Road, Suite 2 • Las Cruces, New Mexico 88005 USA•505-524-8959 • Fax: 505-524-9669 • 800-843-2236

Circle (24) on Reply Card

THE ULTIMATE
BROADCAST VIDEOGRAPHICS PLATFORM

You don't need to buy an expensive dedicated character generator **and** a paint box **and** an animation station **and** a still store **and** a DVE unit **and** a TBC **and** a transcoder to create high-impact titles, animations, graphics and effects.

All you need to do is add a Matrox® Illuminator®-PRO videographics board and some application software to your PC and you have a very cost effective way to mix high-end computer graphics with video.

- Serial digital D1, Betacam, S-VHS & composite I/O
- Easy to integrate into your video editing suite
  full genlock, programmable SC/H phase and key delay
- Full resolution 32-bit display
  720 x 486 NTSC, 768 x 576 PAL
- Realtime frame capture for still store applications
- Built-in infinite window timebase corrector
- On-board digital mixer
- Alpha channel & keyer output timed to encoded video to drive external key

Titling and more!

Insciber VMP™ from Image North Technologies is a **true** broadcast character generator featuring multiple text and graphics layers, transparent, soft-edge shadows, texture mapping, keyed logos, text rolls and crawls, NTSC and PAL safe color and title area control and True Type and Adobe Type 1 anti-aliased fonts. It's also much more — a digital still store, an event editor, a transition generator, a logo maker and a DVE editor.

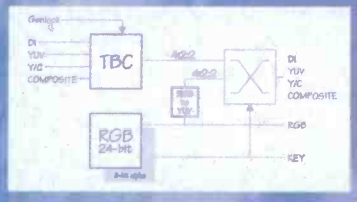
3D Animation

Autodesk 3D Studio™ and Crystal Graphics TOPAS™ PRO are two Illuminator-PRO compatible software packages that let you create stunning 3D still images and animations like you'd expect to see coming from high-end workstations.

The addition of a motion JPEG compression engine turns your Illuminator-PRO into "MAX", the Matrox Animation Xpress™ digital animation recorder. MAX eliminates time-consuming frame-by-frame recording by playing back broadcast-quality animations directly from hard disk in real time. You get a huge productivity boost without a quality compromise. MAX-Edit software makes fine tuning your animations a breeze. Every one of your animations can be PERFECT. You never have to settle for "good enough" because you run out of time to do it over.

Video Paint

The current generation of Windows™ graphics packages — Adobe Photoshop™, Corel PhotoPaint™ and Fractal Design Painter®, just to name a few — are excellent video paint tools. In addition to traditional graphics creation and photo retouching, they offer strong compositing, filtering and special effects capabilities Video Clipboard™ from Image North Technologies lets you transfer images from your Windows computer screen to your video monitor — ready to go ON AIR.



For more information call us today

1-800-361-4903 or (514) 685-2630

Matrox and Illuminator are registred trademarks and Matrox Animation Xpress is a trademark of Matrox Electronic Systems Ltd. All other trademarks are the property of their respective owners.

Matrox Electronic Systems Ltd.
1055 St-Regis Blvd., Dorval (Quebec) Canada, H9P 2T4
Fax: (514) 685-2853

Circle (25) on Reply Card

matrox
VIDEO PRODUCTS GROUP

ILLUMINATOR PRO

rooms and in master control, digital monitoring distribution amplifiers (DMDAs) driving standard NTSC and monochrome monitors are used to monitor most digital signals. Each of these has four SCH-phased NTSC outputs and four re-clocked digital outputs practically eliminating the need for dedicated digital video DAs.

The audio distribution standard is analog, stereo, voltage fed at +4dBu. This greatly reduces the number of DAs needed. All patchfields in the signal path are half normalled to enable testing and feeding multiple loads without interrupting the source signal path. In the future, some AES-EBU audio signals will be multiplexed onto the digital video datastream. Space has been reserved in the racks and converter frames to accommodate this upgrade.

Each area is equipped with one or more audio distribution frames. These are connected via multipair cables to a main distribution frame in the central equipment area. Short jumpers then connect points on the central frame to give the functions needed. Although it is initially more costly, this system makes it unnecessary to run additional long cables when equipment is added. Equipment can be added quickly with minimal disruption to the on-air operation.

Installation philosophy

In this facility the technical center, production control rooms and the central equipment room are built on raised access floor. All signal cabling runs through this floor. Air admitted through front louvers or blown through grilles in the fronts of the racks cools the equipment. In the central equipment area, ducts on top of the racks guide heated air back to the air handlers. Because the raised access floor is not an air plenum, we were able to use cables with standard insulation and dielectric material. There is a significant cost saving because plenum-rated cable is not only more expensive but is difficult to strip and slower to install. Additionally, dedicated control cables supplied by manufacturers are not always plenum rated.

Anyone who has had to place standard EIA equipment racks on raised access floor knows that the rack size is incompatible with the tile size. In the central equipment area the floor is laid on a 15-inch spacing at the ends of the rack rows. (See Figure 1.) It is, therefore, unnecessary to cut many floor tiles and the bottoms of the racks are left completely open for wiring.

Standards

The system integrator provided standards for the numbering of racks, cables, cable installation techniques and system documentation. These standards ensured that the wiring is consistent and will remain so throughout future upgrades. The backplane connectors are densely packed on modern routers. The need to minimize stress on connectors and at the same time provide visibility and access to maintenance staff dictates the wiring behind this equipment be carefully planned.

We specified different cable types for analog and digital signal distribution to optimize characteristics for each domain. The cable selected for digital distribution has a rather low crush resistance. The installation staff tightened all final cable ties with a tool specifically designed for the job and approved by the cable tie manufacturer. We used tie wrap tools (guns) and specified the setting to be used. In recent months, cable superior to both types has become available and will be used in the future. In the final installation there will be no cable ties in the raised access floors. Velcro straps will contain the cable in groups for convenient access.

In the raised access floors, Velcro straps will contain the cable in groups for convenient access.

Studio design

The design of the digital production studios is straightforward. Each video control room is built around a 64-input component serial digital production switcher. The four channels of digital video effects have parallel component digital inputs and outputs. The two production studios share these through parallel component digital switching. The signals from these channels and to the input switcher are converted to and from the serial digital domain by small converters attached directly to the back of the equipment. The still-stores have parallel component digital inputs and use the same small converters. The still-store outputs are available in the decoded analog domain (RGB) and are translated directly into decoded digital without passing through NTSC. Character generator and camera outputs are available in RGB and Beta format respectively and are translated in the same way. The linear matrices of the decoded format translators are easily changed to accommodate

Software vs. hardware system organization

The proliferation of software has as much impact on traditional broadcast engineering practice as does digital signal processing. A broadcaster who starts to renovate an 8- to 10-year-old facility will therefore suffer a double shock.

Modern broadcast systems, whether analog or digital, are now organized by software. As core systems, such as intercoms and routers became larger and signal paths more complex, manufacturers found it convenient to organize their equipment in software. Connecting a wire to an equipment port no longer defines its logical location. In the latest generation of distribution equipment you can connect any wire to any port and later define its position (and sometimes its function) in software or firmware. Often what appears to be a serious system problem can be cured by a trip to the nearest keyboard.

A survey of the computing resources needed to manage the core, master control and studio systems finds more than 30 computers running about 100 programs. Many need only be run on start-up, reconfiguration or after a catastrophe. Keyboards and VGA monitors are switched among as many CPUs as possible. Nevertheless, keyboards now occupy a large percentage of the level working surface in the control rooms and in the master control center.

Individual cards in certain equipment now require megabyte software loads in battery-backed or non-volatile RAM. During the commissioning stage of a project, there is a continuous exchange of definition, executable and hex files between client and manufacturer. Broadcasters building today need to include a good PROM burner in the budget, along with provisions for personnel familiar with software-based systems and coding. ■

The Legend Continues.

The Old Standard.

Our M267 Mixer is more than the best selling mixer of the last ten years. It's the most versatile, the most durable, and the best performing. You trust it in your rack – you trust it on the road. And while production environments have changed, your mixer remained the same. Until now.

The New Standard.

Our new M367 Portable Mixer gives you all the reliability and durability of the M267, plus a list of new features and improvements. We made it over 25 dB quieter with a low noise circuit — ideal for digital formats. We added two more mic line inputs, bringing the total to six. We added peak LEDs. And we gave it 12 and 48-volt phantom power for your condenser mics.

What we didn't change was its toughness. It's still made with a rugged all-metal chassis and manufactured in the USA with legendary Shure durability.

The New Features.

Without increasing the size, we were able to pack in dozens of new features and improvements. The M367 has all the features of the M267, plus:

- Input peak LEDs
- Detachable power cord
- Two XLR outputs
- Easy-access side battery compartment
- Headphone monitor circuit
- Output peak/limiter LED
- Balanced, 2-position mix bus
- Adjustable limiter threshold
- Battery/AC VU meter illumination
- Monitor input sensitivity selector
- Program/monitor input selector

With the Shure M367 mixer, we've just raised the standards. It's time you raised yours.

For The Shure Dealer Nearest You, Call 1-800-25-SHURE.

THE SOUND OF THE PROFESSIONALS...WORLDWIDE. SHURE®

Circle (26) on Reply Card

either RGB or Beta analog formats.

Master control is an entirely digital enterprise. The master control switcher accepts as inputs the three first buses of the router and can perform fades, dissolves and keys in the digital domain. Wipe capability can be provided by the addition of a card. Master control has its own dedicated slide store and character generator, both of which are entirely digital devices. The character generator is simply a personal computer with a specialized board and software. This device can also capture images and key text over them, allowing it to function as a limited capacity slide store.

The graphics department has been left as a decoded analog island with digital translators forming bridges to the outside world. The translation process to digital is, if nothing else, an excellent low-pass filter and some resolution would inevitably be lost were translation to be done at the input and output of every device.

Timing

Timing is not a consideration at the studio level as the auto-timing input window of the production switcher is 44µs wide. House timing is a different matter. The digital production and master control switchers have delays ranging from 50µs to 235µs. High-quality decoders from NTSC to component digital video are likely to cause a delay of 70µs or more. (The ideal, spare-no-expense decoder might have a delay of more than 66ms — four fields). Translators between the component formats are much faster, typically 2µs to 3µs, while monitoring DAs have somewhat less than 7µs of delay. The delay of the monitoring DAs is constant so the output timing will follow that of the input. The output SCH of these devices, while constant with a constant input signal, can change 180° if there is any discontinuity at the input. Serializers and deserializers are extremely fast, typically less than 400ns. Broadcast-quality conversions back to the analog domain are done by line synchronizers that have an adjustable delay of between 6.5µs and 70µs. Their output is stable in both time and SCH phase even though the timing of the digital input signal might vary by plus or minus almost half a line.

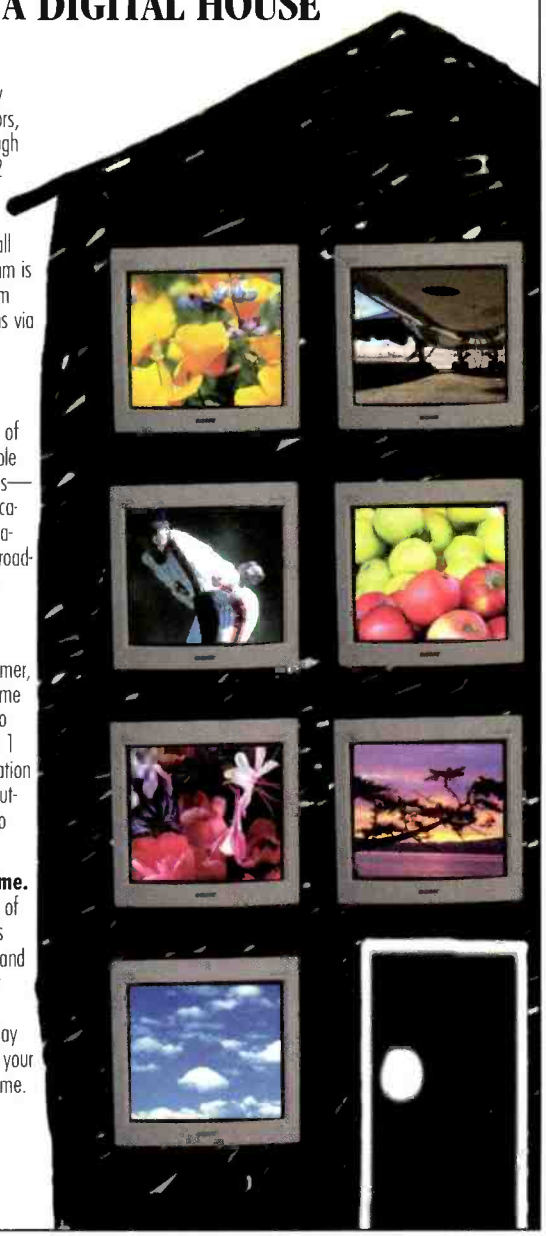
We constructed 16 signal bridges, eight in each direction, with the appropriate conversion equipment between the old analog router and the new digital one.

During the transition from analog to digital it is necessary to exchange signals between the existing analog system and the new digital one. We constructed 16 signal bridges, eight in each direction, with the appropriate conversion equipment between the old analog router and the new digital one.

The long processing delays of the conversion equipment can cause problems in the vertical interval. Line synchronizing encoders will, if maladjusted, extend the vertical blanking interval and displace or remove closed-captioning, teletext and proprietary information on station output and on composite VTR recording.

QUICK-FRAME™

AT HOME IN A DIGITAL HOUSE



At a nearby digital studio, a dozen animation/effects workstations are positively humming, piloted by twelve talented operators, each with their favorite application. And though they're all working with uncompressed 4:2:2 component digital video—in real time—you won't find their cubicles cluttered with towers of disk storage. That's because all the digital material required by the entire team is stored by one Quick-Frame Video Disk System and channeled seamlessly to the workstations via Sierra Design Labs' new SCSI Framer.

Roomy Storage in Tight Quarters.

Quick-Frame revolutionized digital video recording by providing from 3 to 24 minutes of uncompressed D1 in just 5¼ inches of valuable rack space. With Ethernet and SCSI interfaces—plus support from all leading SGI-based applications—Quick-Frame now plays host to animation, paint and 2D/3D effects. No wonder broadcast, telecine and post facilities welcome the Sierra solution.

Architects of Network Storage.

Sierra innovation continues with SCSI Framer, a low-cost combination of SCSI, real-time frame buffering, and serial D1. High-speed access to uncompressed CCIR601 video is provided for 1 to 24 applications with no additional workstation hardware investment. Built-in analog video output supports the display of Quick-Frame video data being recorded or played back.

Remodel Your House with Quick-Frame.

Quick-Frame has rapidly become the VDR of choice for post houses, animation and effects software manufacturers, production facilities and television stations worldwide. *Video Systems* even named it a Pick-Hit of NAB '94.

Call Sierra Design Labs today and find out how to furnish your digital studio with Quick-Frame.

SIERRA DESIGN LABS Tel: (702) 831-7837 Fax: (702) 831-5710

Circle (27) on Reply Card

Now you don't have to scramble during the game.

Gone are the days of fumbling for those elusive video tape cassettes during live broadcasts.

With Pioneer's VideoDisc Recorder, you can access footage literally at the speed of light. No sweat. How can it be so fast?

Well, the VDR-V1000A's High Speed Dual-Head System allows for non-linear search and play. So you can instantly jump to any piece of footage you want.

For example, let's suppose you're broadcasting a football game and you want to refer to some clips from previous games. Your VideoDisc Recorder will allow you immediate access to any of your catalogued footage.

In addition, with our FastFile™ software, locating and retrieving clips is as simple as a point and click. It's also perfect for indexing, organizing, and accessing stills, video segments and graphics.

And as if that wasn't enough, the VDR-V1000A is rewritable so you can re-record over a million times.

For more information, call one of our regional offices. East: 201-236-4180, Central: 214-580-0200, West: 310-952-3021.

PIONEER®

Pioneer New Media Technologies, Inc.

©1995 Pioneer New Media Technologies, Inc.
2265 E. 220th Street, Long Beach, CA 90810

Circle (28) on Reply Card

Support of a major project from a distance

This integration project explored technical frontiers and in the process discovered subtle incompatibilities. All digital products incorporate a high level of software in the control and processing of signal processing systems. Much of the technology used has evolved and been put into operation as a technical island, not as an integrated system. The high level of integration at KHOU uncovered heretofore unknown technical anomalies, or more simply put, bugs. The equipment at KHOU is manufactured in Europe, Japan and North America; in other words it crosses 17 time zones. The esoteric level of some of the challenges presented necessitated a direct path of communications with the factories and engineers, which in some instances were 11 time zones away.

All digital products incorporate a high level of software in the control and processing of signal processing systems.

The proliferation of standards

Although the house video distribution standard is component serial digital, there are many other signal standards in use at KHOU ranging from the parallel-coded digital I/0 of existing D-2 VTRs to decoded analog, such as RGB and beta. To have a common notation for running lists, drawings and conversation, we wrote a lexicon giving a 3-letter abbreviation for each type of signal. Any two of these can be concatenated to describe a conversion or translation process.

In writing the lexicon, we avoided the words composite and component because no good abbreviation exists that distinguishes one from the other. Instead, we made the distinction between encoded and decoded formats. The 3-letter abbreviations given below also appear preceding the wire number on wire labels and running lists.

- *AES*— AES/EBU audio on coax or TP
- *AIA*— Analog Intercom Audio
- *AMA* — Analog Monaural Audio
- *ASA* — Analog Stereo Audio
- *CAV* — Coded Analog Video
- *CDV* — Coded serial Digital Video
- *CVS* — Coded analog Video with Subcarriers
- *DAV* — Decoded Analog Video
- *DDV* — Decoded serial Digital Video (house distribution standard)
- *ETN* — EtherNet
- *GPI* — General-Purpose Interface
- *MAV* — Monochrome Analog Video
- *MCS* — any Manufacturer's Control Standard
- *MDV* — Monochrome Digital Video
- *PCD* — Parallel-Coded Digital video
- *PDD* — Parallel Decoded Digital video
- *R2S* — RS-232
- *R4S* — RS-422
- *RF* — RF
- *TRN* — Token Ring Net ■

Modern communications technologies, such as voice mail, facsimile machines and computer bulletin boards, were used to help overcome the constraints imposed by time zones and the requirement that all the engineering staff work in the same location at the same time. These technologies provide vehicles that were used to deliver software upgrades a.k.a. bug fixes, often the same day, updated drawing documentation and voice communications with the various parties involved in the project. These tools allow many of the tasks required to be done off site, in another city or at a hotel or apartment. The engineers and support staff could exchange information at all hours of the day or night.

The exchange of information electronically is not a new phenomenon, but what is new is the proliferation of high-speed technologies, high-powered laptop computers, economical bulletin board software and communications software and electronic drafting tools with specific modules for the broadcaster.

Manufacturers' support

Almost universally the manufacturers demonstrated a commitment to repair bugs as they were uncovered and identified sufficiently. Credit must be given to the many manufacturers who responded to the problems and who worked closely with the integrator to resolve the challenges as they introduced themselves.

Drafting and system documentation

This project involved the application of new technologies and equipment that heretofore did not exist in the database. The consultant, his engineers and draftsman worked closely with the supplier of the CAD-based drafting software. This software supplier embraced the constructive input offered by the consultant and worked with the consultant revising and correcting existing symbols, creating new ones as specified by the consultant and implementing specific improvements in the operation of the documentation package.

What now?

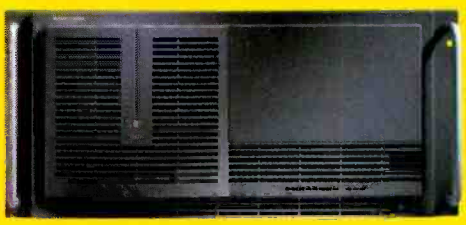
This project has been challenging and rewarding. It is not meant to be the end but rather the beginning. Taking this step into the digital world has given us a new challenge. Now the training for operators and maintenance engineers must begin. We have all learned to diagnose symptoms in the analog world. Most of us can distinguish a color balance problem from a clamping problem. However, now we are faced with totally new symptoms. Symptoms that we have never seen before. What is the new symptom telling me? Why is this tape machine that used to work in the analog world not being accepted by this new digital system? What test equipment is available and what tests should be conducted?

We are just now crossing the threshold into an exciting world filled with the promises of improved quality, interactive video, multi-use operation and who knows what else. It is up to each one of us to fully explore this new world from which there is no turning back. ■

David Carr is director of engineering for KHOU-TV, Houston, TX, and a board member of the Society of Broadcast Engineers. Dick Stephen is a senior engineer with IMMAD Broadcast Services. Stephen F. Pumple is the president of IMMAD Broadcast Services, the consultants and integrators for this project. Respond via the *BE* FAXback line at 913-967-1905 or via E-mail to be@intertec.com.

You can spend millions on ads, public relations and big trade show productions convincing the world you've created the first truly practical pro video disk recorder.

Or, you can build it.



The **Pro***file*™ Professional
Video Disk Recorder from Tektronix.
Hundreds now playing worldwide.
Call 800-998-3588 today.

Tektronix

©1995 Tektronix, Inc. All rights reserved. Profile™ is a trademark of Tektronix. TVG-138

Circle (20) on Reply Card

Timing a digital facility

Timing in the digital domain raises new issues as shown in Figure 1. Decoding delays are more than 70µs. Even though digital video mixing equipment is remarkably tolerant of input timing errors several timing references are necessary to bring all sources within the auto-timing window of such equipment. In addition, analog equipment that requires its input to be close, in analog terms, to station reference cannot produce a digital output timed to that reference after decoding. Note the position in time of the tape library systems. It is necessary in this case to use frame delays to re-establish correct timing. This is done at no cost to signal quality as the delays (frame synchronizers) use decoded digital video as their native format. Timing with cable is impossible. The small rectangles in the lower left of the figure are respectively one kilometer and one mile of precision video cable.

While all reference signals are NTSC color black, the traditional sync pulse generator that will backtime only 10µs or so is no use except as a master timing source.

While all reference signals are NTSC color black, the traditional sync pulse generator that will backtime only 10µs or so is no use except as a master timing source.

Several SPGs are needed and these must be able to time anywhere in vertical phase. SCH does not exist in the component digital domain, it must be created by the encoder that returns the signal to NTSC.

There is no sync, setup or burst in the component digital domain because it is a waste of digital quantizing levels to decode and encode those parts of a signal whose characteristics are exactly known. Instead, these are removed on decoding into component serial digital and are restored by the encoder when the signal re-enters the NTSC domain. For this reason, all encoders that must produce NTSC signals in common SCH phase require reference connections. As the digital monitoring DAs do not accept a reference signal, their outputs should not be switched or dissolved in the analog domain.

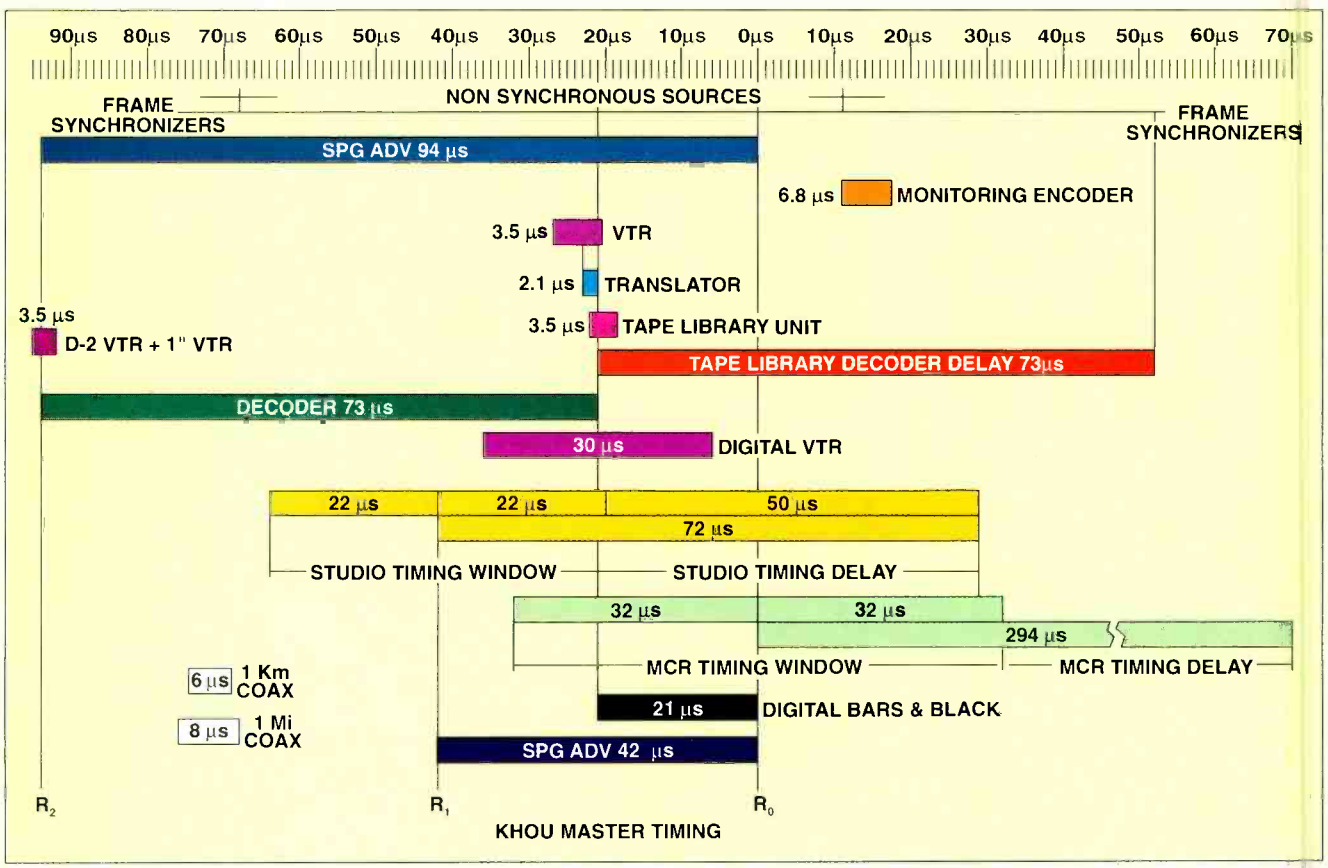


Figure 1. Timing parameters that had to be dealt with due to the latency of the encoders and decoders used within the facility.

THUD

It's the sound you've been waiting for. The DA-60. A **SMPTE/EBU synchronizable four-head DAT recorder** at a price any studio can afford. Sure, you could pay up to $10,000 or more for a DAT with similar features, but why? At **only $5,999*** you get a **superior sounding** DAT recorder built to perform flawlessly in any production environment. Test it for yourself. Take the transport, for example. With **four precision direct drive motors** and an auto-calibrating four-head drum you not only have full confidence while tape monitoring, the **variable digital cross-fade** means seamless punch ins and outs. Plus, thanks to TASCAM dependability and reliability you will be confident that your DA-60 will serve you for the long term. And sound? You get the performance that has earned TASCAM the reputation of the **best sounding DAT** — at any price. And because you need even more, TASCAM gives you things like a built-in **RAM buffer** for instant starting and auto cueing. Plus, incredibly accurate dial searching with **2 locate points,** adjustable **automatic fade-in and out**, and ± 12.5% pitch control. What would make this machine sound even better? **Synchronization.** All you need to do is plug in the optional TASCAM SY-D6 Sync Board and the DA-60 is completely **SMPTE/EBU compatible.** This $649* board gives you multiple time-code options. You can directly convert absolute time from existing tapes, or use the SY-D6's time code generator to generate it. Either way you get standard SMPTE time-code, which makes the DA-60 ideal for chase synchronizing to any video or audio recorder. It even gives you **an RS-422 port** for direct connection to video edit controllers. Of course the DA-60 provides you with **AES/EBU digital I/O** and word sync I/O and thru. What's left? Your dealer. Call him and tell him to send over a DA-60. Because you have to try it. Oh, tell him not to forget the optional RC-D6 **remote control unit**. This way you can lean back, and remotely control your DA-60 while thinking about how much money you saved.

THE PRICE OF 4-HEAD DAT JUST HIT ROCK BOTTOM

TASCAM®

Take advantage of our experience.

©1993 TEAC America, Inc. 7733 Telegraph Road, Montebello, CA 90640 213/726-0303. *Suggested retail price.

Circle (21) on Reply Card

By Paul Breneman

Graphics and effects systems

Early squeeze zooms and perspective effects have given way to warps and mapping video onto 3-D surfaces.

The Bottom Line:

Times have changed. It used to be that DVEs and graphics systems were options found only in high-priced edit suites. Today's graphics and effects systems are integral to the production process. Understanding the basics allows buyers to tailor their purchase for the intended role. ___ $

A look around a typical production control room usually reveals a variety of sophisticated video equipment. One of the newer entrants to the production arsenal is digital video effects. Generating and manipulating video in real time requires sophisticated hardware and/or software because of the speed and bandwidth necessary to produce quality video. When TV equipment consisted of analog tube-type circuits, generating pictures artificially was practically impossible. Only since the development of high-speed digital logic circuits has there been rapid growth in equipment that gives us new ways of creating picture content.

Digital logic circuits were used to develop the first character generators. This may be the first case where something that never physically existed appeared on TV screens. Sometime later digital logic circuits were used to create the first production-model digital video effect (DVE) units. The first popular DVEs were manufactured by NEC and Vital in the late 1970s.

In most DVEs, the video is manipulated by high-speed digital logic circuits. Early DVEs used simple microprocessors to control the digital logic circuits. However, they did not manipulate the video directly. Newer systems are fast enough to use single or multiple microprocessors to process video directly and in real time. The introduction of desktop video production systems has allowed DVE-like effects to be created in non-real time using generic computers and powerful software.

Picture manipulation

DVE effects can be put into two major categories. The first category is effects that actually change the video itself. Examples of these effects are posterization and solarization. The second category is effects where the position of the video is changed. Posterization and solarization are fairly simple effects to perform on video in the digital domain. Both effects are simply a matter of throwing away one or more bits worth of picture information. If the least significant bits are thrown away, the effect is slight. However, if the most significant bit is thrown away, the effect can be severe. When these bits are "thrown away," that can mean setting them to zero, which generally darkens the picture. It can also mean setting them to a "one," which usually lightens the picture. Inverting the bits, changing zeros to ones and vice versa, usually increases the severity of the effect. These effects can generally be produced in TBCs by taking individual bits on the data bus high or low. (Don't try this at work, because it may cause serious damage!)

The first DVEs were only 2-D. The pictures were always rectangular so no sense of perspective was possible. This is demonstrated by Figure 1A and 1B where the full-size raster image has been reduced, repositioned and stretched. Ampex later pioneered, with its ADO product line, what is customarily referred to as 3-D capability. A sense of perspective is added by allowing the rectangular image to be modeled as a quadrilateral (Figure 1C), allowing effects that are much more realistic.

Warp capability (see Figure 2) added the ability to bend the edges, creating even more of a 3-D illusion. Note that in this effect, the picture is still 'flat,' but gives the appearance of being positioned in 3-D space.

Recent systems have added full 3-D surface mapping capability. This is similar to 3-D computer modeling and animation. Image portions can be mapped to rectangular polygons. These polygons

SVS

For your move to serial digital technology...

NEW MODELS FOR 1995!

...take Sierra Video Systems along.

New companions to the Model 1616D serial digital video routing switcher from Sierra Video Systems include the Model 88D (8 x 8) and the Model 3232D (32 x 32) digita video routers. Our Model 1616DE (16 x 16) digital video router with an integrated digital audio switching matrix is also new for '95. This compact system features a SMPTE (AES/EBU) digital audio crosspoint module in addition to a high performance 16 x 16 serial digital video matrix. With this new technology, trouble-free distribution of digital audio using familiar coaxial cable is now possible.

- Serial digital video router matrices — 8 x 8 to 32 x 32
- Video data rates from 140 to 400 Mbps
- Automatic equalization for up to 300 meters of cable
- 16 x 16 serial digital audio router
- RS-232 or RS-422 serial port for external control
- Rugged, low-cost modular design

In your move to serial digital video, you can count on Sierra Video Systems to lead the way. The proven leader in analog routing switchers is the *new* name in digital video and audio.

Sierra Video Systems — for an easy move to serial digital technology.

SIERRA VIDEO SYSTEMS

...you can see the difference!

P.O. Box 2462
Grass Valley, CA 95945 USA
Tel (916) 478-1000
Fax (916) 478-1105

To find out more about our family of serial digital routing switchers, contact your nearest SVS dealer, or call Sierra Video Systems at (916) 478-1000.

Circle (22) on Reply Card

Fast & Luscious

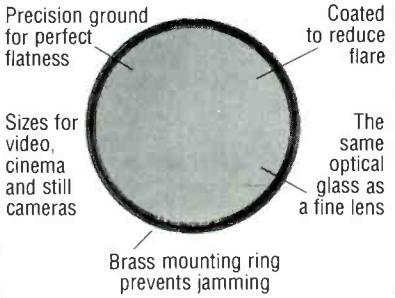
500, 750 and 1000 watts without the weight or hassle. Lowel Rifa-lites. The skinny travel companions that turn into bright, sensually soft sources in seconds.

lowel®

Lowel-Light Manufacturing, Inc.
140 58th St. Brooklyn, NY 11220
718 921-0600 Fax: 718 921-0303

Circle (37) on Reply Card

IMPORTANT FEATURES TO LOOK FOR WHEN LOOKING FOR A FILTER



When taking the shot, you need a filter that's optically as good as your lens, and made to take all the punishment you can dish out. So, don't settle for distorting "window" glass and aluminum rings that bind when the pace heats up. Trust only B+W filters to keep you out of a jam and picture-perfect.

B+W FILTER
Schneider KREUZNACH

For a catalog or name and address of your nearest dealer, contact
Schneider Corporation of America
400 Crossways Park Drive
Woodbury, NY 11797
TEL: 516 496-8500
FAX: 516 496-7508

Circle (38) on Reply Card

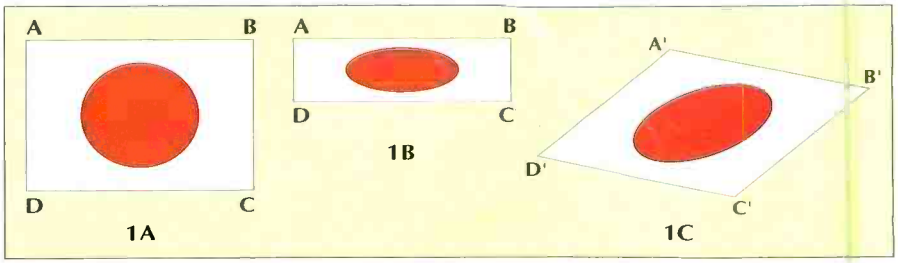


Figure 1. Simple 2-D DVE picture manipulation. 1A is the original image, 1B has the original resized and repositioned, 1C adds perspective to the image.

can then be positioned individually in 3-D space and the resulting image (see Figure 3) is a true 3-D object. Many new effects have been created using this technique.

Effects/compositing systems

For a long time, DVEs used in live on-air control rooms were the same as DVEs used in post-production. The move to put post-production capability in the desktop environment has changed that. DVEs used for live production still require a dedicated control panel for efficient and error-free operation. However, most desktop systems have done away with the separate hardware control panel. Many desktop systems also sacrifice real-time operation for added features and processing capability. Without real-time effects capability, these systems cannot be used for live productions.

To their credit, many desktop effects/compositing systems integrate capabilities normally found in separate equipment into a single unit. Paint, CG, switching, keying (mixing/compositing) and digital video effects are among the integrated capabilities of these systems.

The architectures of effects/compositing systems can be quite different. Some systems emulate present control room capabilities, but with a single user interface. Many of these do the effects processing in real time. But this also means that complicated effects must be done a layer at a time without the ability to see the whole composite. Performing more effects in each layer requires adding additional effects hardware, just like in a control room.

Other desktop systems work with non-real time and low-resolution previews, but allow you to see the whole composite. When you are satisfied with the effect, it must be rendered at full resolution before you can see the full-quality, full-speed result. These systems can share effects hardware between many separate layers. This process is non-linear until the full-resolution render. The amount of rendering time required is dependent on the length and complexity of the effect, as well as system horsepower.

Desktop non-linear on-line editing systems have had limited DVE capability. But these effects must usually be rendered greatly restricting the creative freedom these non-linear systems provide. However, several manufacturers have announced add-on hardware DVE systems that will speed up effects creation and enhance the overall system capabilities.

Operational considerations

Real-time hardware-oriented DVEs present large delays to the video signal mainly due to the amount of processing that must be done for each frame. DVEs typically have delays of either one field or one frame. Although most difficulties with the delay occur in the post-production environment, live telecasts can suffer also if the delay is not accounted for. When the video signal passes through DVEs (and frame synchronizers), it is delayed with respect to the audio. Going

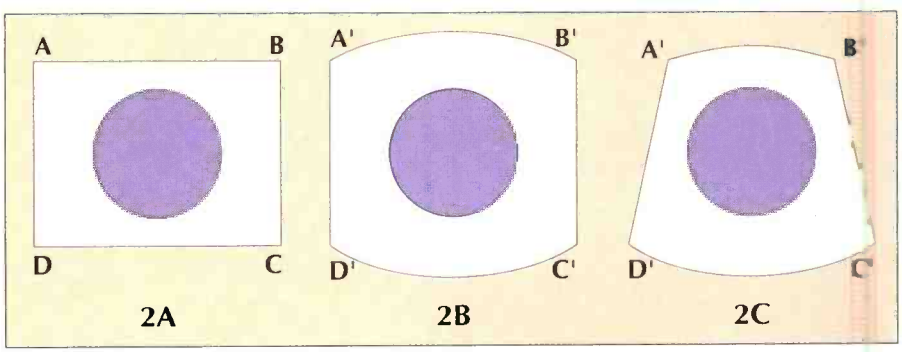
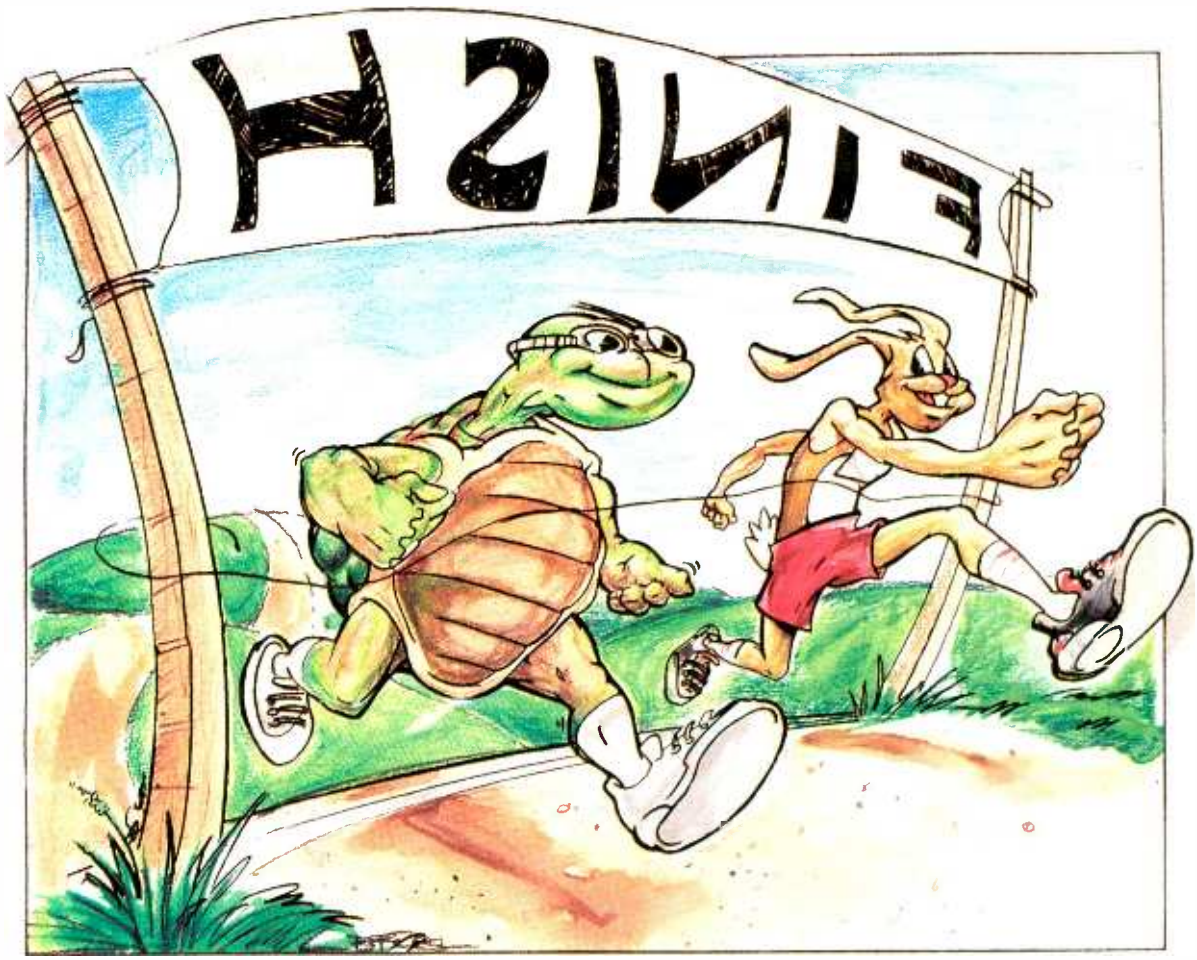


Figure 2. The illusion of 3-D is created when curved edges are added. 2A is the original image, 2B shows the addition of curved edges to make it appear as a half cylinder. However, when the image is rotated to add perspective, it becomes apparent that it is not a true 3-D object.



With HVM They Both Win!

Random Access Playback *and* Cost-Effective Library Storage

Sometimes you don't have to choose! Especially when you need both the rapid access of disk, and economical archiving. Now, with hierarchical video management (HVM), you can have it all.

HVM puts every penny you spend where it does the most good. Your valuable spots are downloaded from a secure tape archive to a high-performance disk "cache" for replay to air. Spot inventory is economically maintained on tape in the format of your choice, so you're not using disk space until you need it. And programs are played direct-to-air from tape. All automatically.

Since HVM reduces both the size of your disk array and wear and tear on the VTRs, it's a price/performance winner for single- and multi-channel operations.

HVM is the technology of television's future – today. And the product that best embodies HVM is the Odetics CacheMachine™. The CacheMachine keeps your entire spot inventory on-line. A whole library of spots and programs can be instantly available. Plus modular design of the CacheMachine lets you use the same library for more than one on-air channel.

So bet on the sure winner. HVM, the technology that saves you time, money and manpower. And the Odetics CacheMachine, the system that puts your station across the profit line first. Call us today at (800) 243-2001.

Director of Sales
Bill Keegan
(714) 774-2200

Northeast
George Anderson
(609) 953-9101

Southeast
Emerson Ray
(813) 960-0853

Odetics Broadcast

West
Chuck Martin
(702) 256-7001

South Central
David Scally
(404) 917-9506

Canada
Applied Electronics
(905) 625-4321

Circle (39) on Reply Card

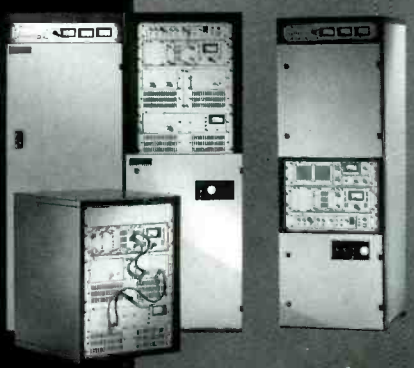
We are a big family.

In the FM & TV Broadcasting World.

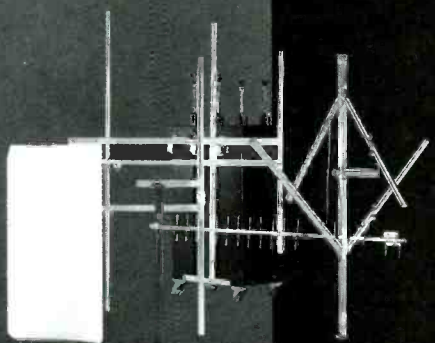
IMMAGINE ASSOCIATI - PH SALMASO

FM Cavity Trasmitters from 1000 W to 20.000 W output power, FM Solid State Trasmitters from 100 W to 2000 W output power.

Digital Encoder / Decoder for analog aural FM radio links. 2 or 4 high quality audio channels without need to change existing equipment.



TV Cavity Trasmitters from 1000 W to 10.000 W output power. TV Solid State trasmitters from 10 W to 500 W output power, for Band I - III - IV/V



FM Omnidirectional and Directive Trasmitting Antennas, TV Panel Antennas, Splitters, FM & TV Combiners, Radio Link Antennas, Accessories.

Become one of the DB Elettronica family, a great international manufacturer of radio and television equipment, present in more than 80 countries on all the continents

DB

with innovative products, fully integrated broadcast system and 24 hours worldwide spare parts & service. The most strict international normatives are fully complied with.

Elettronica Telecomunicazioni

DB Elettronica Telecomunicazioni S.p.A. - Via Lisbona, 38 - Zona Industriale Sud - I 35127 Camin (PD) - Italy
Tel. + 39 - 49 - 8700588 (3 line) - Fax + 39 - 49 - 8700747 - Telex 431683 DBE I

through several such devices can slip the audio/video relationship enough that lip-sync is lost. This can be corrected by adding delays into the audio path that match the delays in the video path.

In post-production control rooms, the DVE delay can significantly affect several operations. DVEs with only a single field of delay can present problems. For example, in some videodisk or CD-ROM productions, it is important to know the field dominance used when material is edited and keep it constant. Edits on a mixture of fields can prevent still-frames from working correctly. If some edits have opposite field dominance, displaying a clean still-frame can be impossible. If your DVE has a field delay, passing already edited material through the DVE has the effect of changing the field dominance. Sometimes this "feature" can be used to correct problems, but care must be taken when using such a DVE.

It is common to perform match edits when editing material. Edit controllers perform this by rolling the playback material in sync with the same material already recorded, and then starting the new recording right before the effects transition. The edit point is invisible if all equipment is working normally. If not, you can get horizontal shifts or other picture distortions.

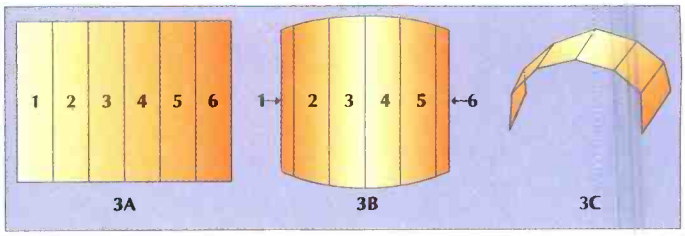


Figure 3. *True 3-D picture manipulation using polygons to create a 3-D object.*

If you put the playback material through a DVE right before performing the match edit, then without further compensation you will get an extra field or frame of video at the edit point. If your DVE has a frame delay, then you can advance the playback material (if it is a component format) to compensate. If your DVE has a field delay, you cannot advance the playback by a single field. In this case you must back up and record the entire last scene through the DVE if that is possible.

Some of the digital VTR formats (D-2, D-3, D-5, Digital Betacam) have a read-before-write feature (commonly called preread). In this mode the playback heads read the video before the record heads record on the same track. Using production equipment with minimal delay allows a single machine to be used in this mode as both a playback and a record machine. Problems encountered with DVE delay are similar to those mentioned above. Only in this case you cannot advance the playback material with respect to the record machine. You can only use a DVE on new video from a different source.

As digital effects are integrated into more and more equipment, their use in production will continue to grow. As computer horsepower increases, realistic digital effects will be easier to create using low-cost systems. New effects will find their way into the mainstream and editors will find it easier to turn ideas into reality. ■

Paul Breneman is with SOS Productions, Columbus, OH, and Directed Path Enterprises, Plain City, OH. Respond via the *BE* FAXback line at 913-967-1905 or via E-mail to be@interlec.com.

For more information on digital video effects and graphics systems, circle (305) on Reply Card. See also "Desktop Video" on p. 60, "Animation Equipment" on p. 71 and "Graphics Systems" on p. 72 of the BE Buyers Guide.

← Circle (40) on Reply Card

THE IFplus FAMILY: THE WORLD'S BEST LENS TECHNOLOGY, IS NOW MORE AVAILABLE THAN EVER.

J15ax8B IRS/IAS

J9ax5.2B IRS/IAS

J20ax8B IRS/IAS

J33ax11B IAS

J33ax15B IAS

Canon introduces more of a good thing.

IFplus, the industry-standard technology that meets the needs of tomorrow, 16:9, while satisfying the needs of today, 4:3, is now available in more Canon lenses.

These include the J15ax8B IRS/IAS multi-purpose lens; the J9ax5.2B IRS wides: angle; the J20ax8B IRS/IAS with large magnification ratio for ENG, sports and production; the J33ax11B IAS telephoto portable EFP style zoom; and the J33ax15B IAS longest portable style zoom.

IFplus means wider angles at shorter MOD's and the widest angle lens available. It means higher MTF performance (corresponding to 6MHz) an advance that is cons stent with the needs of l6:9 formats, where the density of the scanning lines are 20% greater than 4:3. It means reduced chromatic aberration, the result of a new glass material Hi-UD.

IFplus also features an ideally angled "Ergonomic Grip" allowing the user to enjoy fatigue-free shooting even over a long period of time. A special protein paint even absorbs perspiration.

The first family of next generation lenses, IFplus, gives you more of everything you want, including an expanded selection.

We'd like to tell you more. For information, please call 1-800-321-4388. (In Canada call 905-795-2012)

Canon

The Number One Lens

Circle (29) on Reply Card

Intercoms: No longer an afterthought

By Bennett Liles

Audio communication is a critical part of every broadcast production.

The Bottom Line:

Among a broadcast facility's systems, the intercom system is perhaps the least understood by the most people. Yet no program can be produced without properly functioning audio communications. Today's intercoms have become increasingly specialized and sophisticated. Their programming and operation require equivalent specialization and sophistication among the crews that use them. $

There is an old saying that audio is the stepchild of TV production. If that's true, then communications audio is an orphaned street waif.

As a production element, intercoms usually receive the least amount of pre-production thought, but they can generate the greatest amount of panic the moment that they cease to function as expected. Their components are unique among broadcast equipment because they can require complex setup, after which most of the hardware is turned over to users who may know little more about how it operates than just finding the microphone switch and leaving it on.

Further challenging is the fact that after all the setup and cable stringing, there is often no one specifically in charge of the intercom system's care and feeding during the actual production (except perhaps an audio operator whose hands are confined to the mixing console and whose ears are trying to mix a program's sound through a jumble of director's chatter). The audio engineer-in-charge (or *A-One*) usually has the setup and programming responsibility for the intercom system, but once that's done, most of the system's operation is spread out among its users.

> ***There is often no one specifically in charge of the intercom system during the actual production.***

Communications planning

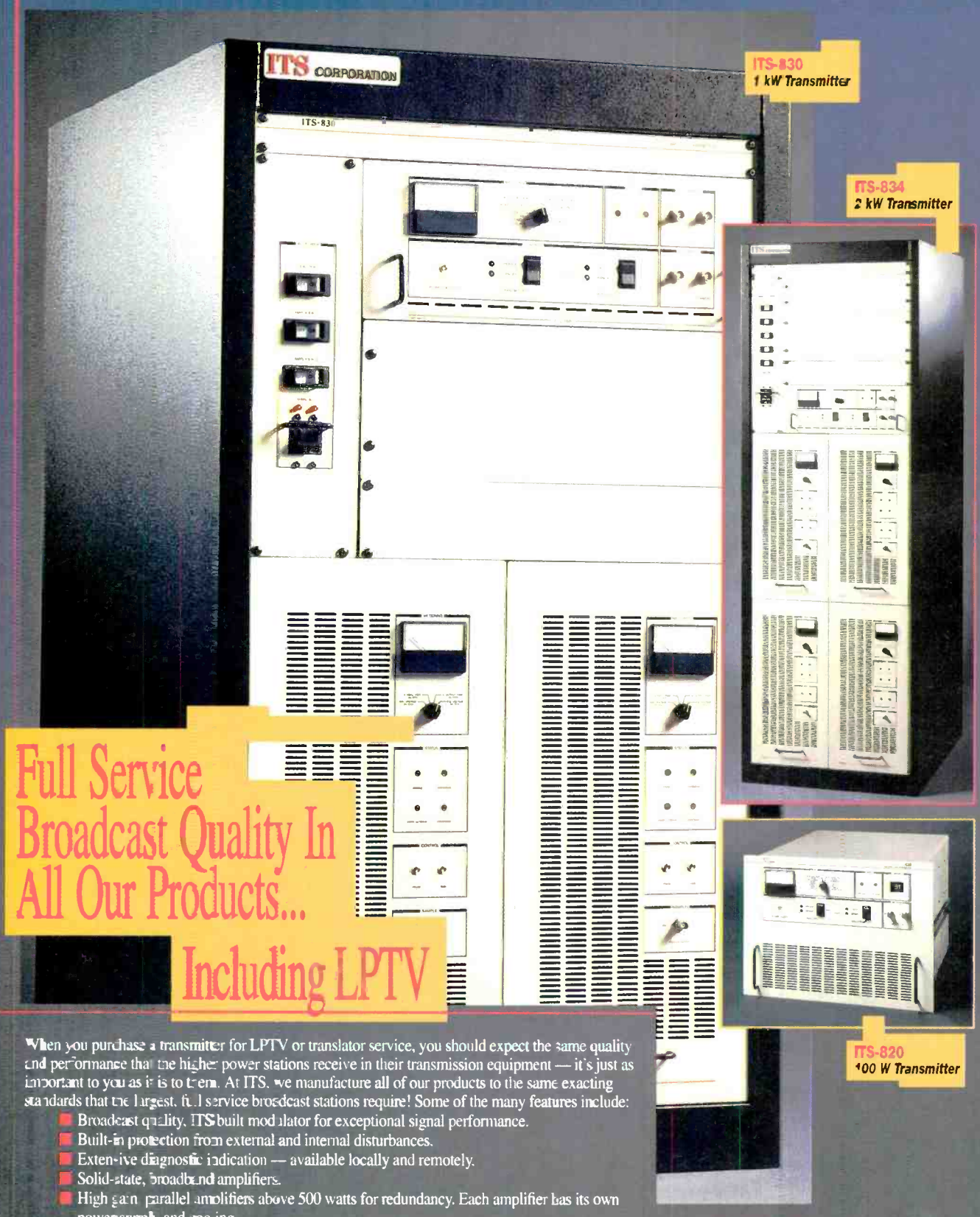
With the complexity and features available on the newer intercom systems, an audio assistant or communications manager is needed for complex productions, from initial planning to completion of the show. The communication planning itself can be a steep task taking into account what everyone in the production is doing. Changes made anywhere in the production area will likely affect the communications plan.

The main task seems to involve figuring out which station needs to hear which other stations, but the key to success is in approaching the situation from the other direction. The communications manager must briefly assume the identity of each intercom user and determine who they need to talk to and who they should *not* hear. By working through an elimination process, channel by channel, the system programmer can determine who must have a private line and who can have a party line with director and cameras.

Limiting the crossing conversations on each intercom channel is the primary goal. Many systems in use now offer wireless links that are 1-channel only. These, along with muting relays, isolated feeds (ISO), interruptible foldback (IFB), program-to-intercom feeds and telco interfaces can all play a part in the communications system plan. But if there is no plan, or a bad one, all the wonderful features of today's intercoms can simply create chaos and cause expensive waste of time.

System architectures

Like telephone systems, intercoms can run send



Full Service Broadcast Quality In All Our Products... Including LPTV

When you purchase a transmitter for LPTV or translator service, you should expect the same quality and performance that the higher power stations receive in their transmission equipment — it's just as important to you as it is to them. At ITS, we manufacture all of our products to the same exacting standards that the largest, full service broadcast stations require! Some of the many features include:

- Broadcast quality, ITS built modulator for exceptional signal performance.
- Built-in protection from external and internal disturbances.
- Extensive diagnostic indication — available locally and remotely.
- Solid-state, broadband amplifiers.
- High gain parallel amplifiers above 500 watts for redundancy. Each amplifier has its own power supply and cooling.
- Conservative design and advanced signal processing for outstanding reliability and performance.
- Full product line from 10 watts to 2 kW for LPTV and translators.

In addition, every product is backed by ITS' deep commitment to customer service after the sale — we simply won't let you down! Join the many broadcasters who are turning to ITS for the best transmitters for both low power and full service requirements.

"Visibly Better Technology"

ITS *information transmission systems*
CORPORATION

Broadcast Systems Division
Freedom Drive
P.O. Box 460
Lawrence, PA 15055-0460 USA
(412) 873-1500 FAX (412) 873-1254

Circle (30) on Reply Card

and receive circuits either on separate pairs (4-wire) or on the same pair, using hybrids at each end (2-wire). Four-wire systems offer greater channel-switching flexibility and private-line (PL) capability, but they demand a centralized switching matrix and more cabling. Two-wire systems are simpler, providing easier set up and operation. In actual practice, a combination of 2- and 4-wire methods is often used.

The latest digitally controlled matrix intercoms allow anyone to talk privately to anyone else. They can also offer system-wide programming capability from user stations (instead of from a single central controller). Some such systems offer "totally soft" control panels that the system programmer can set up to have any button or switch perform any function. These typically employ an LCD or LED display for labeling of button functions and other status display.

The beltpacks of two popular intercom systems, RTS/Telex (top) and Clearcom, use the same connectors and cables for the same functions, but their systems are not compatible.

A wide variety of control actions can be set up, including talk and/or listen, IFB and conditioned switching, remote talk/listen, contact closures for signaling and speaker-muting relays, assignment of groups and conferences and more. System status upon power-up also can be pre-configured.

Push-to-talk-and-listen is a handy feature for allowing a director to talk and listen to a tape operator who may have his or her hands occupied. Most brands also offer DTMF dialing from control panels equipped with standard (telco-type) keypads. From these, calls can be made through optional telephone interface units to outside phones. With auto-answer and self-nulling capability, incoming calls can be received and the caller will appear on the pre-designated intercom channel, without the squealing feedback that formerly plagued telco-intercom connections. Also available on the newer telephone interfaces are multiline coordination, call waiting and call monitoring.

Once all the control functions on a soft-controller system are set, the LCD display and its settings become a *page*. Most systems have a storage capacity of at least 16

SYNC AUDIO FOR $799?!

Pristine Digital Quality From the AVA 22 Audio/Video Alignment Delay.

The AVA 22 does only one thing: digital audio delay in one-field increments. It does it very well. And very inexpensively.

By clever application of the Dolby™ Time Link 1-bit delta-sigma circuitry, Rane brings uncompromising digital performance with a new degree of cost-effectiveness to the process of audio-to-video synchronization. Two separate channels each provide up to 9.5 NTSC frames or 8.0 PAL/SECAM frames of audio delay. That's it.

Okay, we did add a few nice features, like two memory locations per channel, remote memory recall capability, front panel lockout, fail-safe bypass and battery-free EEPROM operation. But we didn't get carried away.

The AVA 22. Pristine. Clever. Reliable. Inexpensive.
The Rane solution for audio sync.

PURITY BY DESIGN
RANE

AVA 22 A/V ALIGNMENT DELAY

RANE CORPORATION 10802-47th Ave.W., Mukilteo, WA 98275 (206) 355-6000

NOW SHIPPING

Circel (32) on Reply Card

Advanced wireless intercom system

Vega Q600

- **Rugged, reliable, metal beltpack remotes**
- **Hybrid UHF/VHF operation to conserve scarce VHF frequencies**
- **Inexpensive VHF monitor receivers to lower system costs**
- **High-quality, low-noise, low-distortion audio**
- **Up to six beltpacks per master station**
- **Designed specifically for broadcast and production**
- **Directly compatible with all standard wired intercoms**
- **Many advanced circuit and system design features**

In the studio or on the set, Vega's wireless intercom systems are the choice of professionals who demand ruggedness, reliability, broadcast-quality audio, and a full set of professional features. Designed from the ground up for broadcast and production work, the Q600 UHF/VHF system provides all the functions and technical capabilities required for these demanding applications.

The Q600 system provides continuous, full-duplex, hands-off communications between up to six people plus an unlimited number of "listen-only" users.

The QTR-600 beltpack remotes are extremely easy to use and provide operation similar to that of hard-wired intercom beltpacks. They are compatible with popular dynamic or electret headsets, such as Beyer, Clear-Com, and Telex. The cases are welded aircraft aluminum alloy with a high-impact, molded Cycolac (ABS) control panel that will withstand the roughest use.

One QX-600 master station supports up to six QTR-600 remotes with "hands-free" two-way communications, and an unlimited number of PL-2 receivers for listen-only users. Circuitry is provided to interface external line audio with the system or to link two QX-600s into a 12-user system. The master station is directly compatible with all standard wired intercom systems such as Clear-Com, RTS, ROH, Telex, and many others via internal programming switches. A local headset position and extensive control, adjustment, and monitoring provisions are also included.

The PL-2 VHF mini-receiver provides a high-performance, low-cost solution to providing one-way "listen-only" communications. Very often, individuals need to receive instructions but are not required to speak. Using PL-2 receivers for this application avoids the expense of additional full two-way remotes and can significantly lower the cost of a typical system. The PL-2 is fully compatible with the Q600 system and is designed to provide reliable communications in the most demanding RF environments.

When the job demands hands-free, full-duplex operations in the most demanding environment, go with the Vega Q600, the system recommended by professionals worldwide.

VEGA

a **MARK IV** company

9900 East Baldwin Place
El Monte, California 91731-2294
Telephone: (818) 442-0782
Toll-Free Telephone: 800-877-1771
Fax: (818) 444-1342
FaxBack: (818) 444-2017
Toll-Free FaxBack: 800-274-2017

Circle (33) on Reply Card

of these setup scenarios. In many cases, programming can also be done on a PC (Windows or DOS) connected to the intercom system via RS-232 or Ethernet. This feature is extremely useful in news operations where a breaking story can require quick switchover of a studio from a production session to live on-air use. Any communications setup page can be rapidly called up and its settings restored.

Some systems offer control panels that are programmable but not totally soft. These have a setup mode in which each button can be assigned from a short list of pre-defined operations. Once programmed in a particular setup mode, the panel buttons are usually labeled manually.

Several manufacturers currently have smaller, digitally controlled (analog audio) systems on the market that offer totally soft rack-mount stations. The cost of these small systems now compares favorably to some of the more traditional "semi-soft" systems.

How digital is it?

The terms *digital system* and *digitally controlled system* are used quite a bit among intercom systems today. Although several current intercoms feature a digital switching matrix, there are only a few on the market that actually send *digital audio* signals to the user stations. Examples of such fully digital systems are the Drake DCS-3000 or the RTS/Telex ADAM. The DCS-3000 uses a 25kHz sampling rate providing a 10kHz audio bandwidth, while the ADAM uses 44.1kHz at 16 bits for CD-quality audio. Level control, summing and processing are all digital-domain functions on these systems. Digital matrix cards housed in a central frame use time-division multiplexing (TDM) to route talk and listen paths to/from more than 1,000 users on a single matrix. The ADAM's TDM bus is 44 bits wide, and the system distributes audio signals at 24 bits, which allows audio quality to be preserved through multiple passes, mixes and routings.

Daisy-chaining stations on intercoms can add noise and make failures harder to diagnose and fix.

These systems support new digital rack-mount stations as well as traditional analog stations. (See Figure 1.) The new hardware includes A/D and D/A converters at the stations, while the analog units are fed through adapters with A/D and D/A converters at the central matrix. All beltpack and earpiece stations on these systems still operate in the analog domain.

As digital hardware costs continue to fall, it is anticipated that the trend toward digital audio distribution will continue, eventually including A/D and D/A conversion in the beltpacks, as well. The major advantage of taking digital audio all the way through the system is the elimination of induced electrical hum and noise. This can be appreciated by anyone who has ever had to run intercom lines around a pile of lighting cables and SCR dimmer units. Rather than sometimes delivering noisy sound, communications systems that are digital from end to end generally will either work perfectly or not at all.

One feature that totally digital systems will probably *not* offer is the ability to daisy-chain stations like current analog systems allow. Daisy-chaining stations on

Digital Output (SMPTE 244M)
20 Bit Audio Companion Stereo Delays
AES/EBU Format
One Rack Package

10 BIT
FRAME SYNCHRONIZER
HOTRONIC
AT61

Price from
$2,400.00

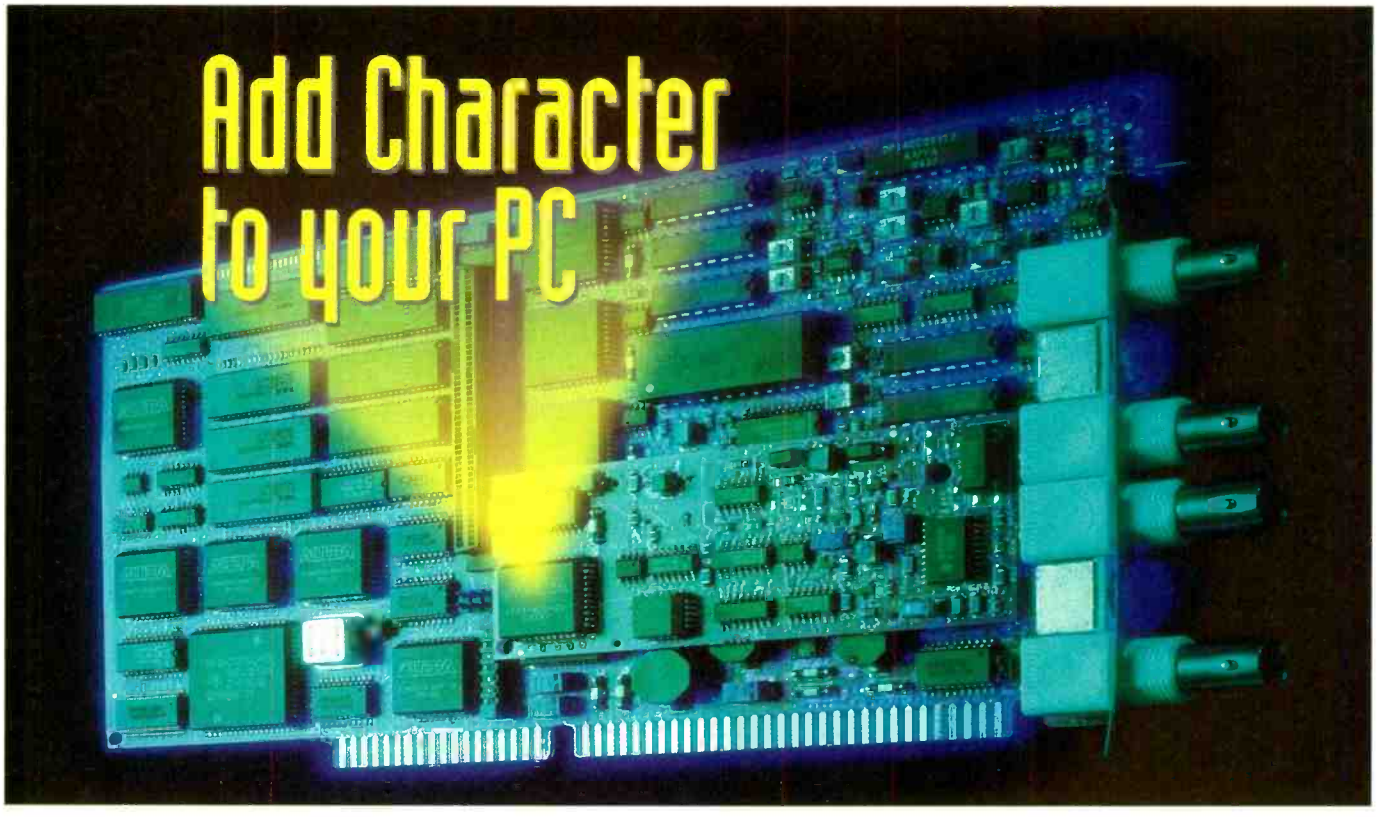
* Freeze Field/Freeze Frame
* Full Proc-Amp Control
* Pass VIR/VIT
* No visible quantization noise
...and more....

The 8X Sub-carrier, 10 bit processing achieve no visible quantization noise. The matching audio delay can handle the lip sync perfectly. The Analog to Digital format transcode will meet with the needs of the new digital world.

HOTRONIC, INC.
1875 So. Winchester Blvd. • Campbell, California 95008 • USA
Tel: (408) 378-3883 • Fax: (408) 378-3888

Circle (34) on Reply Card

CHYRON



© Copyright 1995 Chyron Corporation. All rights reserved
All Trademarks are held by their respective companies.

pc-codi™

NEW BROADCAST QUALITY CHARACTER GENERATOR

Add Character to your PC... Give it the highest quality video, character and graphics generator available today on a PC board — Chyron's **pc-Codi**.

Chyron, the leading designer of high performance graphic systems for the broadcast video market, is pleased to offer **pc-Codi**, an ISA board designed for fully anti-aliased real-time graphics performance at a PC price level.

With **pc-Codi**, you can have broadcast video quality with no sacrifice in resolution in a low cost PC platform. No more waiting for your titling to be rendered... **pc-Codi** does it instantly. And with **pc-Codi's** Font Convert utility, you can use all of your existing Windows-based typefaces, including Truetype™ and Postscript™.

So expand your graphics capabilities with a **pc-Codi**, and get broadcast television quality graphics from your PC, when you want them.

Call or fax us today to find out about **pc-Codi** and the software available from Chyron or our developers... or write your own applications for **pc-Codi** with our developer's kit.

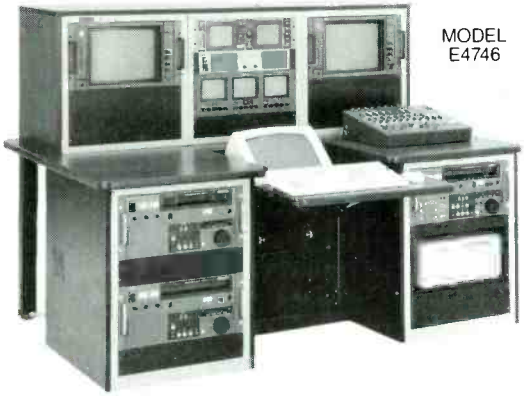
Tel: ***(516) 845-2026***
Fax: ***(516) 845-3895***

CHYRON
THE COMPANY THE WHOLE WORLD WATCHES

5 HUB DRIVE
MELVILLE, NY 11747

Circle (35) on Reply Card

Winsted®



MODEL E4746

DUAL CABINET EDIT STATION

Integrated Workstation for Multimedia Use.

Full 72" wide work surface with keyboard shelf and recessed monitor well for easy viewing. Ample space for electronics in three 19¼" vertical top rack cabinets and two 24½" lower rack frames. The comfort and convenience of working at your own desk.

- Ergonomic design for user comfort. • Over 106" of rack space.
- Wire management trays. • Attractive 2-tone finish in Dove Grey and Black Granite.

For FREE CATALOG, write or call TOLL-FREE 1-800-447-2257

THE WINSTED CORPORATION

10901 Hampshire Ave. So. • Minneapolis, MN 55438 • FAX 612-944-1546

Preferred by Professionals Worldwide

Circle (31) on Reply Card

NEW! It's MATCHBOX II!

The industry's best "balancing box" is now even better!

All four outputs adjustable
HI-GAIN mode for digital editors
Pro-grade gold-plated RCA jacks
More dynamic range

A better product...for the same price!

Over 15,000 Matchboxes are in use worldwide

HENRY ENGINEERING

HENRY ENGINEERING
503 Key Vista Drive
Sierra Madre, CA 91024 USA
TEL (818) 355-3656
FAX (818) 355-0077
FAX-on-Demand Doc #120 (818) 355-4210

Circle (52) on Reply Card

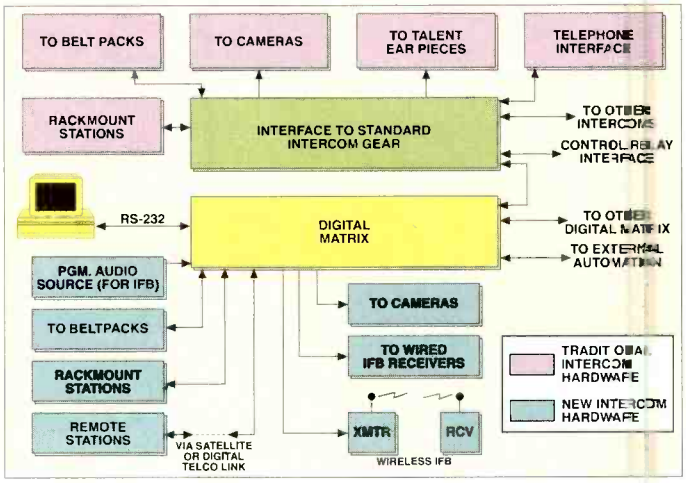


Figure 1. Block diagram of a fully featured current intercom system incorporating traditional equipment and new digital systems.

today's intercoms is not the best idea anyway, because it can add noise and make failures harder to diagnose and fix. Although daisy-chaining is convenient when running cable around a large event, the main reason the tradition developed was the small number of output channels that intercom systems offered. Today's newer intercoms effectively eliminate the need for daisy-chaining because most of their digital switching matrixes can deliver 128 x 128 crosspoints, often expandable to 512 x 512 or larger.

Note that both digitally controlled and fully digital systems have interfaces that provide the conventional 2-wire analog lines to beltpacks, but not all beltpack wiring schemes are compatible — even though they all use standard microphone cable and XLR connectors (more on this later). This is an area where operator knowledge is critical. Beltpacks are not interchangeable and using the wrong type can load down the system or even cause damage.

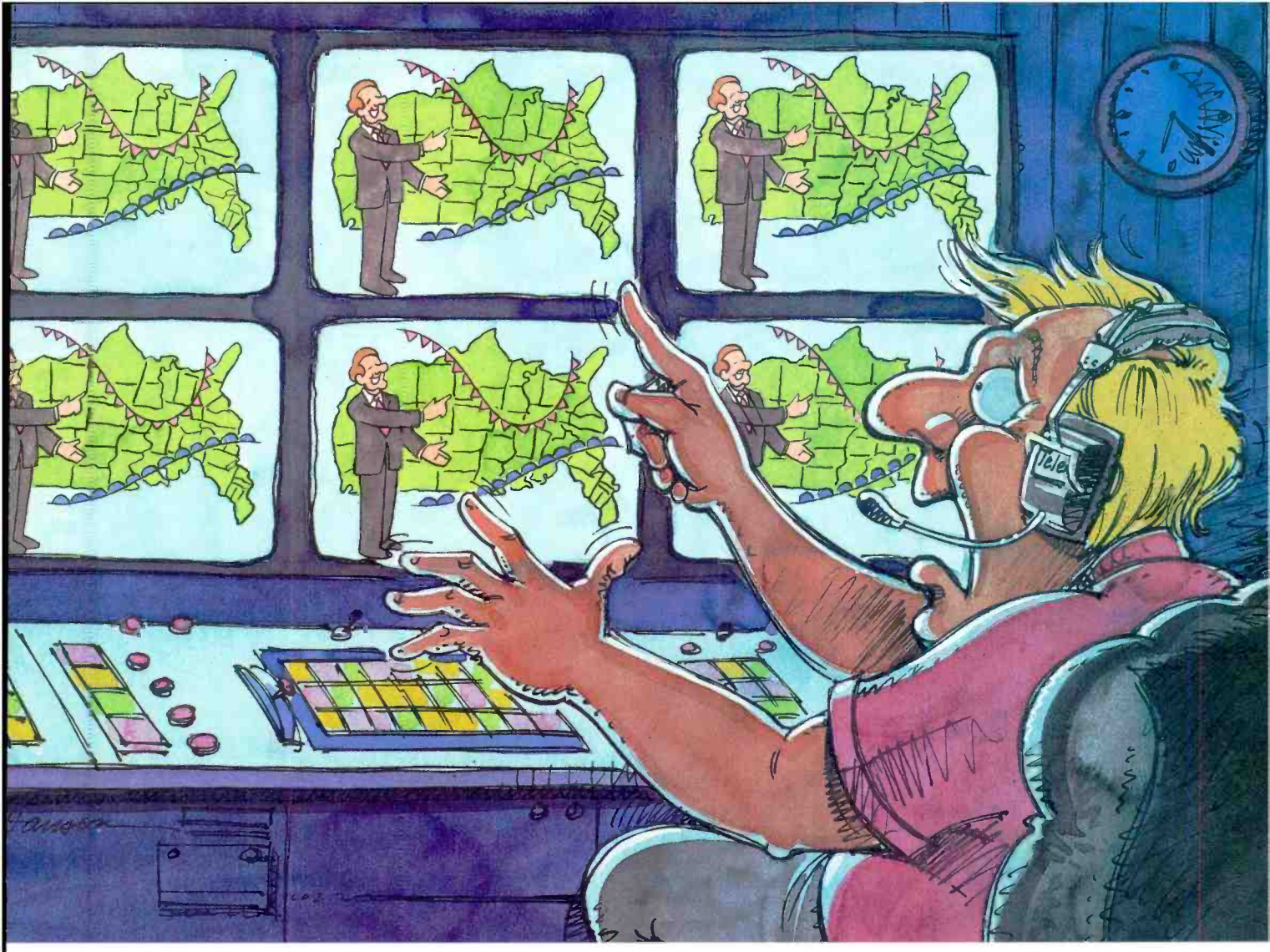
Meanwhile, out on the cables

Regardless of what's happening in the central switching matrix, certain things still have to occur out at the business end of the system. Intercom stations are powered in two ways. Rack- or wall-mounted (fixed) stations can be powered from available AC by way of external DC supplies. These stations can communicate via "dry" lines carrying audio only. Beltpack stations, on the other hand, are powered via "wet" communications lines, carrying 24VDC to 32VDC and audio. (Some fixed stations can also take power from a wet line.)

However supplied, the power is used to drive several necessary functions. With the low-impedance headsets in use today, intercom stations must provide a headphone amplifier with volume control, switching circuits for microphone and channel selection, call-light power and switching, a pre-amp for the headset microphone and a sidetone amplifier, usually with screwdriver-adjustable gain control.

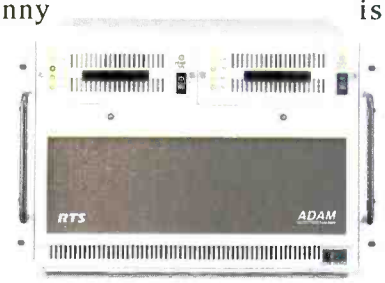
As mentioned earlier, not all intercom makers get power to their beltpacks in the same way, even though they all use the same standard low-impedance microphone cable and XLR connectors. A case in point is the difference between the 2-wire schemes used by Clearcom and RTS/Telex. Clearcom uses pin one for ground, with operating voltage on pin two and audio on pin three. RTS/Telex uses a method similar to microphone phantom powering, using pin one for ground and pins two and three for both balanced audio and simplexed power.

Call lights on these systems also operate differently. RTS/Telex uses a 20kHz tone while Clearcom uses a DC voltage for call-light activation. These methods are not compatible, and if there is ever a



At times like this, you better have an intercom system you can count on.

Things could go from warm and sunny to partly cloudy rather quickly on the set if you're unable to communicate effectively. That's why Telex developed ADAM,™ the most advanced intercom system ever designed. It allows communication with up to 1,000 people with CD quality audio and takes up minimal space, eliminating unnecessary clutter. ADAM™ (Advanced Digital Audio Matrix) is cost effective, all digital and backward compatible, so it will work with your existing RTS™ CS9000 series key panels. And because there is no size limitation, you'll never outgrow ADAM™ These features make ADAM™ a system of the future, available today. Exactly what you'd expect from a sound company like Telex. Give us a call, we'll help you keep your sunny disposition.



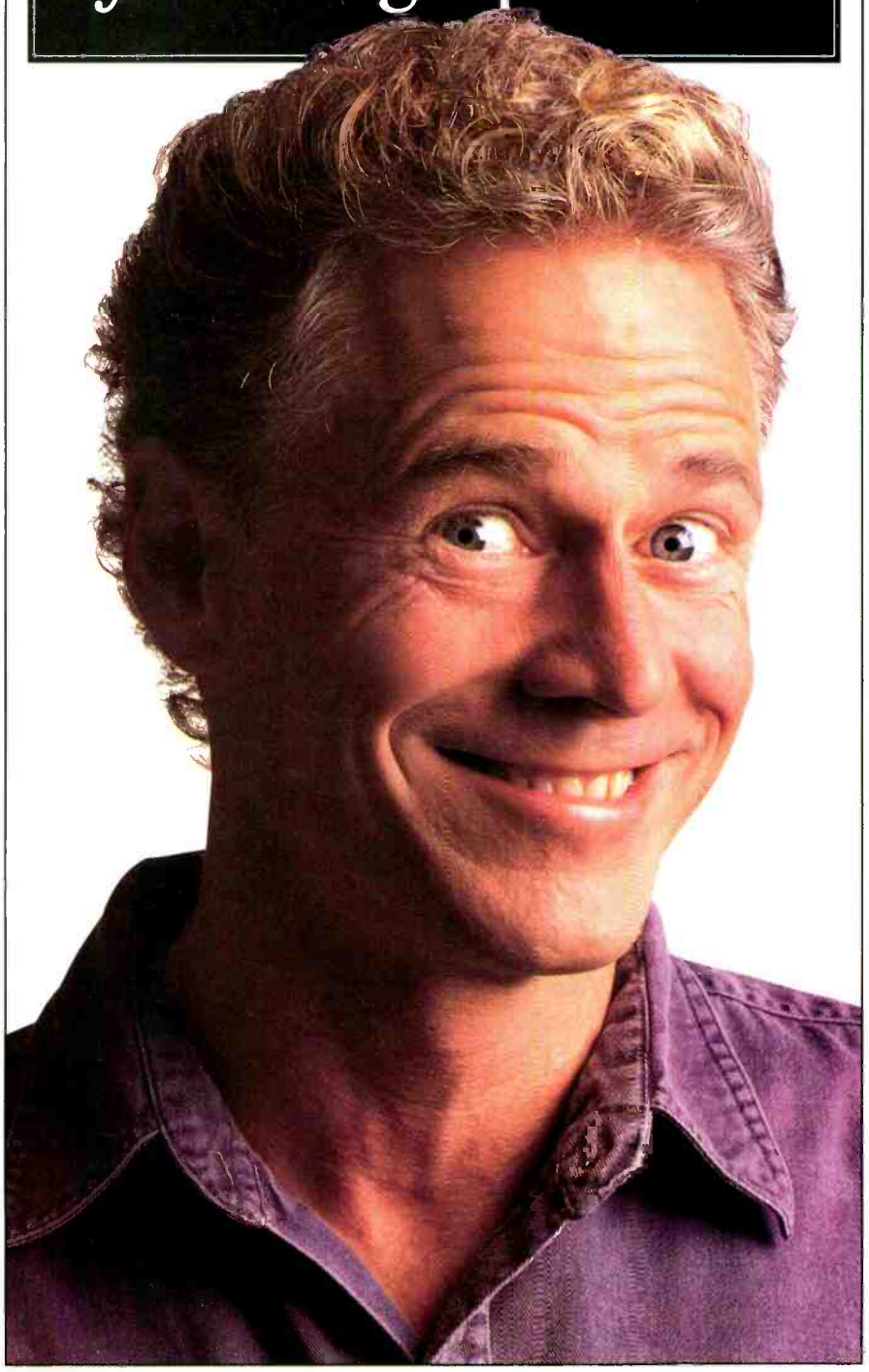
RTS™

RTS™ Intercom Systems. A Product of Telex.

9600 Aldrich Avenue South • Minneapolis, Minnesota 55420 USA • 612-884-4051 Fax 612-884-0043

Circle (4) on Reply Card

Remember how you felt the last time your system gave you more performance than you thought possible?



situation where a remote truck with one system pulls up to a theater equipped with the other, an interface will be needed. Fortunately, such adapters and interfaces abound within the industry. Almost every manufacturer makes an adapter for its gear to plug and play with most other makers' equipment. Any well-equipped remote vehicle should have such a "universal" interface, which is typically packaged as a rack-mount unit.

These interfaces generally provide bidirectional, 2-channel communication between the host system's and the foreign system's 2-channel lines. The interface usually can be powered by either wet lines or via local DC. The lines on each side of the interface are assigned just as if they were beltpacks, and each side of the interface can be powered by the wet line powering scheme to which it is native. These units are versatile and provide the necessary impedance- and level-matching, pin conversion and call-signal transmission. This is certainly an improvement over the lighting director trying to wear two headsets — one to the light crew and the other to the TV truck.

Some 2-wire base stations use different connections for single-channel beltpacks vs. 2-channel beltpacks. If single-channel beltpacks get mixed up with 2-channel connectors, the whole system can be loaded down. This is usually revealed by a sudden drop in reception level at every station. Beltpacks on these systems are usually color-coded between single-channel and 2-channel units. It pays to also color-code the corresponding intercom connections on the studio or truck break-out panel because the single and dual units once again use the same type of cable and 3-pin XLR connectors.

The classic problem of the headset mic being left on has been solved in several ways.

The classic problem of the headset mic being left on has been solved in several ways. A standard feature on new digital matrix systems, *remote mic kill*, has also been implemented on traditional 2-wire systems by using non-audible tones. In one system, a 24kHz tone burst can be sent from a central operator panel to kill all open mics or just selected ones. Such tones can also be used to squeeze 2-channel operation into an otherwise 1-channel, 2-wire line. Some beltpacks have been made or modified to send a continuous subaudible

tone that receiving stations gate to a second channel. Without the tone, it's channel 1. With the tone, it's channel 2. Similarly, non-audible in-band call signals can be used for remote activation of repeaters, amplifiers, on-air lights and other single-trigger devices.

Wireless links

As broadcast production has become more mobile, one of its most pervasive movements has been the rush toward wireless operation of microphones, IFBs and intercoms. Accordingly, all of the major intercom makers offer hardware for wireless (RF) links, which come in several forms.

The simplest arrangement involves the base station and all beltpacks using one frequency. Although simple, it does not allow two stations to talk at the same time. In the second approach, the base unit transmits on one frequency while all of the beltpacks transmit on a second frequency. All beltpacks can hear the entire party-line conversation but only one can talk at any time. The third version is full-duplex, and this is the one most popularly employed. With this method, the base station transmits continuously to all beltpacks on one frequency while each beltpack transmits back via a separate frequency. The base unit acts as a repeater in a mode quite similar to police and other public service radio. This way, all the beltpack units can talk simultaneously and all can hear the discussion.

Care must be taken in setting the squelch on the base unit for each beltpack. Improper squelch setting can result in loud static being sent through the wireless system (and the hard-wired intercom channel to which it is assigned) if one of the beltpacks is turned off. To avoid this problem, many of the more modern units have an auto-squelch feature.

RF base units are usually made to be generic. They can operate with a hard-wired system from the same manufacturer or they can be internally dip-switch programmed to work with other intercoms. All generally offer a rear panel loop-through just like hard-wired beltpacks. Many models have two antennas on the base and two on each beltpack. This does not imply any type of spatial diversity as in wireless microphone systems. Rather, one antenna is used for transmission and the other for reception. Diversity reception is not commonly found on wireless intercoms.

Because intercom beltpacks are not subject to the same size constraints as wireless microphones, they typically operate on an RF output power of approximately 50mW, or about five times the RF power output of many wireless mics. Base station front panels generally include a local headset con-

Wanna feel that way again?

YOU KNOW THE FEELING. It's the confidence that comes from knowing that the tools you work with every day will deliver all the performance you expect—and more—every time.

And that's exactly the feeling you'll get from the Model 1200, our serial component digital switcher that delivers "big-system" 4:2:2:4 performance in a familiar, affordable design. With chroma-keying ability that is unmatched by any other system in its class. Not to mention superb video quality, stability, and reliability. The Model 1200's advanced control system makes setup and operation simple, fast, and intuitive. And best of all, its versatile design allows it to be used effectively in broadcast, post-production, and telecine environments.

If you'd like more information on the Model 1200, call us today at 1-800-474-8889, ext. 300.

The Model 1200 from Grass Valley. Nothing else feels like it.

Grass Valley
A TEKTRONIX COMPANY

© 1994 The Grass Valley Group, Inc.

Circle (42) on Reply Card

Fibox
AUDIO-ON-FIBER

We Hear You Loud And Clear!

"The audio coming out of our new Fibox system was so good that it was almost shocking... night and day compared to copper. And the system has been very reliable."
Bill Parinello, Technical Manager, NBC Sports

"We dropped our STL noise floor about 15dB by going from copper telco lines to the Fibox, which was great for our 24-hour classical format. Cost was not a problem, even with the limited budget of a small college station."
Everett DeVelde, Chief Engineer, WSAJ-FM, Grove City, PA

"We bought the Fibox primarily for lighting isolation on a 500-foot run between our studio and STL tower. But we also noticed that the audio came through crisper and brighter than on our temporary shielded pair."
Galen Hassinger, Director of Engineering WINK-FM, Ft Myers, FL

- Fully Modular
- Two To Twelve Channels Per Fiber
- *Totally transparent* Mic Preamps
- Analog And Digital Output Modules
- No Line Loss
- No Ground Loops
- 48kHz Sampling
- 20-bit Conversion With 108dB Dynamic Range
- High CMRR
- Transmission Distances To 4km
- Easy Installation And Set-up
- Inherent immunity to EMI and RFI

Lightwave A SUNDANCE SYSTEMS COMPANY
900 Jackson Street, Suite 700 Dallas, Texas 75202
214-741-5142 Fax 214-741-5145 Toll free 800-525-3443

Circle (43) on Reply Card

This large-facility, 300x320 analog-crosspoint intercom matrix occupies 16 full racks. Rectangular matrices such as this must grow in proportion to the square of the number of users. A new digital intercom system could reduce the size of this matrix to a single rack. (Photo courtesy of ABC Broadcast Operations & Engineering.)

nection, an indicator light for continuous base transmit and a light to denote reception of each beltpack's RF carrier. These systems have traditionally used the VHF band but, as with wireless microphones, recent movement to the UHF band has resulted from the crowding and interference problems encountered at VHF. As always, the length of the antennas indicates the RF band being used.

Most wireless IFB systems in use still operate in the VHF band around 70MHz, but some use frequency modulation near TV Channel 6 (at the bottom end of the FM radio band). These units can use personal FM radios as receivers.

Take care not to connect wireless intercom transmitters directly to an IFB system using wet lines. The powering on these lines can damage the transmitter. Instead, buffer the feed to the wireless transmitter using a hard-wired IFB talent beltpack that outputs only audio on a dry line.

Communications specialists needed

As digital intercom systems gradually take over the broadcast communications industry, their wealth of features and configurations can provide limitless communications options. The huge range of interface options and wireless links proves that intercoms can no longer remain an afterthought in production planning, nor is it a part-time job of the program audio mixer. With today's hardware, broadcast intercoms are becoming a specialty unto themselves. ■

Bennett Liles is an audio engineer at Georgia Public TV, Atlanta. Respond via the *BE* FAXback line at 913-967-1905 or via E-mail to be@intertec.com.

Photos by Bennett Liles, except where noted.

Editor's note: Thanks to Clearcom, Keith Hall of Intercom Specialties and Dennis Whitley of WXIA-TV.

For more information on intercom systems, circle (300) on Reply Card. See also "Intercoms," p. 52 of the BE *Buyers Guide.*

Circle (44) on Reply Card →

Preview

June...

• **NAB Review**

B&E reporters canvassed the entire NAB exhibition floor for the latest sizzling new products and technology. This multipart package includes thorough coverage of new products and demos from the show floor and back-room peeks as well as coverage of important session reports. Almost 50 staff members and reporters were on their toes to bring you the best coverage in the industry.

• **TV Pick Hits**

The top 20 new products on the show floor as judged by our army of engineers and industry experts.

July...

• **Editing Systems**

Editing systems encompass a wide range of products. No longer divided into on-line and off-line systems, editing technology is a blend of old and new technology. Author Karen Mills will look at more than the traditional editing system. Today's systems need to talk to other workstations, newsroom computers and even to outside footage supply houses. This must read will cover traditional editing equipment plus networking, video server applications and something new called "transportable editing systems."

• **Building a Remote Newsroom**

John Weigand, director of engineering for WFMB-TV, was faced with the challenge of building a complete remote newsroom so his station could cover the Super Bowl Game. With only 2-week's notice his staff built, shipped and got a 3-room editing facility on the air. This article will review the complex process and highlight how to incorporate 2-way data traffic for scripts, live on-air prompting, 2-way talent talk-back circuits, satellite feeds and cellular interfaces for live coverage.

• **Choosing a Camera**

The low-light performance of video cameras is often crucial in news and specialized production applications. Unfortunately, manufacturers sometimes rate lowe-light performance in different ways. This can make it an apple-and-oranges comparison for the buyer. The author takes care to debunk confusing product specifications.

SCTE®

For more information contact:

Society of Cable Telecommunications Engineers

669 Exton Commons
Exton, PA 19341
(610)363-6888
(800)542-5040
FAX: (610)363-5898

To sponsor the 13th annual

CABLE-TEC EXPO '95

In Las Vegas, June 14-17

"It *would* be great to have an edit system that gave me true non-linear, on-line working. Add in the right quality and *we'd be laughing,* but hey,"

dream on!

Wireless microphones in the studio

By Bennett L[illegible]

Wireless systems are becoming as common in the studio as they are in the field.

The Bottom Line:

Untethering your studio talent fits the recent trend toward increased mobility and greater flexibility in production. Most operators have gained their wireless microphone knowledge from remote applications, but there are some important differences when going wireless in the studio. $

Once feared as exotic and temperamental animals, wireless microphones have, over the past decade, become as tame and common as cats. The growing mobility of cameras and recorders has assured these increasingly reliable microphones a solid place in broadcasting. The explosion of new programming outlets and formats has also had a positive impact on wireless microphone technology. Advanced design, better construction and improved techniques by users have all been instrumental to this trend.

Much has been written about how wireless microphone technology performs on the road. Film production, sports and ENG applications have all been examined and the impact of RF mics in these areas has been considerable. Studio installations have been less thoroughly surveyed, but they have also felt a substantial effect of the wireless invasion.

To buy or not to buy?

With any wireless installation, temporary or permanent, the type of equipment used and the way it is set up depends largely on the specific production format. In a local station or cable studio, the RF mic installation may serve only the weather forecaster and an occasional commercial spot taped within a relatively small space. At minimum distances with little talent mobility, a single receiver antenna may work well. In a production house or larger TV station environment, the wireless mic setup may have to accommodate a much wider range of production formats in which higher RF power, multiple antennas and antenna dividers may be needed.

In the studio, temporary setups of rented wireless gear can work well, however, their set up time will be longer than permanently installed systems. The operator will have to assemble antennas and receivers instead of just turning on a rack-mounted tuner and attaching the transmitter and mic to the talent. The more wireless mics you rent for a particular session, the longer this set up time differential will be. Coverage limits and optimum antenna placement will also have to be learned "on the fly" with rented systems, whereas such performance limitations will probably be well-known with permanent systems soon after they are installed.

For rented systems, it is highly recommended to mount the two receive antennas separately on tall, telescoping microphone stands and to connect them to the receiver by relatively short (20-foot to 50-foot) lengths of coaxial cable. Most receiver/antenna systems have a 50Ω internal impedance, although for short cable runs on a temporary setup, 75Ω coax will usually do. For permanent installations requiring longer cable runs, RG-8 or RG-58U should be used. RG-8 has somewhat lower loss than RG-58U in the UHF band, but the RG-58U is much smaller cable and will be less of a headache to install. Even at UHF frequencies, it works quite well.

In a temporary installation, antennas should be placed at least three feet apart. If many metallic objects are moving through the set, at least 20 feet apart is better. Using microphone stands, the antennas can be easily moved for better pickup if problems are encountered. Sets and cameras may move, and lighting instruments may be raised or lowered changing an antenna placement that worked well a few scenes ago into a noisy and dropout-prone arrangement.

Another disadvantage of a temporary setup is that the receiver is usually out in the studio and the operator is usually in a control room, so the receiver is out of the operator's sight and reach. In addition, multiple rented microphones may not be

One of a pair of diversity receive antennas for a permanently installed UHF wireless microphone system. The other antenna is mounted on the same studio wall, about 30 feet away.

able to share master antennas, meaning more antennas, more mic stands, more cable runs from antennas to receivers and more audio lines from receivers to audio snake — in other words, more studio clutter.

Permanent installations avoid these problems by placing the receivers in the control room adjacent to the operator with the receive antennas mounted on the studio wall or hung by wooden poles from the lighting grid. But other problems are encountered in this scenario: RF cable runs are typically much longer and they may travel along with camera cables or near AC lines. In setting up a permanent RF mic situation, it is good practice to fasten the antennas onto their mounts and run the cable loosely at first. At least 20 feet of extra cable should be left coiled near each antenna in case interference

Most manufacturers now offer DC-powered antennas, which are recommended for permanent installations.

requires the antenna to be moved after a few trial runs. After enough use has shown that they work, the extra cable can be cut off and the lines fastened down.

Most manufacturers now offer DC-powered antennas, which are recommended for permanent installations. With these, the receiver supplies a DC voltage (typically 9V or 12V) to the active antennas by way of the antenna cable in similar fashion to condenser mics' phantom powering. The DC power feeds an RF amplifier inside the antenna housing and produces an amplified RF signal. The RF amplification is usually around 10dB or less in the center of the antenna's pickup frequency range. Rather than boosting the signal

Circle (54) on Reply Card

Dream on.

EDIT™ BOX

The future of editing.

QUANTEL

Quantel Inc., 85 Old Kings Highway North, Darien, CT 06820
Tel: (203) 656 3100 Fax: (203) 656 3459

Circle (53) on Reply Card

by a large amount, the RF amplifier's main task is impedance matching between the antenna and the receiver so that the long cable runs involved in permanent installation are possible. On many units, an indicator light on the antenna housing will signal the RF amplifier's operation. On wall-mount types, this light is not always visible once the antenna is mounted. The antenna, however, can be easily removed from the wall temporarily to view the indicator if the amplifier's operation is in question.

Regarding interference to wireless microphones, AC is not to be feared nearly as much as RFI. AC power and its harmonics (60Hz, 120Hz, 180Hz, etc.) are well below the operational band of the receiver. RFI shielding is far more important, especially in an environment where high-power TV transmitters are nearby. If a station's transmitter is co-located with the studio, even the audio board can act as an antenna, and in some such cases, rather heroic measures are needed for shielding wireless mics from RFI.

Receivers

Although the receiver does not have to be within sight or reach of the operator, it is best to have it rack-mounted in the audio control area, close to the audio mixing position. This allows RF signal strength to be continuously monitored and frequency selection to be easily adjusted — typically front-panel items on receivers offering these features. Frequency-agile receivers are quickly becoming the norm, even for ENG applications. Fixed-frequency wireless mic receivers soon will be considered legacy equipment among broadcasters.

Regarding interference to wireless microphones, AC is not to be feared nearly as much as RFI.

Most frequency-agile systems are ordered with their operating frequencies selectable within the range of at least two TV channels that are vacant in the facility's market. Within each 6MHz-wide TV channel, some 47 or more wireless mic channels are established. The exact number of mic channels available depends on their spacing, which varies among manufacturers. The channel separation required is a function of the amount of FM deviation used by the system's transmission scheme. The wide variation among systems stems from the use of differing amounts (from none to lots) of audio companding among systems.

Most professional wireless mic receivers have 2- or 4-pole helical or crystal front-ends that are nothing more than tuned filters with high selectivity. The receiver itself is wideband, with the front-end acting as a narrow funnel through which the selected mic carrier signal must pass. Frequency-agile systems operate in similar fashion using active front-end filter components. In their case, the frequency "funnel" can be slid up and down within its designed range.

For situations where one control room can serve two or more studios, receive antenna(s) in each studio can feed a single receiver in the control room via a (dual) RF switch. Large facilities may also require multiple sets of antennas at different ends of the same studio to optimize coverage throughout.

When initial testing of a wireless mic setup is performed, all lights, cameras, monitors and other equipment should be turned on.

This is especially true of other wireless gear, such as IFB transmitters and RF intercoms. Be sure to have the talent make a thorough walk-around throughout the studio area that is likely to be used during the broadcast or production session. If no help is available at the time, a sole operator can roll an audiotape, put on the transmitter and mic, open the mic input on the audio mixer, and stroll around the studio. While walking, the operator should verbally announce his or her current location for the tape.

Especially with VHF body-pack transmitters, it's a good idea to make sure the antenna on the talent is vertical. Correct RF polarization always helps. If the receivers' antennas are vertical, the transmitters' antennas should also be vertical. Talent may have to be discouraged from coiling up a VHF antenna and tucking it neatly away. It should be extended to its maximum length, beneath clothing. On David Letterman's frequent, coatless forays down the hallway, his transmitter can clearly be seen fastened to the back of his belt with the antenna extended straight upward and gaffer's-taped to the middle of his shirt. An advantage of UHF in this regard is that the antennas are too short to be coiled or easily bent. If interference is encountered with a fixed-frequency system, a change from vertical to horizontal polarization can sometimes work

A VHF wireless mic receive antenna at WXIA-TV, Atlanta. The antenna is mounted on a non-RF-reflective pole hung from the ceiling above the news set.

wonders, thereby saving the operator from swapping in new hardware.

Regarding RF power output, the trend throughout the industry is up. Over the years, wireless mic transmitters have become steadily more powerful. The current legal limit for their 110KF3E emission is 150mW. Some manufacturers currently use this maximum while others have elected to keep the RF output down to as low as 10mW, using high receiver selectivity to avoid interference. Neither approach seems to have a clear advantage over the other. Both systems work quite well doing things in their own way (although other nearby users of the same spectrum may have a clear preference for the latter method).

Most RF microphone systems now include *pilot tone muting*, similar to that used in 2-way communications radio systems. In this arrangement, the transmitter sends out audio along with an inaudible, above-band tone. The tone governs the audio output from the receiver and when the tone is not present, the receiver mutes and prevents reception of conflicting transmissions or noise. Another approach in use is one in which the receiver senses not only the presence of the FM carrier but also searches for hypersonic components in the audio signal.

...is also the longest lasting battery on the job.

That's because PROCELL® PROFESSIONAL™ batteries *are* DURACELL® batteries — *the longest lasting alkaline batteries available.* PROCELL is Duracell's line of alkaline and specialty batteries made for professionals. They deliver DURACELL dependability, DURACELL value and DURACELL performance.

PROCELL's superior performance is the result of a new Duracell alkaline battery design with features so unique they're patented.

See for yourself that PROCELL is the longest lasting battery you can buy. For more information or a distributor referral, call **1-800-548-5489**.

Circle (55) on Reply Card

When it matters the most.™

DURACELL®

PROCELL PROFESSIONAL™ BATTERIES

Most reception problems appear in the audio signal as hissing white noise like a TV receiver tuned between stations. This signal contains many frequencies above the usable audio spectrum. Sensing such frequencies (above 15kHz or so), this type of receiver will mute. One advantage here is that no circuitry is needed to filter out a pilot tone and its harmonics, thereby improving audio quality slightly. Regardless of the method used, these systems prevent the earlier nightmare of aircraft communications or a CB operator springing from the receiver the moment the mic is turned off or moves out of range.

Diversity reception

As a practical tool, diversity reception has been around for decades. The military used it to prevent dropouts from multiple radar arrays. At radar frequencies, momentary dropouts can result in sizable data loss and big blind spots. In the wireless mic world, there have evolved several different ways of using multi-antenna reception.

Today, many systems use two antennas with two receiver front-ends and two demodulator sections. The output switches back and forth between demodulators taking the strongest RF signal and ignoring the weaker antenna signal. As long as the outputs are correctly balanced, the switching is perfectly transparent. Frequent gain and loss in level can indicate that tuning is necessary to equalize gain between A and B outputs.

A less sophisticated method is called *antenna summing*. It simply involves adding together the total signal from all antennas simultaneously. Unfortunately, the various antennas' signals are rarely in perfect phase with each other, and as the phase relationship between antenna signals changes, the combined signal strength will vary considerably. Also, the RF amplifier has to be so wideband that it can interfere with its own receiver.

In another variation of diversity switching, the antenna signals are adaptively *mixed* so that each antenna's signal is fed to the receiver in varying degrees rather than via an all-or-nothing switch. This method can also suffer some phase problems.

One interesting diversity scheme compares the phase between antennas and constantly adjusts the phase of the second antenna so that it complements the signal from the first. This setup uses one receiver, one demodulator section and one audio output. It doesn't switch antennas at all but continuously performs this complementary phase adjustment between antenna signals.

No matter how it is performed, diversity reception has put real muscle into wireless microphones' reliability, and more than any other single development, has enabled the use of wireless microphones to explode throughout the broadcast industry.

The wireless microphone is a beast that has at last been tamed. Although permanent studio installations do require some special care, experimentation and custom tailoring, wireless systems are fast becoming a standard feature of the broadcast production facility. ■

Bennett Liles is an audio engineer at Georgia Public TV, Atlanta. Respond via the *BE* FAXback line at 913-967-1905 or via E-mail to be@intertec.com.

Photos by Bennett Liles.

For more information on wireless microphones, circle (301) on Reply Card. See also "Microphones, Wireless" p. 50 of the BE Buyers Guide.

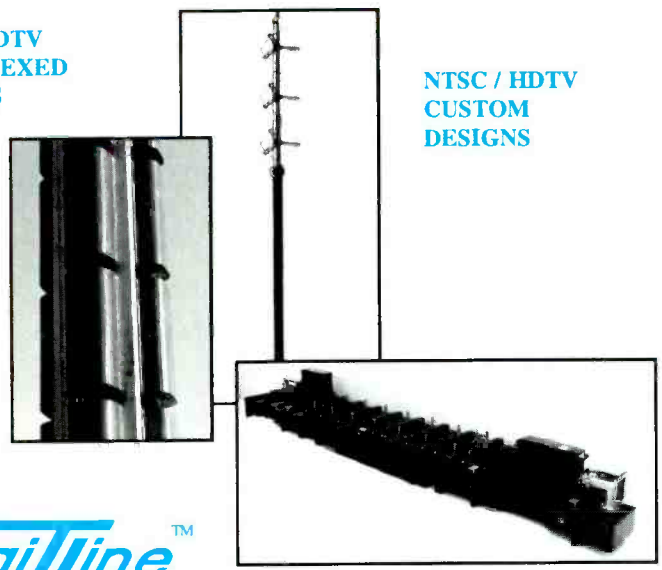
Question: ***How can I replace my antenna system TODAY and still prepare for tomorrow's Advanced HDTV future?***

Answer:

DIELECTRIC

NTSC / HDTV MULTIPLEXED SYSTEMS

NTSC / HDTV CUSTOM DESIGNS



More stations have chosen Dielectric for HDTV adaptable antenna systems. Why?

Because Dielectric's antenna engineers, the most experienced staff in the industry, translate your custom requirements into products only Dielectric can deliver.

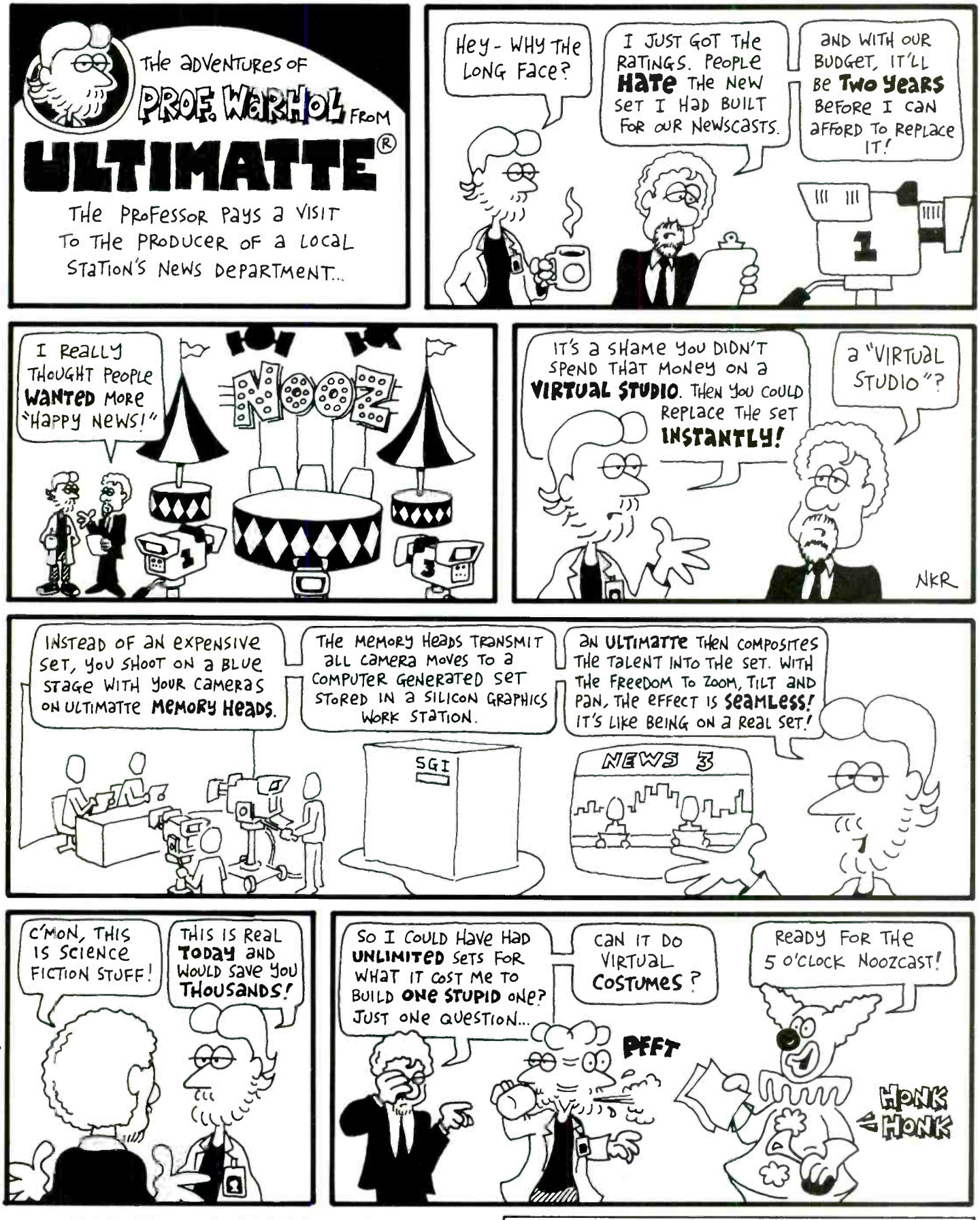
Looking to replace your antenna system? Call TODAY and put Dielectric's expertise to work for you!

digiTline™
BROADBAND RIGID TRANSMISSION LINE

RF SYSTEMS FOR IOT AND SOLID STATE TRANSMITTERS

DIELECTRIC COMMUNICATIONS
RAYMOND, MAINE 207-655-4555 FAX: 207-655-7120

Circle (56) on Reply Card

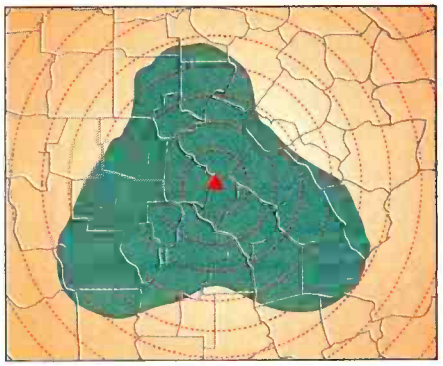


Cartoons by Keith Robinson/Making It Productions 310-379-4345

Stop clowning around with budget-busting sets!
CALL FOR INFO ON THE ULTIMATTE VIRTUAL STUDIO TODAY!
Phone: 818-993-8007 Fax: 818-993-3762

ULTIMATTE® 20554 Plummer Street
Chatsworth, CA 91311

By Robert D. Weller



Predicting ATV coverage

As the broadcast community moves toward the realization of advanced TV (ATV) systems, it is appropriate to examine the issue of ATV coverage. Coverage prediction is important in the selection of allocation criteria and in selecting optimum operating powers, antenna patterns and transmitter sites.

Because ATV departs from the traditional NTSC transmission standards, it is appropriate that traditional methods of coverage prediction be reconsidered in favor of more advanced techniques.

Receiver sensitivity and transmitter power

Although analog systems such as NTSC television are evaluated by fidelity criteria — signal-to-noise ratio, percent distortion, etc. — digital systems are evaluated by probability of error. Probability of error is commonly characterized by *bit error rate* (BER), which is the number of errors received divided by the total number of bits transmitted. The BER threshold value determines whether the signal will be usable. (Digital systems do not degrade gracefully.)

The BER at the *threshold of usability* (TOU) is measured in the presence of random (Gaussian) noise. For the Grand Alliance (GA) ATV system, this occurs at a BER of 3×10^{-6}. It has been determined experimentally that this TOU occurs at a carrier-to-noise ratio of 14.9dB. This ratio is used as the basis for deriving the signal level requirements for the GA system under noise-limited (weak signal) conditions.

Furthermore, it has been suggested that since the GA system is characterized by a threshold effect, coverage availability should be increased from the customary median value of F (50, 50) (i.e., 50% of the locations 50% of the time) to a much higher value such as F (50, 99) (50% of the locations 99% of the time). Additional fade margin factors can be derived by assuming that the fading ratios tend to follow dB normal (Gaussian) distributions. For a transmitter sited at 1,500 feet (457 meters) above average terrain, the additional fade margin required to serve a receiver 55 miles distant is 16dB at a typical UHF frequency (Channel 53). The additional factor for a typical VHF frequency (Channel 6) is 12dB.

Although measurements using actual consumer ATV receivers are required for confirmation, calculations of F (50, 99) values have been performed. They indicate that for a typical VHF channel, ATV signal levels of 59dBu, 44dBu and 32dBu seem appropriate for "inside antenna," "outside antenna," and "limit of service" coverages, respectively. For a typical UHF channel, these same values are 72dBu, 63dBu and 47dBu. These calculated values assume a uniform 9.2-meter receive antenna height and no change in noise threshold due to multipath propagation.

Finally, in order to obtain coverage that is approximately equal to that from an NTSC system, experiments have shown that the average power of the GA system must be reduced by 12dB from the NTSC peak-of-sync value. For typical VHF operation, where the maximum NTSC power is 100kW, the corresponding average ATV power would be 6.3kW. For typical UHF operation, the maximum NTSC ERP is 5MW, with a corresponding ATV average power of 316kW. Of course, the required transmitter size would have to include the 8dB peak-to-average factor, resulting in peak ERPs of 40kW at VHF and 1.99MW at UHF.

Advanced coverage projection

So-called "area" methods, such as those used in the FCC rules, treat terrain in a statistical manner and truncate the available terrain information to produce maps that are acknowledged to be mere approximations of coverage. Over the years, various algorithms have been used to predict path loss between two points, considering actual terrain profiles between transmitter and receivers.

Selection of the proper algorithm requires expert engineering judgment of the actual terrain in question. To prepare a sufficiently detailed map of coverage requires the analysis of literally thousands of separate and distinct terrain profiles. It is, therefore, a practical impossibility to prepare a realistic coverage map solely by using manual computation.

To provide a computerized method for predicting coverage, the National Telecommunications and Information Administration (NTIA) developed an integrated system that embeds a number of different propagation algorithms within it. The basic NTIA publication, *Master Propagation System Users' Manual*, describes algorithms for groundwave and tropospheric propagation prediction from 10kHz to 300GHz for a variety of conditions. However, only its *terrain-integrated rough-Earth model* (TIREM) is deterministic. The use of TIREM, together with other programs and appropriate databases, can provide a detailed map of predicted signal strength throughout an area.

The TIREM program automatically selects the most appropriate propagation algorithm for computing basic path loss between any two points. This *expert system* substitutes for the judgment of an expert engineer, who would otherwise be required to select the appropriate algorithm for each of the thousands of paths. For paths that have characteristics appropriate to more than one algorithm, TIREM automatically calculates a weighted average between the two most applicable algorithms.

The public domain TIREM code includes 12 propagation modes as shown in Table 1. A few modes are illustrated in Figure 1. The modes included in TIREM are arranged in a modular fashion, permitting additions or enhancements, and are divided generally into

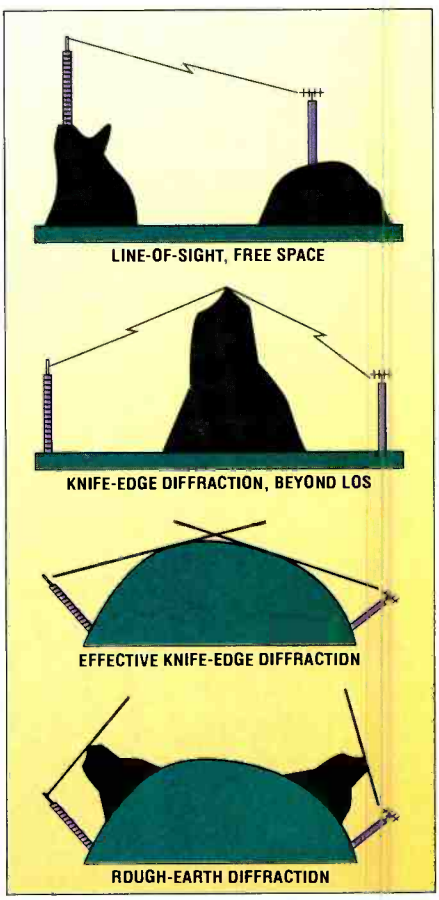


Figure 1. Graphic descriptions of four propagation modes.

two groups: *line-of-sight* (LOS) and *beyond line-of-sight*. Line-of-sight means that the receiving antenna lies within the radio horizon of the transmitting antenna. The radio horizon distance is calculated by determining the great circle path between the points and adding the effects of *atmospheric refractivity* and the Earth's curvature. Atmospheric refractivity is most commonly taken to be 300 N-units, resulting in the familiar value of 4/3 effective Earth radius. Refractivity increases with humidity and other factors, so while the 4/3 factor is a typical value, the actual result can change significantly with time of day, location, season and altitude.

The automated preparation of coverage maps depends not only upon the availability of TIREM but also upon the use of a suitably detailed digitized terrain database, such as that available from the U.S. Geological Survey. This database provides terrain elevations throughout the United States at points located on a rectangular grid with a spacing between points of three arc-seconds (approximately 270 feet apart). Together, the TIREM program and the digitized terrain database accurately predict the time-invariant path loss in the region surrounding a station.

1. Line-of-sight, free space
2. Line-of-sight, rough Earth
3. Line-of-sight, transition
4. Knife-edge diffraction, beyond LOS
5. Rough-Earth diffraction
6. Effective knife-edge diffraction
7. Effective knife-edge/rough-Earth diffraction
8. Tropospheric scatter
9. Effective double knife-edge
10-12. Diffraction/scatter combination modes

Table 1. *The 12 basic propagation modes supported by the TIREM program.*

When combined with a suitable driver program that incorporates the radiation characteristics of the station and generates the grid of receiver locations, the signal levels over a wide area can be easily calculated.

Figure 2 plots the terrain-sensitive coverage of a hypothetical NTSC Channel 53 facility located at Sutro Tower in San Francisco. For comparison, the "City Grade," "Grade A" and "Grade B" signal-strength contours, calculated using the FCC method, are overlaid on the map.

AS-101
Audio Switcher

- Illuminated and legendable control buttons
- Instant or overlap switching
- Front panel accessible level controls
- Options include: RS-232 interface, remote control, relay-follow-switch outputs
- Network proven quality and reliability

P.O. Box 1342 Bellingham, WA 98227
1-800-645-1061 FAX (206) 676-4822

Conex Electro-Systems, Inc.

Circle (59) on Reply Card

For AM, FM, SCA
and TV modulation monitors.

WHEN ACCURACY COUNTS...COUNT ON...

Call **(610) 687-5550** or write for more information on Belar Am, FM, Stereo, SCA and TV monitors.
FAX: 610-687-2686

BELAR
ELECTRONICS LABORATORY, INC.
LANCASTER AVE. AT DORSET, DEVON, PA 19333

Circle (60) on Reply Card

ShibaSoku

Test Equipment: On the Mark Every Time.

ACCURATE TEST EQUIPMENT

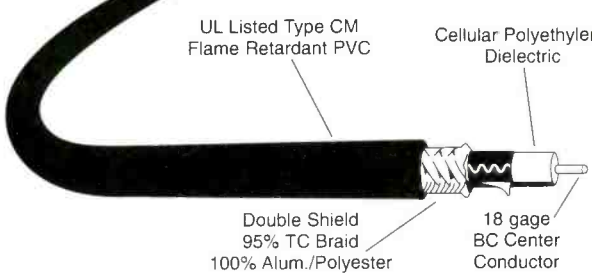
The ShibaSoku tradition of accuracy is demonstrated in a wide range of superior test instruments. Optimum ShibaSoku performance is demanded by top professionals all over the world in R&D labs and leading audio/video equipment, TV, VCR, disc and tape manufacturers. They look to Asaca/ShibaSoku for test equipment which offers many years of reliable, stable service. From digital, monoscope, and multi-standard generators, to color video noise meters, dropout counters, and audio analyzers, Asaca/ShibaSoku's precise and modular test instruments offer unparalleled accuracy and dependability.

ASACA®
The true measure of performance

ASACA/SHIBASOKU Corporation of America
12509 Beatrice Street, Los Angeles, California 90066
Telephone (310) 827-7144 Fax (310) 306-1382

Circle (58) on Reply Card

Extend Your Serial Digital Signal with GEPCO VSD2001



Gepco's Video Serial Digital cable outperforms traditional precision video cable because it has a larger center conductor and dielectric which means lower attentuation at higher frequencies. This enables you to make longer cable runs.

The RG/6 Type VSD2001 is suitable for all serial digital applications, post production, TV studios and HDTV. It is a stock item available in bulk lengths, various colors and can be connectorized and custom-cut your length requirements. All Gepco cable is made in the U.S.A.

1-800-966-0069

Ask your sales representative for a VSD2001 sample

Cable to carry you into the next millennium

GEPCO

GEPCO INTERNATIONAL, INC. 2225 W. Hubbard, Chicago, IL 60612
312-733-9555 Fax 312-733-6416 TOLL-FREE: 1-800-966-0069

Circle (61) on Reply Card

IT'S 10:00. . .

DO YOU KNOW WHERE YOUR BATTERY IS?

YOU WOULD KNOW IF YOU OWNED A POWER PLANT!

The POWER PLANT from US Broadcast indicates the condition of your batteries **BEFORE** you need them. With 5 elective discharge and one full ANALYZE station you never have to guess again. Whether you use NP's, 90's, bricks. . . even cellular and walkie talkie batteries, the POWER PLANT can do them all...that's right, charge ALL these batteries **AT THE SAME TIME** for less than what other companies want for their single charger! Isn't it time you stopped guessing where your battery is... and bought a POWER PLANT?

UNITED STATES BROADCAST

PH: (606) 282-1802, FAX: (606) 282-1804

Circle (62) on Reply Card

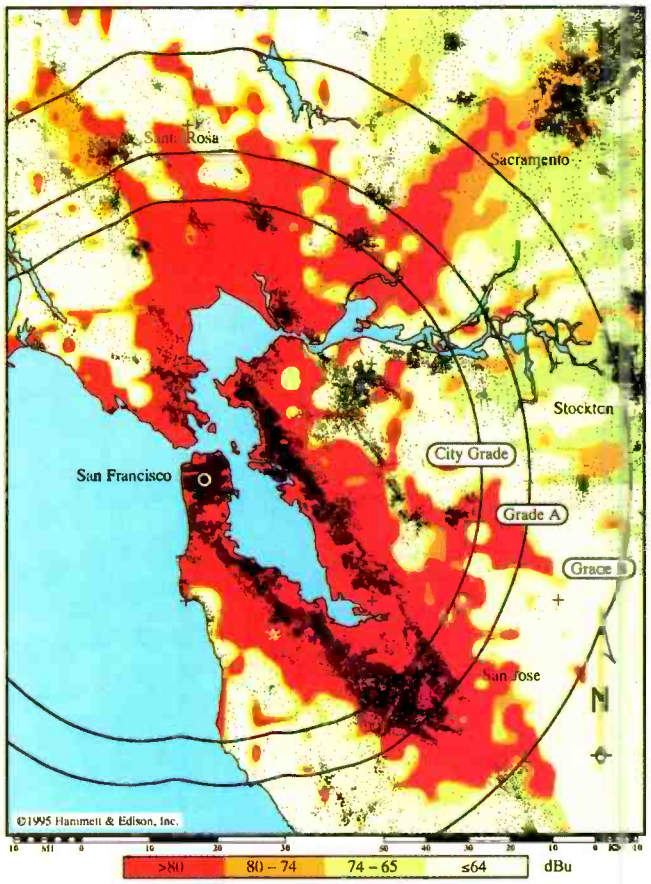


Figure 2. Coverage projections of a hypothetical 5MW NTSC station operating on Channel 53 from San Francisco's Sutro Tower. Shading colors indicate City Grade (red), Grade A (yellow) and Grade B (dark green) signal levels predicted using TIREM method. Equivalent coverage contours calculated in accordance with FCC rules are superimposed for comparison. Black dots represent population concentrations. The population covered at each TIREM-based signal level totals 4,885,445, 5,451,709 and 6,190,956 persons, respectively (U.S. 1990 census). A hypothetical 316kW ATV station on Channel 53 at the same site produces fairly similar TIREM-based coverage plots.

Population coverage

In order to maximize the potential audience from a particular site, knowledge of the population distribution in the region surrounding the site is also required. The U.S. Bureau of the Census provides a database of United States population distribution in electronic form as determined by the most recent census (1990). Each database entry consists of the center coordinates of a *census block* (approximately equivalent to a city block) along with the population contained within that block. In a rural area, a census block may contain only one person. In a dense urban area, the block may contain 400 to 500 people. By identifying the census blocks with centroids lying within a given signal-strength contour, the number of people potentially receiving that level of service can readily be calculated. For TV broadcasters, population counts are much more meaningful and important criteria than purely geographic-area coverage because nearly all receivers are operated at fixed locations in homes.

By combining the coverage information from a terrain-sensitive propagation model such as TIREM with census data, accurate and repeatable counts of the population receiving a particular signal level can be obtained. Similarly, the effects of co- and adjacent-channel interferences can be seen in terms of the populations they affect.

Use of advanced propagation models and population-counting techniques are important and beneficial tools to optimize channel allocations and allotments, operating power levels, antenna configurations, and other aspects of ATV. The accuracy and precision of such techniques provides a reliable method for minimizing interference while providing maximum coverage. ■

Robert D. Weller, P.E., is an engineer with Hammett & Edison, Consulting Engineers, San Francisco. Respond via the *BE* FAXback line at 913-967-1905 or via E-mail to be@intertec.com.

BUSINESS

Leitch Technology, Chesapeake, ...igned ...ration ...quality, ...and time- ...a contract with Digital Equipment ...pha 64-bit ... to design and manufac... Editing Sys- ... real-time 10-bit di... agreement for ... code PCI inte... orks. Structured ... family of ...reement provides ... million Tektronix ... the shareholders of T... for the outstanding ... The transaction is ... early June.

...phics, Inc., New York, Alias ...search and Wavefront Technologies have entered into definitive merger agreements. As a result of the mergers, Silicon Graphics will form a wholly owned, independent software subsidiary.

Macrovision is developing RADEM (RAdio-on-DEMand), a system designed to provide commuters with instant access to a large selection of U.S. and international news stories, newspaper articles, magazine features and radio programs in audio form.

The Lyon's Group's post-production facilities used audio and video cable from GEPCO International for its children's program, *Barney & Friends*.

Thomson Broadcast and Thomson Broadband Systems are joining to form a new professional operating group to be known as Thomson Broadcast Systems.

Horizons Technology, San Diego, has been chosen by Fox News, a unit of Fox Television Group, for a multimedia integration project designed to catalog a film library of vintage news footage. The footage contains clips spanning 1919 to 1972 and documents events of historical significance and general interest.

A.F. Associates, Northvale, NJ, has received a contract to design and build facilities for NBC Desktop Video, a service being launched to deliver new financial TV programming directly to personal computers.

The production complex, comprised of a studio/workstation room, two master control/production control centers, videotape room, graphics suite and equipment center, will be located in Fort Lee, NJ.

Videssence and Strand America have signed an agreement under which Strand will manufacture and market Sustained Red-Green-Blue (SRGB) lighting products under license from Videssence.

Omnitronix, North Wales, PA, has been awarded a contract for the U.S. Special Operations Command for design and production of a solid-state frequency-agile and mobile AM broadcast transmitter.

PEOPLE

John T. Duggin Sr. has been appointed to the position of president and CEO of Digital Systems Technology Inc., W. Covina, CA.

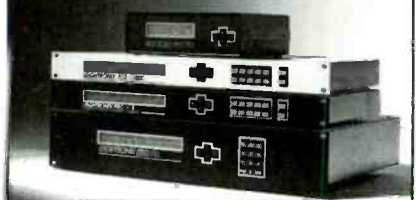
David A. Giblin and J. Steven Lewis have joined Communications Engineering, Inc. (CEI) as senior managing engineer and director of sales and marketing, respectively.

Mitchell H. Montgomery has been named domestic high-power product sales manager for Acrodyne, Blue Bell, PA. ■

The GALLERY

Take Control
with Programmable Event Controllers from LEIGHTRONIX!

- AUTOMATED BROADCAST
- UNATTENDED RECORDING
- TIMED EVENT VIDEO & AUDIO SWITCHING
- REMOTE VCR & SWITCHER CONTROL



LEIGHTRONIX, INC.
2330 Jarco Drive Holt, MI 48842
(517) 694-8000 Fax (517) 694-1600

Circle (48) on Reply Card

VIDEO TEST INSTRUMENTS AND TRAINING

IF you're NOT using TENTEL gauges for VCR repair, you're wasting time and NOT doing as good of a job! (Sorry, but it's true).
You can do Repairs BETTER, FASTER, and EASIER than you ever thought possible, using the *FOUR different TENTEL gauges...*
Gauges for Video HEAD Protrusion, Torques, Tape Tension, Guide Height, Carriage latching, Reel table Heights, and more... Lots MORE!
We also offer On-Site BETACAM training classes!

TENTEL®
4475 GOLDEN FOOTHILL PKWY.
EL DORADO HILLS, CA 95762
800-538-6894 / 916-939-4005

Circle (47) on Reply Card

A Versatile VTR Control System...

Control Solutions from DNF Industries
Your Source For High Quality, Low Cost Control Solutions

1X8 RS422 Switcher
Gang Roll 8 VTRs at the press of a button
Select 1 of 8 VTRs for individual control

Slow Motion Controller
100 Cue Point Memory
Cue points are retained when controller is off
Vary from -100% to +200% of play speed

VTR Control Solutions from $250.00

Call now for a free catalogue
213-650-5256 ◆ 213-650-6639 Fax

Circle (46) on Reply Card

Unlock your market potential. Advertise in THE GALLERY

- 32,000 TV-only circulation
- Free reader service #
- Frequency discounts
- Agency discounts

To explore this new, inexpensive alternative for reaching your key customers, contact
Tiffany Sewell-Howard @ 913-967-1942

NEW PRODUCTS

UHF TV amplifier
Teko Telecom

➤ **L4AMP250/B:** full solid-state 250W UHF TV amplifier; housed in a 19-inch 5SU rack; complies with CCIR B and G specifications; features 4.5W unified driving, output channel integrated filter, and high RF power/mains efficiency.

Circle (350) on Reply Card

Digital actuality recorder
Henry Engineering

➤ **TeleStor:** a specialized digital audio recorder for automatically recording broadcast station actualities; system automatically records the feed from a regular dial-up telephone line and stores it in digital memory for instant on-the-air playback; TeleStor operates unattended; the maximum recording time of the standard TeleStor is 1:20 while the MX version records up to 5:25; the actuality is played on the air like any other audio source, either manually via a broadcast automation system; a DTMF password prevents unauthorized recording into the TeleStor.

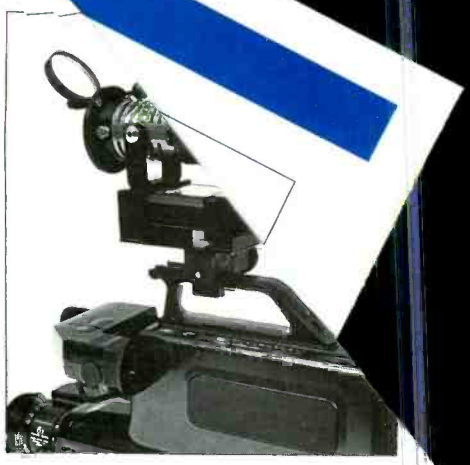
Circle (355) on Reply Card

Transmitters/drivers
Acrodyne

➤ **TR series:** transmitters and drivers equipped with a high performance exciter that features a video processor, stereo and monaural sound compatibility, a SAW IF filter, temperature-compensated oscillator, digital and analog power control and IF precorrection, the standard video processor subsystem provides video AGC, individual sync amplitude adjustments, individual differential gain and phase adjustments along with ICPM correction; full metering and status LEDs are provided on the front panel.

Circle (356) on Reply Card

Universal mini-fill
Frezzi Energy Systems

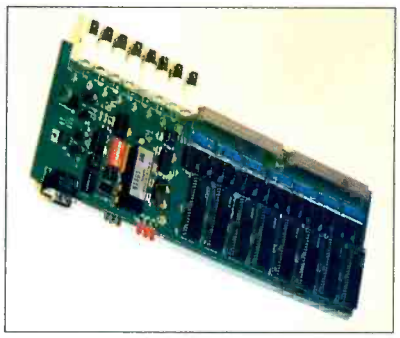


➤ **MFNP1-HC:** Mini-Fill that comes standard with an NP-1 bracket; a universal ML mounting clamp also comes built-in and attaches in seconds to any fixable area on any camera; this Mini-Fill allows wireless, instant light attachment and simple, connector free, NPI battery connection.

Circle (353) on Reply Card

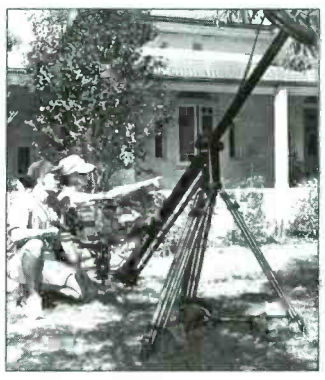
Routing switchers
Knox Video

➤ **Chameleon 64 series:** modular full-matrix routing switchers that can assemble any configuration up to a full 64 x 64 matrix within a single 6U rack frame; switchers can route baseband video as well as mono or stereo, balanced or unbalanced audio; matrix configurations are assembled by inserting cards that are seated in a motherboard in the rack frame; video cards plug into the right-hand side of the rack frame and audio cards plug into the left-hand side; standard audio and video cards are available in input arrays of 24, 32, and 64 (other cards sizes are also available).



Circle (357) on Reply Card

Camera mount
Miller Fluid Heads



➤ **Pro-Jib:** a versatile, lightweight camera mount for ENG, location and studio production; attaches easily to most conventional tripods and all fastenings and control mechanisms are ergonomically designed for optimum comfort and smooth operation; precision bubble levels are installed at both the camera mount and tripod mount ends of the jib arm; Pro-Jib folds down to 130cm in length.

Circle (354) on Reply Card

Component digital video keyer
Sierra Video Systems

➤ **Mirage image compositing engine:** a high-quality stand-alone digital video keyer with 10-bit serial inputs and outputs; features full 4:4:4 internal processing and the power to produce outstanding chroma and luminance keys; also includes support functions such as 8-input source selector, autophasing input timing system, stable crystal-based gen-lock, built-in transition mixer, color correction system and a color fill generator.

Circle (351) on Reply Card

There Are Two Kinds Of Engineers. Those Who Buy Utah Routing Systems. And Those Who Buy Something Else.

Introducing the UTAH-300. History Repeats Itself. Digitally.

If you're in the market for a routing switcher, you'll be happy to know Dynatech's new UTAH-300 is the ultimate achievement of four generations of router technology. In 1978, our AVS-1 proved that rugged, versatile routing switchers could also be affordable. Today the UTAH-300, with analog/digital capability, is the most sophisticated member of a full family of mature, reliable routing products. The UTAH-300 is built for growth. It goes from 32 x 32 to 256 x 256. And beyond. It's compatible with every control system we've ever built, so it integrates into any Utah installation. And not only does the UTAH-300 manage D1 (serial component) and D2 (serial composite) formats, it's ready for 360 Mb/sec. data rates of future ATV signals. Far more capability, yet it's priced competitively.

At 128 x 128 VAA, with redundant power and control, the rugged JTAH-300 takes up only 27 RU of space.

Experienced Support, Too.

Over time, we've also learned about what you need in the way of support. That's why we offer reliable 24-hour, 7-day Global Customer Service Support Center, training and on-site repair, and a 10-year warranty. Call your nearest Dynatech sales office for more information on the routing system everyone is smiling about.

Universal matrix frames allow easy upgrade to digital signals.

DYNATECH
VIDEO GROUP

Americas
Phone: 801-575-8801 Fax: 801-575-3299

Europe
Phone: 44-1635-521939 Fax: 44-1635-528387

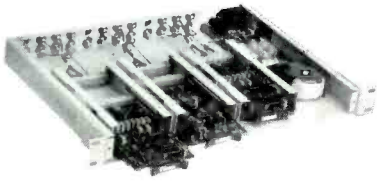
Asia
Phone: 852-2868-1993 Fax: 852-2525-8297

© 1995 Dynatech Video Group, Inc.

Circle (49) on Reply Card

bvs®

INTERFORMAT TRANSLATORS



TYPE 734 — RGBS to Y, R-Y, B-Y
TYPE 735 — Y, R-Y, B-Y to RGBS

FOR THE CLEANEST VIDEO IN AND OUT OF YOUR NON-LINEAR EDITOR

FR 730 FRAME HOLDS 3 BOARDS, ANY MIX

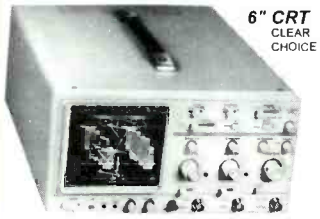
- Absolute conversion accuracy
- Long term stability
- 10 MHz bandwidth
- Adjustable Y setup
- On-board horizontal phasing
- Comp or non-comp RGB outputs
- Betacam, MII or SMPTE/EBU levels
- 525 or 625 line operation

broadcast video systems ltd.

40 West Wilmot St., Richmond Hill, Ontario L4B 1H8
Telephone: (905) 764-1584 Fax: (905) 764-7438

Circle (50) on Reply Card

COMPUVIDEO TEST INSTRUMENTS



6" CRT CLEAR CHOICE

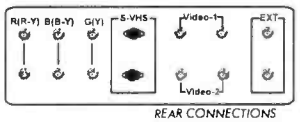
COMBINATION — NTSC or PAL
- WAVEFORM MONITOR
- VECTORSCOPE
- DUAL TRACE OSCILLOSCOPE

MULTI INPUTS
- COMPOSITE.S-VHS/HI-8.COMPONENT
- EXT REFERENCE

BASIC FEATURES
- FLAT.IRE.CHROMA.1H.2H. 1mS/DIV . 2V . 2V MAG
- CIRCLE . VECTOR
- OVERLAYS.DC REST.
- H-PHASE. SUB-PHASE

ADVANCED FEATURES
- LINE SELECT.
- DG . DP
- X - Y DISPLAY (STEREO/AUDIO)
- VIDEO/AUDIO HEADS CHECK

POWER (AC/DC/BATTERIES)
DESK TOP OR RACK MOUNT



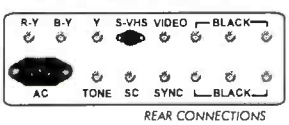
REAR CONNECTIONS

Priced from $1421

IN STOCK NOW

NTSC or PAL
VIDEO SYNC & TEST GENERATORS
MULTI OUTPUTS / MULTI PATTERNS
- ALL SIMULTANEOUS OUTPUTS
- COMPOSITE • S-VHS
- COMPONENT • RGB
- 12 PATTERNS incl SMPTE & BLACK
- 6 BLACK BURST OUTPUTS (GENLOCK)
- SYNC & SUBCARRIER OUTPUTS
- AUDIO TONE
- 2-CH XLR AUDIO BALANCED OUTPUTS

POWER (AC/DC/BATTERIES)
DESK TOP OR RACK MOUNT

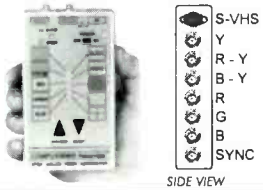


REAR CONNECTIONS

Priced from $ 299

JUST ASK FOR "POCKETGEN"

NTSC or PAL
HANDHELD
VIDEO/AUDIO GENERATOR



SIDE VIEW

- 10 PATTERNS INCLUDING SMPTE BARS AND BLACK BURST
- ALL SIMULTANEOUS OUTPUTS
- COMPOSITE • S-VHS
- COMPONENT • RGB
- AUDIO TONE
- 2-CH XLR AUDIO BALANCED OUTPUTS

POWER (AC/DC/BATTERIES)
Priced from $ 357

VIZ TECHNOLOGIES TEL: (718) 714-9873 FAX: (718) 714-0242

Circle (51) on Reply Card

New Products continued

UHF receiver
Sennheiser

➤ **EM2004-UHF:** a diversity receiver that can be tuned to one of 16 preprogrammed channels; features a total bandwidth of up to 24MHz and spans four U.S. TV channels allowing the receiver to be used anywhere in the world; if an active TV channel is encountered, the receiver and its matching transmitter may be retuned to a new, interference-free channel; matching transmitters include the SK50-UHF, SK250-UHF bodypacks and the hanheld SKM5000-UHF; systems available in frequencies ranging from 450 to 800MHz.

Circle (352) on Reply Card

Battery charge monitor
Frezzi Energy Systems

➤ **Energy Gage:** provides on-the-spot monitoring of on-board and in-board battery; displays the measurement of available charge at the push of a button when not being charged or discharged; unit turns on automatically during charge and discharge and automatically recalibrates itself after full discharge; a flash indicates when battery is low or empty; features surface-mount technology; temperature and current compensated for accuracy.

Circle (358) on Reply Card

Director Engineering

Home Box Office, an international leader in the entertainment industry, has an exciting opportunity for an experienced professional to join our Manhattan-based Engineering Group. This group will investigate new technologies and plan innovative strategies for HBO's product distribution on a global scale.

The ideal individual should have:

- 5-7 years experience in broadcast engineering and a BSEE
- Specific experience in satellite transmission
- The ability to evaluate new technology and standards
- Understanding of Telco distribution and strategy
- Familiarity with digital video compression
- Knowledge of broadcast standards and distribution including CATV, MMDS and DBS
- The ability to translate technical knowledge into business strategy

At HBO, our commitment to innovation and investment in emerging technology has solidified our position as a leader in the industry. The excitement of new forms for video delivery makes this an exciting time to join the number one premium television company.

HBO offers a competitive salary and a comprehensive benefits package, which includes 401k, tuition reimbursement, medical/dental package and much more.

Qualified individuals should send a resume with salary history, to:

Paul Rubenstein
Home Box Office
1100 Avenue of the Americas
New York, NY 10036
e-mail: rubenstein_paul@twehbo.com
Fax# (212) 512-1520

HBO®

HBO, a Time Warner Entertainment Company, is an Equal Opportunity Employer, M/F/D/V

FREZZI AR304 CHARGER

This new four channel, autoranging model fast charges *any* four batteries in the range of 12 to 30V (2-10Ah), via XLR4(M) connectors, simultaneously. This fast charging technology which was previously only available to lower voltage battery users now enables the charging of higher voltage batteries in 1 to 2 hours. Measures only 9.5"x5.5"x3" and weighs less than 2.5 lbs.

FREZZOLINI ELECTRONICS INC 5 Valley St. Hawthorne, NJ 07506; (800)345-1030; Fax (201)427-0934

Circle (63) on Reply Card

FREZZI AR124NP FAST CHARGER

The AR124NP accepts four NP1 batteries, and four BP90 batteries via direct connection. With optional adapters, it charges any battery in the range of 4.8 to14.4 Volts (1to7 AH). The AR124NP prevents overcharging, automatically maintains peak capacity, uses a recovery program for over-discharged batteries and operates anywhere in the world.

FREZZOLINI ELECTRONICS INC 5 Valley St. Hawthorne, NJ 07506; (800)345-1030; Fax (201)427-0934

Circle (64) on Reply Card

FREZZI SUN PANEL

Today's most advanced and portable solar panel to date. The Frezzi Sun Panel is field tested and military qualified. Rugged, compact (9"x12"x0.5"), and lightweight(1.5 lbs). The Frezzi Sun Panel charges NP1s in 2 hours and will output 15 Watts of DC power in continuous sunlight. Adapter cables are available for all standard batteries .

FREZZOLINI ELECTRONICS INC 5 Valley St. Hawthorne, NJ 07506; (800)345-1030; Fax (201)427-0934

Circle (65) on Reply Card

FREZZI MFIC MINI-FILL

Frezzi's popular Mini-Fill light is now available with built-in dimmer control and has won Videomaker's product of the year award. The MFIC Mini-Fill with pulse width modulation, provides the performance of a 50 to 100 Watt light for added flexibility in different shooting environments. Originally designed by Frezzolini for the first televised Mount Everest climb (ABC Network) the Mini-Fill has become a light of choice among broadcasters.

FREZZOLINI ELECTRONICS INC 5 Valley St. Hawthorne, NJ 07506; (800)345-1030; Fax (201)427-0934

Circle (66) on Reply Card

FREZZI NPX1 BATTERY

Frezzi's NPX1 batteries are computer verified. They are compatible with all equipment that uses NP1 type batteries. Frezzi's NPX1 is readily fast chargeable and is a high capacity eleven cell NiCd battery. This battery extends the running time of cameras even those with high lock out voltages. Overload protected via self resetting cut out. Frezzi's NPX1 is suited for use with Frezzi's latest advanced microcomputer controlled autoranging fast chargers.

FREZZOLINI ELECTRONICS INC 5 Valley St. Hawthorne, NJ 07506; (800)345-1030; Fax (201)427-0934

Circle (67) on Reply Card

FREZZI MFNP1-HC

A new Mini-Fill combined with the NP-1 battery holder and universal clamp. Ready to mount directly to your professional camera. Simply attach and plug in any NP-1 battery. The most cost effective on-camera professional light.

Sony is a registered trademark of Sony Corporation

FREZZOLINI ELECTRONICS INC 5 Valley St. Hawthorne, NJ 07506; (800)345-1030; Fax (201)427-0934

Circle (68) on Reply Card

Frezzi®
ENERGY SYSTEMS

The Frezzolini NP Bracket System mounted on a Sony BVW-400 camcorder.

The Frezzolini NP Bracket System is an external battery holder designed to attach to the Sony NP battery box. When the Frezzolini NP Bracket is attached, it enables a second NP battery to be mounted on the camera for powering a Frezzi Mini-Fill light. The advantage of this system is to allow the use of NP batteries to power both your light and camera without a side battery pack or external cables getting in the way.

NP batteries are lightweight and relatively inexpensive. With the NP Bracket attached, the camera will easily fit into its carrying case. The Frezzolini NP Bracket system is a perfect choice for camera operators to fully utilize their originally supplied equipment by adding the Frezzi Mini-Fill quickly at minimum effort and cost.

Sony is a registered trademark of Sony Corporation

Frezzolini Electronics Inc. 5 Valley Street Hawthorne, NJ 07506
Orders 800-345-1030 • 201-427-1160 • Fax 201-427-0934

Circle (69) on Reply Card

Signal generator and analyzer
Audio Precision

➤ System Two: a comprehensive, PC-controlled signal generator and analyzer for audio testing in both the digital and analog domains; provides complete facilities for measuring every parameter specified in AES3; some of the measurement capabilities include jitter and FFT of jitter, pulse amplitude, eye patterns, delay, word width, bit activity, sample rate, and high-level decoded status bits; also features true Dual Domain architecture with separate high-performance hardware for analog and digital domain signals; the design avoids constant reliance on performance-limiting A/D and D/A converters; system comes with Audio Precision's APWIN Windows-based software.

Circle (359) on Reply Card

DAT recorder
Sony Electronics

➤ PCM-2600: professional digital audio tape recorder offering robust transport and advanced circuitry; features 4-motor tape-drive transport and super bit mapping capability; also features high-resolution digital conversion.

Circle (360) on Reply Card

ENG support system
Miller Fluid Heads

➤ Miller System 25: camera support systems offering maximum payload and counterbalance capacity to handle a wide range of ENG cameras and camcorders; each system has a maximum payload capacity of 12.5kg and a minimum system weight of 3.4kg; the Miller 25 fluid head utilizes multi-step, pan-and-tilt drag system and provides fingertip counterbalance control throughout its tilt range.

Circle (361) on Reply Card

Standards converter
Feral Industries

➤ Advantage: combines all-world standards conversion with a full-frame TBC/synchronizer; converts NTSC, NTSC 4.43, PAL SECAM, PAL-M and PAL-N TV standards and offers multiple composite and S-VHS video inputs and outputs (optional RGB component output); unit features 8-level line interpolation, a comb filter decoder and switchable image enhancement; the built-in TBC/synchronizer with full proc-amp control allows for color correction and output stability; other features include special effects, built-in test pattern generator and burst and sync insertion on the output signal.

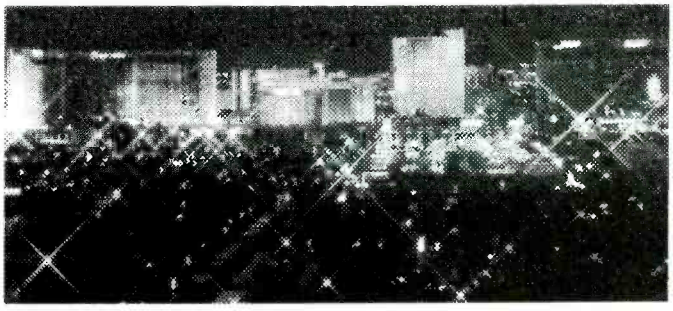
Circle (362) on Reply Card

SOCIETY OF CABLE TELEVISION ENGINEERS

CABLE-TEC EXPO® '95

JUNE 14-17, 1995 LAS VEGAS, NEVADA

THREE PRE-CONFERENCE TUTORIALS!
FOUR GENERAL SESSIONS!
TEN BREAKOUT WORKSHOPS!
300 HARDWARE EXHIBITORS!



MEMBER PREREGISTRATION ONLY $240!

Please call SCTE at (610) 363-6888 for further information.

Circle (71) on Reply Card

B&H PHOTO-VIDEO

"THE PROFESSIONAL'S SOURCE"

FOR ORDERS CALL: 800-947-9928 212-444-5028

OR FAX (24 HOURS): 800-947-9003 212-444-5001

OVERNIGHT AND RUSH SERVICE AVAILABLE

E-Mail at 70550.1616@compuserve.com

SONY

EVW-300 3-CCD Hi-8 Camcorder

- Equipped with three high density 1/2" IT Hyper HAD image sensors. Has an excel ent sensitivity of F8.0 at 2,000 lux, high S/N of 60 dB, and delivers over 700 lines of horizontal resolution.
- Provides high quality PCM digital stereo and single channel AFM Hi-Fi recording. Has XLR balancec audio connectors.
- Quick start 1.5" viewfinder with 550 lines of resolution plus Zebra pattern video level indicator and color bar generator. Also, quick-start recording – takes only 0.5 seconcs to go from REC PAUSE to REC MODE for immediate recording in the field.
- Built-in 8mm Time Code generator records absolute addresses. (Either non-drop frame or drop frame mode may be selected.) Furthermore the EVW-300 incorporates a variety of time code features such as Time Code PRESET/RESET, REC RUN/FREE RUN anc User Bits.
- A variety of automatic adjustment functions for different lighting conditions are incorporated into the EVW-300:
  - ATW (Auto Trace White Balance) – when ATW is turned on optimum white balance is always ensured during recording, even for changes in color temperature. Conventional white balance adjustment is still provided with the Auto White Balance.
  - AGC (Automatic Gain Control) – in addition to manual Gain Up AGC provides linear gain up in the range of 0 dB to 18 dB.
  - Intelligent Auto Iris – for situations where the lighting between subject and background is different (subject is underexposed) the Intelligent Auto Iris automatically examines the scene and ad usts the lens iris for proper exposure.
- Selectable Gain-up from 1 dB to 18 dB in 1 dB steps for Mid and High positions.
- Clear Scan function – provides a variety of selection of shutter speeds ranging from 60-200 Hz allowing recording of almost any computer display without flicker.
- Compact, lightweight (12 lbs with NP-1B) ergonomic design provides well balanced and extremely comfortable operation.

EVW-300 with Canon 13:1 Servo Zoom Lens, VCT-12 Tripod Mounting Plate and Thermodyne LC-422TH Shipping/Carrying Case $5995.00

porta brace

Quick-Draw Professional FOR CAMCORDERS OR STAND ALONE CAMERAS

The Quick-Draw Camera Case provides a convenient way to carry and protect your camera on the ground, in your car and in the air. While much lighter and more compact than shipping cases, this padded nylon case has hard-shell construction and an aluminum viewfinder guard for 100% protection and security. It is particularly designed for working out of the back of a van or the trunk of your car. The top loading case has a wipe-open fold back top that stays out of the way.

FEATURES:
- Heavy-duty shoulder strap and comfortable leather hand grip.
- Crush proof aluminum guard protects viewfinder.
- Fits into back seat and fastens securely with seat belt.
- Holds camera with on-board battery attached.
- Lid closes with Velcro for quick opening or secures with full-length zippers.
- Two trim exterior pockets and clip board pocket.
- Dual purpose rear pouch is an expandable battery chamber or all-purpose pocket.

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 indicat on 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

DIGITAL COMPAC MAGNUM

Extremely small and light weight (almost half the size and weight of a Pro Pac), the powerful Digital Compac Magnum still has more effective energy than two NP style slide-in batteries. The high voltage design and Logic Series technology eliminate all the problems that cripple conventional 12 vold slide-in type batteries. The Digital Compac Magnum is the professional choice for applications drawing less than 24 watts. Not recommended when using an Ultralight.

- **DIGITAL COMPAC MAGNUM 14 LOGIC SERIES NICAD BATTERY** 14.4 v 43 Watt Hours. 2 3/4 lbs. Run time: 2 hours @ 20 watts, 3 hours @ 13 watts.
- **DIGITAL COMPAC MAGNUM 13 LOGIC SERIES NICAD BATTERY** 13.2v 40 Watt Hours. 2 1/2 lbs. Run time: 2 hours @ 18 watts, 3 hours @ 12 watts.

GOLD MOUNT BATTERIES

The Logic Series Gold Mount batteries are virtually identical to their respective DIGITAL versions (above) with respect to size, weight, capacity, IMPAC case construction, and application. They are similarly equipped with micro-code logic circuits and comprehensive ACS sensors that communicate directly with all Logic Series chargers, providing the essential data critical for optimum performance, reliability and long life. They do not, however, 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)
- **MAGNUM 14 NICAD BATTERY** (14 4v 72 Watt Hours)
- **MAGNUM 13 NICAD BATTERY** (13.2 v 66 Watt Hours)
- **COMPAC MAGNUM 14 NICAD BATTERY** (14.4v 43 WH)
- **COMPAC MAGNUM 13 NICAD BATTERY**(13.2v 40 WH)

MP-4D DIGITAL FAST CHARGER w/LCD and DIAGNOSTIC PORT

The most advanced and versatile Anton/Bauer charger. In addition to features such as four-position one-hour sequencing fast charge, five fast charge termination systems, it also has:

- SSP (Selective Sequence Programming) which automatically arranges the charging order among the 4 batteries to assure fully charged batteries in the shortest time possible.
- Multifunction LCD checks each of the four battery positions and indicates charge status, available capacity, battery type/rating, percent of maximum charge, battery serial number, date of manufacture, accumulated charge/discharge cycles and other data.

JVC

KY-27UB 3-CCD Color Video Camera

- New ⅔" CCDs with 380,000 pixels (360,000 effective) with advanced electronics delivers resolution of 750 horizontal lines and reduced smear.
- Sensitivity of f/9.0 at 2000 lux. Min. illumination 7.5 lux with f/1.4 lens, +18dB.
- LOLUX mode allows shooting scenes that were previously impossible due to insufficient lighting. CCDs are maximized for low light sensitivity equivalent to an electronic gain of 24dB plus a JVC pixel readout system which provides an additional 6dB. Together they provide +30dB without the noise and picture degradation normally associated with this much gain. Excellent color balance is maintained even down to 1.5 lux illumination.
- Auto Shooting Mode where you only have to zoom, focus and record. All other parameters are controlled automatically.
- Enhanced ALC (Automatic Level Control) mode for continuous shooting in all light levels. This allows continuous automatic shooting from dark interiors to bright outdoors. Also features an aperture priority mode. Manually set iris for desired depth of focus, and ALC circuit automatically achieves correct video level.
- The Multi-Zone Iris Weighting system gives preference to objects in the center and lower portions of the picture. The Automatic Peak/Average Detection (APB) provides intelligence to ignore unusual objects such as bright lights.
- Auto knee circuitry extends a scene's light to dark dynamic range reproduction by up to five times without overexposure.
- Has large 1.5-inch viewfinder with 500 lines of resolution and SMPTE color bars. Status system provides audio levels, accumulated or remaining recording time and VTR operation. Also battery voltage and camera setup. Zebra pattern indication and safety zones with a center marker are also provided.
- Equipped with Variable Scan function. This allows flicker-free shooting of computer screens. Variable scan enables a precise shutter speed from 1/60.2 to 1/196.7 of a second in 256 increments to be set, matching a computers scan rate. Almost any computer display can be clearly recorded.
- Star filter creates dramatic 4-point star effects. Users can also select from a wide range of optional filters.
- Advanced Memory System (AMS) stores customizable settings for various shooting conditions.
- Docks directly to the JVC BR-S422U, BR-S411UB and BR-S420CU professional S-VHS recorders. Optional adapters for docking to Hi-8 and Betacam SP are also available.

Vinten

THE ADVANCED RANGE OF VISION LIGHTWEIGHT HEADS AND TRIPODS

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. So for the first time, one head gives you all the advantages of both fluid (viscous) and lubricated (LF) drag systems – and none of their disadvantages. Achieve the smoothest pans and tilts regardless of speed, drag setting and ambient temperature. The Serial Drag system provides the widest range of infinitely variable precise settings with repeatable, consistent drag in each pan and tilt direction.

Features:
- Simple, easy-to-use external control for perfect balance.
- 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.
- Redesigned flick on, flick off pan and tilt caliper disc brakes.
- Greater control, precision, flexibility and "touch" than any other head on the market.
- Touch activated, time delayed illuminated level bubble.
- Environmental working conditions from as low as -40° to as high as +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 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 each incorporate the new torque safe clamps to provide fast, safe and self-adjusting leg clamps that never let you down. Two stage operation gives them more flexibility when in use as well as greater operating range.

- "Torque Safe" requires no adjustment. Its unique design adjusts itself as and when required, eliminating the need for 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.
- The #3513 weighs 6.5 lbs and the #3523 CF (Carbon Fibre) weighs 5.2 lbs.

Vision 12 Systems

All Vision 12 systems include #33643 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

SD-12LT System
- 3364-3 SD-12 Pan and tilt head
- 3523-3 Two-stage carbon fibre ENG tripod w/100mm bowl
- 3363-3 Lightweight calibrated floor spreader
- 3425-3A Carry strap
- 3340-3 Soft case

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

SD-22 LT System
- 3386-3 SD-22 Pan and tilt head
- 3219-52 Second telescoping pan bar and clamp
- 3523-3 Two-stage carbon fibre ENG tripod w/100mm bowl
- 3314-3 Heavy-duty calibrated floor spreader
- 3425-3A Carrying strap
- 3341-3 Soft case

SD-22 ELT System
- 3386-3 SD-22 Pan and tilt head
- 3219-52 Second telescoping pan bar and clamp
- 3383-3 Two-stage carbon fiber EFP tripod w/150mm bowl
- 3314-3 Heavy-duty calibrated floor spreader

CALL FOR PRICES

WE BUY, SELL AND TRADE USED VIDEO EQUIPMENT

SEVEN-DAY CUSTOMER SATISFACTION GUARANTEE

Circle (72) on Reply Card

B&H PHOTO-VIDEO

"THE PROFESSIONAL'S SOURCE . . .

FOR ORDERS CALL: 800-947-9928 212-444-5028

OR FAX (24 HOURS): 800-947-9003 212-444-5001

OVERNIGHT AND RUSH SERVICE AVAILABLE

TASCAM

DA-88 Multi-Track Recorder

The first thing you notice about the eight channel DA-88 is the size of the cassette - it's a small Hi-8mm video cassette. You'll also notice the recording time - up to 120 minutes. These are just two of the advantages of the DA-88's innovative use of 8mm technology.

- Intrinsic to the 8mm video format is the Automatic Track Finding (ATF) control system. This approach records the tracking control information, along with the program material, using the helical scan (video) head. Competing S-VHS based system record the tracking data with a linear recording head, independent of the program data. The S-VHS tape must be run at a higher speed (thereby delivering shorter recording time) to deliver control track reliability, and requires some form of automatic or manual tracking adjustment. Synchronization and tracking must be adjusted, either automatically or manually (just like on your home vcr) as the machine ages, or if the tape is played back on another machine.
- On the other hand, the ATF system ensures that there will be no tracking errors or loss of synchronization. The DA-88 doesn't even have (or need) a tracking adjustment. All eight tracks of audio are perfectly synchronized. What's more, this system guarantees perfect tracking and synchronization between all audio tracks on all cascaded decks - whether you have one deck or sixteen (up to 128 tracks!).
- Incoming audio is digitized by the on-board 16-bit D/A at either 44.1 or 48KHz (user selectable). The frequency response is flat from 20Hz to 20KHz while the dynamic range exceeds 92dB. As you would expect from a CD-quality recorder, the wow and flutter is unmeasurable.
- One of the best features of the DA-88 is the ability to execute seamless Punch-ins and Punch- outs. This feature offers programmable digital crossfades, as well as the ability to insert new material accurately into tight spots. You can even delay individual tracks, whether you want to generate special effects or compensate for poor timing. All of this can be performed easily on a deck that is simple and intuitive to use.

OPTIONS

- **RC-808** – Single Unit Remote Control
- **RC-848** – System Remote Control
- **MU-8824** – 24-Channel Meter Unit
- **SY-88** – Complete SMPTE/EBU Chase Synchronizing and MIDI Machine Control interface

Fostex

RD-8 Multi-Track Recorder

This digital multitrack recorder is designed specifically for the audio professional. Fostex has long been a leader in synchronization, and the RD-8 redefines that commitment. With its built-in SMPTE / EBU reader/generator, the RD-8 can stripe, read and jam sync time code - even convert to MIDI time code. In a sync environment the RD-8 can be either Master or Slave. In a MIDI environment it will integrate seamlessly into the most complex project studio, allowing you complete transport control from within your MMC (MIDI Machine Control) compatible sequencer.

- Full transport control is available via the unit's industry-standard RS-422 port, providing full control right from your video bay. The RD-8 records at either 44.1 or 48KHz and will perform Pull-Up and Pull-Down functions for film/video transfers. The Track Slip feature helps maintain perfect sound-to-picture sync and the 8-Channel Optical Digital Interface keeps you in the digital domain.
- All of this contributes to the superb sound quality of the RD-8. The audio itself is processed by 16-bit digital-to-analog (D/A's) converters at either 44.1 or 48KHz (user selectable) sampling rates, with 64X oversampling. Playback is accomplished with 18 bit analog-to-digital (A/D's) and 64X oversampling, thus delivering CD-quality audio.
- The S-VHS transport in the RD-8 was selected because of its proven reliability, rugged construction and superb tape handling capabilities. Eight tracks on S-VHS tape allow much wider track widths than is possible on other digital tape recording formats.
- With its LCD and 10-digit display panel, the RD-8 is remarkably easy to control. You can readily access 100 locate points, and cross-fade time is fully controllable in machine to machine editing. Table of Contents data can be recorded on tape. When the next session begins, whether on your RD-8 or another, you just load the set up information from your tape and begin working. Since the RD-8 is fully ADAT compliant, your machine can play tapes made on other compatible machines, and can be controlled by other manufacturers ADAT controllers. Your tapes will also be playable on any other ADAT deck.
- In addition to familiar transport controls, there are a number of logical, user friendly features. This is the only unit in its class with an on-board, back-lit variable contrast LCD display. It provides all of the information you'll need to keep track of offsets, punch points, generator functions and other pertinent data. Three function keys, combined with HOME, NEXT and UP/DOWN buttons, enable you to navigate the edit menus effortlessly. If you need to have access to the front panel controls, the optional model 8312 remote control gives you remote command of the most common functions.

SENNHEISER

RF SERIES CONDENSER MICROPHONES

Unlike traditional condenser microphones, the capacitive transducer in Sennheiser condenser microphones is part of a tuned RF-discriminator circuit. Its output is a relatively low impedance audio signal which allows further processing by conventional bi-polar low noise solid state circuits. Sennheiser microphones achieve a balanced floating output without the need for audio transformers, and insures a fast, distortion-free response to audio transients over an extended frequency range. The RF-design yields exceptionally low noise levels and is virtually immune to humidity and moisture. The comparatively low RF-voltage across the elements of the transducer also eliminates arcing and DC-bias creeping currents. Sennheiser employs RF-technology to control residual microphone noise. Optimizing the transducer's acoustic impedance results in a further improvement in low noise performance. Sennheiser studio condenser microphones operating according to this RF-principle have proven their superior ruggedness and reliability in the past decades under every conceivable environmental condition.

MKH 20 P48U3 Omnidirectional

Low distortion push-pull element, transformerless RF condenser, flat frequency response, diffuse/near-field response switch (6 dB boost at 10 KHz), switchable 10 dB pad to prevent overmodulation. Handles 142 dB SPL. High output level. Ideal for concert, Mid-Side (M-S), acoustic strings, brass and wind instrument recording.

MKH 40 P48U3 Cardioid

Highly versatile, low distortion push-pull element, transformerless RF condenser, high output level, transparent response, switchable proximity equalization (-4 dB at 50 Hz) and pre-attenuation of 10 dB to prevent overmodulation. In vocal applications excellent results have been achieved with the use of a pop screen. Recommended for most situations, including digital recording, overdubbing vocals, percussive sound, acoustic guitars, piano, brass and string instruments. Mid-Side (M-S) stereo, and conventional X-Y stereo.

MKH 60 P48U3 (Short Shotgun)

Short interference tube RF condenser, lightweight metal alloy, transformerless, low noise, symmetrical capsule design, smooth off-axis frequency response, switchable low cut filter (-5 dB at 100 Hz), high frequency boost (+5 dB at 10 KHz) and 10 dB attenuation. Handles extremely high SPL (135 dB), ideal for broadcasting, film, video, sports recording, interviewing in crowded or noisy environments. Excellent for studio voiceovers.

MKH 70 P48U3 (Shotgun)

Extremely lightweight RF condenser, rugged, long shotgun, low distortion push-pull element, transformerless, low noise, switchable presence (+5 dB at 10 KHz), low cut filter (-5 dB at 50 Hz), and 10 dB preattenuation. Handles 133 dB/SPL with excellent sensitivity and high output level. Ideal for video/film studios, theater, sporting events, and nature recordings.

MKH 416 P48U3 Supercardioid/Lobe (Shotgun)

Transformerless, RF condenser designed as a combination of pressure gradient and interference tube microphones. Very good feedback rejection, low proximity effect, 128 dB/SPL. Rugged and resistant to changing climate conditions. Ideal for boom, fishpole, and camera mountings. A long-distance microphone for video, film, and studio recording. Excellent for interviewing for reporters, podium or lecture microphone.

MKH 816 P48U3 Ultra-directional Lobe (Shotgun)

Narrow-beam pattern, transformerless RF condenser microphone. Handles 124 dB/SPL and has high output voltage. Perfect for crowded news conference, movie sets, TV stages, sporting events and nature recording.

CHYRON Graphics

PC-CODI TEXT and GRAPHICS GENERATOR

A PC-compatible (ISA bus) board, the PC-CODI incorporates a broadcast quality encoder and wide bandwidth linear keyer to provide highest quality realtime, video character generation and graphics display. Used individually or configured with multiple boards, it is a complete and affordable solution for information displays, broadcast, video production or multi-media applications.

- Standard PC/AT ISA bus interface; 2/3 length form factor
- Fully-antialiased displays
- Less than 10nsec. effective pixel resolution
- 16.7 million color selections
- Fast, realtime operations
- Character, Logo and PCX Image transparency
- Display and non-display buffers
- Bitstream typeface library selection
- Variable edges: border, drop shadow and offset
- Variable flush
- Full position and justify control of character & row
- User definable intercharacter spacing (squeeze & expand)
- Multiple roll/crawl speeds
- Automatic character kerning
- User definable tab/template fields
- Shaded backgrounds of variable sizes and transparency
- User definable read effects playback; wipes, pushes, fades
- High quality composite & S-video (Y/C) encoder
- Integral composite and S-video linear keyer
- NTSC or PAL sync generator with genlock
- Module switchable NTSC or PAL operation
- Software controlled video timing
- Board addressability for multi-channel applications.
- Auto display sequencing
- Local message/page memory
- Preview output with safe-title/cursor/menu overlay
- Composite & S-video input with auto-genlock select

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.
- Equipped with beam current feedback circuit which 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. In Blue Only mode video noise can be precisely evaluated.
- Factory set to broadcast standard 6500K color temperature
- Provides an on-screen menu to facilitate adjustment/operation on the monitor. The on-screen menu display can be selected in English, French, German, Spanish or Italian.
- On power up, automatic degaussing is performed. There is also a manual degauss switch to demagnetize the screen.
- Sub control mode allows fine adjustments to be made on the knob control for contrast, brightness, chroma and phase. The desired level can be set to the click position at the center allowing for mul-

PVM-1351Q 13˝ Production Monitor

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

- Is also 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. By inserting the 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 with greater confidence and precision.
- Equipped with input terminals such as component (Y/R-Y/B-Y), analog RGB, S-video, 2 composite video (BNC) and 4 audio terminals for complete flexibility.
- Aspect ratio is switchable between 4:3 and 16:9 simply by pressing a button.
- Underscan and H/V delay capability. With underscan, entire active picture area is displayed. Allows you to view entire image and check the picture edges. H/V delay allows viewing of the blanking area and sync/burst timing by displaying the horizontal and vertical intervals in the center of the screen.
- 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.

SHURE

FP32A PORTABLE STEREO MIXER

This small and rugged portable mixer is well equipped to handle the demands of EFP, ENG, live music recording or any other situation that requires a low noise high performance mixer.

- High quality-low noise electronics, perfect for digital recording and transmission
- Three balanced inputs, two balanced outputs plus tape out and monitor
- Supports all types of condenser mics with internal phantom supply
- Inputs can be switched between mic and line level
- Each channel has own pan pot
- Each channel has illuminated meter and peak indicator
- Two units can be cascaded to provide six input channels
- Internal 1KHz oscillator for record and send level calibration
- Internal (2x9V alkaline batteries) or external power
- Switchable low cut filters

MACKIE

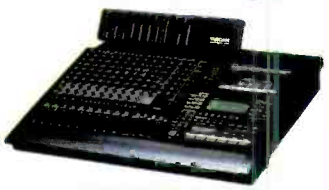
MicroSeries 1202 12-Channel Ultra-Compact Mic/Line Mixer

Usually the performance and durability of smaller mixers drops in direct proportion to their price, making lower cost models unacceptable for serious recording and sound reinforcement. Fortunately, Mackie's fanatical approach to pro sound engineering has resulted in the Micro Series 1202, an affordable small mixer with studio specifications and rugged construction. The Micro Series 1202 is a no-compromise, professional quality ultra-compact mixer designed for non-stop 24 hour-a-day professional duty in broadcast studios, permanent PA applications and editing suites where nothing must ever go wrong. So no matter what your application, the Micro Series 1202 is ideal. If price is the prime consideration or you simply want the best possible mixer in the least amount of space, there is only one choice.

CR-1604 16-Channel Audio Mixer

In less than three years, the Mackie CR-1604 has become the industry standard for compact 16-channel mixers. It is the hands-down choice for major touring groups and studio session players, as well as for broadcast, sound contracting and recording studio users. For them the CR-1604 offers features, specs, and day-in-day-out reliability that rival far larger boards. Its remarkable features include 24 usable line inputs with special headroom/ultra-low noise Unityplus circuitry, seven AUX sends, 3-band equalization, constant power pan controls, 10-segment LED output metering, discrete front end phantom-powered mic inputs and much more.

TASCAM



688 Midistudio

The 688 MIDISTUDIO is a compact, 20 input audio mixer combined with an 8 track cassette recorder system. Designed for the MIDI-based studio, this unit will work well for both the production facility and the individual artist. In the MIDI environment, sources can be selected, destinations assigned and routing designated, all from the remote MIDI controller. With its wide input range and ability to be remotely synchronized, the 688 can be the heart of a high tech, compact 8 track studio.

- Full featured 20 input mixer (10 balanced XLR inputs)
- 8 x 2 cue monitor mixer
- Built-in dbx noise reduction system (defeatable)
- Unique "Scene Display" system to monitor MIDI-controlled setups
- Gapless auto punch in/out and rehearsal modes
- Serial interface for external synchronization

LARGEST IN-STOCK INVENTORY IN THE WORLD

. . . FOR PHOTO & VIDEO"

TO INQUIRE ABOUT YOUR ORDER:

800 221-5743 • 212 807-7479

OR FAX 24 HOURS: 212 366-3738

119 WEST 17TH STREET, NEW YORK, N.Y. 10011

Store & Mail Order Hours:

Sun 10-4:45 • Mon & Tues 9-6 • Wed & Thurs 9-7:30 • Fri 9-2 • Sat Closed

RUSH OR OVERNIGHT SERVICE AVAILABLE (extra charge)

B&H PHOTO-VIDEO

HORITA

WG-50
Window Dub Inserter

- Makes burned-in SMPTE TC window dub copies
- Indicates drop-frame or non-drop-frame time code
- Also functions as play speed SMPTE time code reader
- Adjustments for horizontal and vertical size and position
- Dark mask or "see-thru" mask surrounds display
- Provides reshaped time code output for copying TC
- Displays time code or user bits • Display on/off
- Field 1/ field 2 indicator • Sharp characters
- Always frame accurate (on time)

$269

TG-50
Generator / Inserter

Combination time code generator and window dub inserter It includes all features of WG-50 **PLUS**–

- Generates SMPTE time code in drop/non-drop-frame format
- Jamsync mode jams to time code input and outputs new TC
- Simple "on screen" preset of time code and user bits
- Run/stop operation using front panel momentary switch
- Selectable 30/60/90/120-second automatic generator back-time
- Make a window dub copy while recording TC on source tape

$349

BSG-50
Blackburst/Sync/Tone Generator

The BSG-50 provides an economical means for generating the most common RS-170A video timing signals used to operate various video switchers, effects generators, TBCs, VCRs, cameras and video edit controllers.

- 6 BNC video/pulse outputs
- Now available: 6 blackburst, 4 sync, 2 subcarrier
- Each sync output individually settable for composite sync, composite blanking, H-drive, or V-drive.
- Separate buffer for each output–maximum signal isolation
- 1KHz, 0dB sinewave audio tone output, locked to video
- Outputs can easily be configured to meet specific user and equipment needs

$269

CSG-50
Color Bar/Sync/ Tone Generator

- Generates full/SMPTE color bars, blackburst and composite sync signals.
- Built-in timer can automatically switch video output from color bars to color black after 30 or 60 seconds. Easy and convenient for producing tape leaders and striping tapes with color bars and black.
- Front panel selection of full-field or SMPTE color bar patterns or colorblack (blackburst) video output.
- Includes crystal-controlled, 1KHz, 0dB audio tone output.
- Outputs: video, sync, ref frame, 1 KHz, 0dB
- Audio tone switches to silence and color bars change to black when using 30/60 second timer.
- Fully RS-170A SC/H phased and always correct. No adjustment required

$349

TSG-50
NTSC Test Signal Generator

The TSG-50 generates 12 video test signals suitable for setting up, aligning, and evaluating the performance of various video equipment found in a typical video editing system, such as video monitors, distribution amplifiers, VCRs, switchers, effects generators, TBCs, etc. In addition to the video signals, the TSG-50 also generates composite sync and, with a video DA such as the Horita VDA-50, becomes a high quality, multiple output, house sync generator.

- Fully RS-170A SC/H phased and always correct. No adjustments ever required
- Built-in timer automatically switches video output from color bar pattern to black after 30 or 60 seconds. Makes it easy to produce tape leaders of color bars followed by black.
- Video signals generated are in accordance with industry standard EIA RS-170A video timing specification.
- Audio tone switches to silence and color bars change to black when using 30/60 second timer.
- Convenient pattern selection - 12 position front panel switch.
- Includes crystal controlled, 1 KHz, 0dB audio tone output.
- Generates precise oscilloscope trigger output signal one H line before start of color field 1.
- Outputs: video, sync, ref frame, 1KHz, 0dB

$439

WE STOCK THE FULL LINE OF HORITA PRODUCTS INCLUDING:

WG-50 –	**Window Dub Inserter**
TG-50 –	**Generator/Inserter**
TRG-50 –	**Generator/Inserter/Search Speed Reader**
TRG-50PC –	**Has all of the above plus RS-232 control.**
VG-50 –	**VITC Generator, LTC-VITC Translator**
VLT-50 –	**VITC-To-LTC Translator**
VLT-50PC –	**VITC-To-LTC Translator / RS-232 Control**
RLT-50 –	**HI8 (EVO-9800/9850)TC to LTC ranslator**
TSG-50 –	**NTSC Test Signal Generator**
SCT-50 –	**Serial Control Titler "Industrial" CG, Time-Date Stamp, Time Code Captioning**
SAG-50 –	**Safe Area, Convergence Pattern and Oscilloscope Line Trigger and Generator**

SONY

NEW! SVP-5600 and SVO-5800
S-VHS Player/ S-VHS Editing Recorder

SVP-5600 and SVO-5800 features:

- By combining the high resolution (400 horizontal lines) of S-VHS with high quality signal processing techniques like DNR, Digital Field DOC and Chroma Process improvement, they deliver the consistent picture quality so essential to editing. They also incorporate a wide video head gap and track width (58mm) for stable and faithful picture reproduction.
- Each has a built-in TBC plus an advanced Digital Noise Reducer (DNR) for both the chrominance and luminance signals to eliminate noise during playback. At the same time, a field memory incorporated in the noise reducer removes jitter to provide sharp, stable pictures. The field memory, also includes a Digital Field DOC (Dropout Compensator), which replaces signal dropout with information from the previous field.
- They also incorporate Chroma Process Improvement circuitry for excellent color picture quality in the playback mode. This advanced circuitry greatly improves the chroma bandwidth, thus enabling sharper and clearer color picture reproduction.

ADVANCED EDITING FUNCTIONS

- For frame accurate editing, both machines employ a sophisticated servo system, an improved quick response mechanism and built-in LTC/VITC time code capability. This makes them ideal for animation and computer graphic recording, where a frame-by-frame editing function is indispensable.
- They are equipped with industry standard RS-422 9-pin serial interface. The 9-pin connector carries edit commands and time code data between the VCR and the edit controller.
- When connected to an RS-422 equipped edit controller, the SVO-5800 functions as an editing recorder. It performs assemble and insert functions and also provided audio split editing capability of normal audio tracks 1 and 2. In the insert mode, video, audio and time code can be inserted independently, or in any combination.

FOUR CHANNEL AUDIO SYSTEM

- They each incorporate four-channels of high quality video. There are two channels with Hi-Fi (AFM) tracks and two with longitudinal (normal) tracks. The Hi-Fi tracks provide a wide frequency response from 20hz to 20khz and a superb dynamic range of 90db. The normal tracks incorporate Dolby B noise reduction for high quality sound reproduction. XLR connectors are used for the inputs and outputs for all four channels.

MULTIPLE INPUTS AND OUTPUTS

- Both machines employ composite and S-Video connectors. With optional SVBK-170 Component Output Board, they provide component signal output through BNC connectors. With the board, the VCRs can be integrated into Betacam SP editing systems.

USER FRIENDLY OPERATION

- They have a built-in character generator which superimposes characters on the "video monitor output" signal. This allows time code data, control track, menu setup and VCR function status to be shown on a monitor.
- For more efficient operation they have an on-screen setup menu which allows a variety of customized VCR mode operations. Programmed in the form of a layer structure, you simply go through the menu and initialize VCR operation.
- All parameters of the TBC, such as luminance level, chroma level, setup, hue, Y/C delay, sync phase and SC phase are easily controlled from the front panel, and can be remotely controlled from the optional UVR-60 TBC Remote Control. The UVR-60 also accesses field freeze function in the still mode and allows on/off control of the chroma and luminance noise reducer.
- Quick and smooth picture search can be performed by either using an RS-422 equipped edit controller or the optional SVRM-100 Remote Control Unit. Recognizable color pictures are provided at up to10x normal speed in forward or reverse.

REBATES: Buy an SVP-5600 or SVO-5800 Professional S-VHS VCR or UVW-1600, UVW-1800, Betacam SP VCR with:

- **Sony PVE-500 A/B Roll Edit Controller and receive $500 instant rebate!**
- **Sony FXE-100 A/B Roll Edit Controller/SEG and receive $1000 instant rebate!**
- **Sony DFS-300 Switcher/SEG and receive $2000 instant rebate!**

FXE-100 ALL-IN-ONE VIDEO EDITING SYSTEM

The new FXE-100 is an A/B roll editing system designed for quicker, easier video editing, and is well-suited for today's professional audio/visual communications. It is at once an edit controller which controls basic VCR functions, a special effects generator which cuts, mixes, wipes and composites the video sources with stunning effects: and an audio mixer with various fading and switching abilities. There is no longer a need to configure multiple devices for video editing. With either Hi-8 or S-VHS VCRs and the FXE-100, an ideal professional editing system can be easily configured.

- Switchable machine control of three RS-422 equipped VCRs or three RS-232 equipped VCRs. Basic VCR functions such as play, stop, still, fast forward, rewind and record are controlled through these interfaces. Variable speed control is also possible for VCRs equipped with Dynamic Tracking.
- Accepts time code, control track (CTL), and 8mm time code as editing references. These can be set separately for each VCR.
- Performs assemble and insert editing (Video, Audio 1, Audio 2). The first EDIT mode, which allows you to record sufficient timecode for synchronization to a new tape is also featured.
- Features a split audio edit function which allows setting of audio and video in-points separately. This permits you to bring in the audio source before a visual transition.
- Store up to 99 scenes, including effects settings, in memory.
- Edit list data can be saved and downloaded to an IBM-compatible PC, allowing you to review or modify edit data at any time.
- The FXE-100 has two program busses, the A- and B-bus. Each bus provides Player 1, Player 2, Aux inputs and Background Color. Both composite and S-Video signals can be input.
- Taking advantage of the freeze function, two machine editing with effect transitions is realized by freezing the recorder OUT point picture. Also, by selecting the same video source in both A and B bus, wipe or mix In/Out of the digital effects is possible without picture transition. This "Self A Roll" function is another feature which allows effective two machine video editing.

SWITCHER AND SPECIAL EFFECTS GENERATOR

- Multiple wipe patterns, including picture scroll and slides, are programmed in. Wipe patterns are easily accessed, and transition rates can be set. Soft edges or a choice of 15 color borders can be added to most wipes and effects.
- Variety of mix effects, such as mosaic mix, black and white mix, posterization mix and picture-in-picture (PIP). Also fade to black and fade to white effects.
- Digital effects, such as mosaic, paint, pixel trail, multi-picture, monochrome, and zoom. Picture freeze function is also featured in frame or field mode.
- Because all the special effects can be set separately to the video sources of each bus, wipes or dissolves of the sources with the digital effects can be executed. It is also possible to combine multiple effects to create stunning images, such as wiping the multi-picture effect with the paint effect and dissolving color corrected picture with mosaic effects.

ADJUSTABLE TRANSITIONS

Transitions are done using the fade lever, or they can be automatically set. Transition time can be set from 0 to 999 frames. Transition can also be paused and reversed. Other parameters such as GPI timing, wipe selection and pre-roll time can be set.

CHROMA KEYER

The FXE-100 features chroma and luminance keyers to superimpose characters, figures, or video sources onto a background. Clip and gain levels can be adjusted to give clean and sharp key edges. Color correction is done via the joystick for both busses with memory to hold a favorite setting for storage and recall.

WIPE CONTROL

By moving the location stick, you can move the closed wipe patterns such as square, circle and heart, around the screen. This function also enables you to start the wipe transition from any desired position on the screen.

AUDIO MIXING

Audio-follow-video editing can be performed with the FXE-100. Two channels are assigned to each player VCR's input and one channel for the recorder VCR's input. Two channels of AUX inputs and a MIC input are available for mixing background music with voice-over. All audio input levels can be adjusted separately. Two Program output channels and one monitor channel are provided. A switch for -7.5dB and +4.0 dB is provided for flexibility in choosing input levels for VCRs with either RCA or XLR connectors.

USER FRIENDLY OPERATION

- All keys and buttons are logically grouped by function, and are color coded for quick identification and economy of keystrokes.
- Permits one monitor operation. No need for multiple monitors. Various editing data, such as edit mode and time code address of each VCR, can be monitored on the same screen.

VERSATILE SYSTEM INTEGRATION

- No need to configure multiple devices. By simply connecting three VCRs, a professional video editing system is formed.
- Two frame synchronizers allow perfectly synchronized wipes and dissolves without time base correctors.
- Equipped with two GPIs for control of external devices, such as character generators and audio mixers. Also has a GPI input, allowing it to be controlled from an external edit controller.
- Has four black burst outputs to distribute internally generated sync signal, synchronizing connected devices. There is no need for an external sync generator.

We are an authorized Service Center for Sony and Panasonic Industrial and Professional video equipment. Call (800) 963-2525. In NYC (212) 206-8861 (24 hour service available)

MAGNI

MM-400

- The MM-400 is a combination waveform and vector monitor especially configured for the cost-conscious producer. A low-cost alternative to CRT-based waveform monitoring the MM-400 produces a video picture of the input signal's waveform and displays it on any video monitor. It provides a simple, affordable and accurate way to set camera levels before a shoot, or to check time base correctors and color fidelity in editing. Problems like hue shift, smearing, muddy contrast and loss of detail are easily identified for correction.

FEATURES:

- Converts waveform or vector display information into a standard video signal which can be displayed on a video monitor or routed around a video facility, no need for additional expensive monitors. Switch between pictures and waveforms at the push of a button.
- Incorporates an advanced SC/H phase and color frame indicator that is a must for editing and post production. At a glance it tells you if a signal's subcarrier-to- horizontal phase is properly adjusted and if the signal's color frame matches the house black burst connected to the MM-400 external reference input.
- Works anywhere and with any analog video format—NTSC, PAL, Component or S-Video. It has automatic detection between NTSC and PAL formats.
- Three loop-through inputs can accept three composite signals or one component, or RGB signal.
- No complex displays or special test signals are required for component video monitoring.
- Interchannel timing and amplitude display make component analog monitoring easy, has color bar limit markings for Betacam, M-II and SMPTE formats.
- Waveform and vectorscope controls, including channel, sweep speed, position control, phase rotation are on easy-to-see dedicated pushbuttons.
- Besides instant toggling between picture and waveform, a mix mode combines waveform and picture displays for simultaneous viewing.
- The MM-400 can be readily used by even novice operators. It has easy-to- understand set-up menus for display color, interchannel timing, SC/H phase alarm.
- Usable in any video facility of any size for displaying signals, its low cost makes it affordable by the smallest studio, while its features and performance make it ideal for monitoring in high-end facilities as well.

LEADER

Model 5850C
Vectorscope

An ideal companion for the 5860C Waveform Monitor, the 5850C adds simultaneous side-by-side waveform and vector monitoring. Featured is an electronically-generated vector scale that precludes the need for fussy centering adjustments and eases phase adjustments from relatively long viewing distances. Provision is made for selecting the phase reference from either (A or B) inputs or a separate external timing reference.

Model 5860C
Waveform Monitor

A two-input waveform monitor, the 5860C features 1H, 1V, 2H, 2V, 1 µs/div and 2V MAG time bases as well as vertical amplifier response choices of flat, IRE (low pass), chroma and DIF-STEP. The latter facilitates easy checks of luminance linearity using the staircase signal. A PIX MON output jack feeds observed (A or B) signals to a picture monitor, and the unit accepts an external sync reference. Built-in calibrator and on-off control of the DC restorer is also provided.

Model 5864A
Waveform Monitor

A fully portable waveform monitor for field use, the Model 5864A is a two-channel unit that provides 2H and 2V sweeps with MAG, FLAT and IRE response, and normal and X4 gain.

Model 5854
Vectorscope

2-channel portable vectorscope is ideal for field use and features A and B phase reference, fixed and variable gain. Both units shown with optional battery holder and NP-1 type battery.

ALL ITEMS ARE COMPLETE WITH ALL ACCESSORIES AS SUPPLIED BY MANUFACTURER

Circle (73) on Reply Card

PROFESSIONAL SERVICES

[redacted]
CHAN & ASSOCIATES
BUSINESS DEVELOPMENT • STRATEGIC MARKETING • PUBLIC RELATIONS
CURTIS J. CHAN
PRESIDENT
2212 HERITAGE WAY
FULLERTON, CA 92633
PHONE: (714) 447-4993
FAX: (714) 578-0284
PAGER: (714) 506-1357 [redacted]

JOHN H. BATTISON P.E.
CONSULTING BROADCAST ENGINEER,
FCC APPLICATIONS AM, FM, TV, LPTV
Antenna Design, Proofs, Fieldwork
2684 State Route 60 RD #1
Londonville, OH 44842
419-994-3849

BIGGER HALF MEDIA SYSTEMS INC.
CORPORATE AND COMMERCIAL
VIDEO AND MULTI-MEDIA ENVIRONMENTS
DESIGN - INSTALLATION - CONSULTATION
TEL. (919) 489-5580 JOEL APPELBAUM
PRESIDENT

NETCOM
STATE OF THE ART ENGINEERING
FOR AUDIO AND VIDEO
ENGINEERING DESIGN • CAD DRAFTING SERVICES
CABLE FABRICATION • PRE-WIRED PATCH PANEL RACKS
SYSTEM INSTALLATIONS • EQUIPMENT SALES
(201) 837-8424
FAX: (201) 837-8384
1465 PALISADE AVE., TEANECK, NJ 07666

HAMMETT & EDISON, INC.
CONSULTING ENGINEERS
RADIO AND TELEVISION
DANE E. ERICKSEN, P.E.
Box 280068
San Francisco, CA 94128
707/996-5200 707/996-5280 Fax

D.L. MARKLEY
& Associates, Inc.
CONSULTING ENGINEERS
2104 West Moss Ave.
Peoria, Illinois 61604
(309) 673-7511
FAX (309) 673-8128
Member AFCCE

Why not run your business card here?

Only $133 per insertion.

Frequency discounts available.

Advertise in Broadcast Engineering!

CLASSIFIED

FOR SALE

ATTENTION BROADCAST ENGINEERS
SOFTWARE HELPS OPTIMIZE AND MANAGE RF TRANSMITTER SITES!
- Intermodulation Interference Analysis
- Transmitter Noise/Receiver Desense Analysis
- Radiation Hazard Analysis
- Site Facilities Design
- Site Management Database

COMSITE™ PLUS
BY DOUGLAS INTEGRATED SOFTWARE
CALL 800-845-0408 or 904-656-8673

For a *FREE* sample and brochure call 800-829-4275

Durable Velcro Straps for wrapping Cables & Cords of all kinds.

Cable Lock
Giving organization a Good Wrap.

Tape Resources, Inc.
Video • Audio • Data Media
Special Pricing for FCC Call Letter Stations
(800) 827-3462
SONY PROFESSIONAL MEDIA

Classified Advertising

Advertising rates in **Broadcast Engineering** Classified Section are $119.00 per column inch, per insertion, with frequency discounts available. There is a one inch minimum and ten inches maximum.

Ads may also be purchased By-The-Word for $1.75 per word, per insertion. Initials and abbreviations count as full words. Minimum charge is $40 per insertion.

Blind box ads (replies sent to **Broadcast Engineering** for forwarding) are an additional $40.00. Reader Service Numbers are available for $50.00 per insertion. Ads 4 inches or larger receive a Reader Service Number free.

Spot color, determined by **Broadcast Engineering**, is available at $95.00 per insertion.

No agency discounts are allowed for classified advertising.

Call the *Broadcast Engineering* Classified Sales Manager at 913-341-1300 to reserve your classified ad!

KurlyTie NEW!
Spring Coil Cable Wraps
FREE SAMPLE!
DIAL 1-800-587-5984
The KurlyTie Company, 3382 Border Dr., Stone Mtn. GA 30087
a div. of SuperVid Also: Pocket Tool converts VHS tapes to SVHS

Fix RF on Headsets, Handsets & Phones!

Our Filters are the only ones **TUNED** to the specific band - **AM, FM, CB** or **Amateur**...
*String two together to filter AM **AND** FM!*

We also have the **only** filters for the **HANDSET CORD** (either the base or handset cord is acting like the antenna) - and **50%** of the filters we sell are for the **Handset!**

Modular Filters... One Pair: $15.95
Two Pair or **Handset**: $19.95

Call for 4 Page RFI Tech Bulletin & Catalog

Modular Handset, 1 or 2 Pair Plug / Jack

Unique Telecom Products from:
Mike Sandman...Chicago's Telecom Expert
VISA **708-980-7710**

BUY WHERE THE BROKERS BUY!

WHY PAY A MIDDLEMAN? CALL THE PEOPLE WHO HAVE IT IN STOCK!
GOOD GEAR, GREAT PRICES!
(WE HAVE MORE EQUIPMENT IN STOCK THAN MANY BROKERS SELL IN AN ENTIRE YEAR!! CALL TODAY, GET IT TOMORROW.)

U.S. BROADCAST (606) 282-1802

CLASSIFIED

FOR SALE

Sony Interface for your VPR-2 or BVH-1100

- Convert Sony serial to parallel control.
- Complete editing capability.
- RS-422 interface for editors and automation.
- Controls ATR's and VCR's.

Phantom II VTR Emulator

FOR INFORMATION:
Call 1-800-331-9066
cipher digital 30 W. PATRICK ST., SUITE 310 FREDERICK, MD 21701

Circle (100) on Reply Card

1 EA. LAKE SYSTEMS, LA KART, television commercial spot playback system. Modified for component video output. Has 8 Sony VO-5000 3/4" playback machines. All equipment installed in compact roll-around rack unit. We also have 1" tape machines and other equipment. Please call Bill Brister, Director of Engineering. WRBW-TV, Orlando, Florida. (407) 248-6500.

PANASONIC-MACKIE-RAMSA-TASCAM-TECHNICS-SHARP-BOGEN-DALITE-EIKI-MAXELL-SHURE. Professional/Industrial Video & Audio Equipment. Wholesale Prices! Factory Sealed New! Sales = 800-233-2430, Support = 607-687-0545.

MUST SELL!!! Custom console for video post production. Beautifully hand crafted, oak & mica. With tremendous desk tops including client areas with monitor bridge. Also GVG master sync generator & ADC patchbay. All in mint condition. Must sell!!! (516) 878-3232 or 3233.

JAZZ UP YOUR EDIT SUITE WITHOUT CREATING THE OVERHEAD BLUES! Abekas A 34 Solo; Abekas A51 w/warp; Grass Valley Dubner 20K; Digital F/X Effects System; BVW 60, 65 and 70; Grass Valley Series Component; Videotek RS-12 Video Router; Triplite Voltage Regulator; (3) PVM-91 Monitors; Image Logic Control Switcher; Syncman Pro Synchronizer. TELEVISION PRODUCTION GROUP (912) 745-3779.

---

2 EACH SONY MODEL BVH-3100 Video Tape Recorders with less than 3100 hours on each an 1 each Sony Model BVH-1100 Video Tape Recorder complete with Winstead VTR console. For further information, contact Mr. Jeff Shields, Miami-Dade Community College at (305) 237-0943.

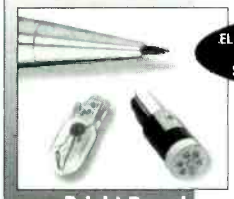
Factory Direct Cases

Our prices can't be beat.

Custom or Stock Sizes

Call for Catalogue or Quote
Roadie Products, Inc.
800-645-1707
In NY 516-563-1181
Fax: 516-563-1390

Long-Life Alternative to Standard Incandescents



ELIMINATE THE NEED TO RELAMP YOUR CONTROL PANELS, SWITCHES AND INDICATORS.

NOW AVAILABLE- ULTRA BRIGHT LED'S

Bright Based Multi-Chip LED's

- 100,000 hour (11 year) shockproof life
- 5 - 120 volt AC, DC, and Bi-polar operation
- Wedge, bayonet, midget flanged, grooved, telephone slide, and other bases
- Red, green, yellow; special order- warm white, blue

LAMP TECHNOLOGY, INC.
1645 Sycamore Ave.
Bohemia, NY 11716
516-567-1800
Fax: 516-567-1806
1-800-KEEP-LIT
(Outside NY)

Circle (101) on Reply Card

• STUDIO EXCHANGE • BURBANK
(818) 840-1351 • FAX (818) 840-1354
NEW & USED VIDEO EQUIPMENT
BUY, SELL, CONSIGN; 25 YRS EXP

"Great article! Can we get copies for our clients and sales force?"

Whether it's an article, ad, or an interesting column, take advantage of this unique opportunity to promote your business and products through reprints – available from this magazine. Reprints are great promotional pieces and make excellent marketing tools ... all at a minimal cost.

Available in full-color or black & white, reprints can be obtained from any issue.

For a free price quote, contact Chris Lotesto, toll-free at 800-458-0479 or 312-435-2357.

DISTRAMIX® 8x8 MATRIX MIXER

- More flexible than a routing switcher
- Fully adjustable crosspoints (64 mix pots)
- Creative audio mixing & distribution

For more information, contact:
510.769.1515 fax: 510.523.6296
MERIDIAN COMMUNICATIONS
P.O. BOX 87, ALAMEDA, CA 94501 USA

FOR RENT

SUB CARRIER availability now offered on a 100KW FM clear channel in the Dallas Fort Worth area. Please call (214) 716-7829.

TRAINING

FCC GENERAL CLASS LICENSE. Cassette recorded lessons for home study. Our 30th year preparing radio technicians for the license. Bob Johnson Telecommunications. Phone (310) 379-4461.

ATTENTION *BE* READERS

ATTENTION *BROADCAST ENGINEERING* READERS A former Editor of *BE* is looking for past issues of *Broadcast Engineering* to complete a collection of magazines. The following issues are needed: March 1984; July 1984; August 1984; June 1985. A finder's fee of $25.00 per issue will be paid for magazines that are complete and in good shape. Direct responses to: Jerry Whitaker, 2373 N.W. 185th Street, Suite 507, Hillsboro, OR 97124, or call 503-645-1221. Thanks for your help!

EQUIPMENT WANTED

USED BVU 900-950 VTR SET, TC not necessary. Will consider TBC(s) if equipped. Call Gene Brewer at WAGM-TV. 1-800-393-9246 or Fax 207-764-5329.

WANTED: USED VIDEO EQUIPMENT Systems or components. PRO VIDEO & FILM EQUIPMENT GROUP: the largest USED equipment dealer in the U.S.A. (214)869-0011.

EDUCATIONAL TRAINING

BIG RESULTS FOR A SMALL INVESTMENT
BE **READERS 106,572***
READERS
*Source: April '94 Ad-Q.

BCS Broadcast Store
Buy Consign Sell Service Trade

Sony BVU-950-8,000
Sony BVE-9000-12,500
Grass Valley 200-48,500
Abekas A-53D-30,000
Sony BVM-1910-3,000
Sony PVW-2650-14,000
Sony BVW-507 w/18X-21,000
Tektronix-1750 wf/vect-3,500
Grass Valley 3400 DA-2,000

Non Linear
Avid
Lightworks
Digital Magic

All Equipment Warrantied!

Upgrade your PVW and UVW Betacam machines to a BVW series with 4 channel audio playback and record.

Phone LA-818-551-5858 NY-212-268-8800 *Fax* LA-818-551-0686 NY-212-268-1858

BETACAM™
WORLD'S MOST COMPLETE
TRAINING CLASSES
'YOUR PLACE OR OURS'
LEARN FIELD TRICKS, SHORTCUTS, THEORY AND PRACTICE
LOTS OF 'HANDS ON'
TENTEL® CORP.
4475 GOLDEN FOOTHILL PKWY.
EL DORADO HILLS, CA 95762
(916) 939-4005 / 800-538-6894

CLASSIFIED

SERVICES

Invest your
Advertising Dollars
where your
Prospects Invest
their Time...

BROADCAST ENGINEERING®

Video Equipment Repair
Broadcast & Industrial
o SONY 7000-Series VCR Rebuilds

Professional Depot Service of:
o VCRs/Tape Units o Cameras
o Monitors o TBCs
o Most Manufacturers

(800) 242-8428
BC Video Services
9415 Gentry Ave. St. Louis, MO 63125
A Unit of BC Group International Inc.

Monitor Service Center

Varitek specializes in high resolution broadcast video monitors. Digital or analog. In all formats NTSC, PAL, SECAM.

We at Varitek have been providing quality service to our clients throughout the United States since 1982.

IKEGAMI, SONY, HITACHI, MITSUBISHI JVC, PANASONIC, CONRAC, NEC BARCO, TEKTRONIX, And More...

(800) 346-4380 Ext. (16)
VARITEK
415 W. Taft Ave., Orange, CA

Circle (102) on Reply Card

HELP WANTED

TECHNICAL FACILITIES MANAGER

KGO-TV is seeking a Technical Facilities Manager for our TV Engineering Department. Will be responsible for operational readiness of all technical facilities. Will directly manage eleven field service engineers and be responsible for all related operational budgets. Must have at least 10 years engineering/technical experience with a strong field service background. A degree in a technically related field or equivalent experience required. Application deadline is May 19, 1995. Please send resume and cover letter to

KGO-TV Personnel
900 Front Street
San Francisco, CA 94111
EOE

MAINTENANCE ENGINEER Black Entertainment Television Inc. Ability to troubleshoot to the component level production switchers, digital video effects systems, routing switchers, vtr's character generators, cameras, editing systems and audio equipment. This will include system interfacing to computers and compatible components, equipment installation for studio and remote productions. Must be knowledgeable of system timing theory, broadcast specifications, and electronics course study. Ability to perform fiber switches and satellite downlink. Must have 3 years experience. BET, Corporate Human Resources, 1905-E 9th Street, N.E., Washington, D.C. 20018

BROADCAST MAINTENANCE TECHNICIAN - Southern Network Affiliate needs full-time technician. Must be proficient in maintaining full service multi-format broadcast station. RF experience helpful. In-depth hands-on experience a must. Send letter, resume, and salary history to Veronica Bilbo, EEO Coordinator, KPLC-TV, P.O. Box 1490, Lake Charles, La. 70602. EOE.

KEYSTONE COMMUNICATIONS has Staff Engineer openings in Audio/Video and RF Systems. Must have 3 yrs. exp. in the Broadcast Industry. SBE certificate a plus. Send resume to Mgr. of Engineering, 10525 W. Washington Bl., Culver City, CA 90232 or fax 213-240-3905. No phone calls please. EOE.

VIDEO DIRECTOR/SYSTEMS ENGINEER component experience, for national convention video and teleconference contractor. Atlanta based. Abilities required: install engineer and call 3 camera system w/GVC 100 switcher, tape rolls, graphics, knowledge of DOS, computers and video projection systems preferred. Light maintenance and on-site trouble shooting is a must. Salary, medical, dental and profit sharing. Contact Mr. Allen, 1-800-782-4322.

MAINTENANCE ENGINEER: UHF station, looking for highly skilled ME, experienced in all aspects of broadcast engineering to maintain tower and studio equipment. FCC general class license; SBE certified. Submit detailed resume, salary requirements to Broadcast Engineering, Classified Ad Coord., Dept. 759, 9800 Metcalf, Overland Park, KS 66212-2215.

HELP WANTED

WE PLACE

(Technical Engineers-Post Production Editors, Colorists, Graphics & Animators)
• All Levels, Locations, & Disciplines •
Employer Paid Fees
Guaranteed Confidential
15 Years Service
FAX and/or Mail your Resume to Mike Kelly

KEYSTONE INT'L, INC.
16 Laflin Road, Suite 900
Pittston, PA 18640
Fax 717-654-5765 • Phone 717-655-7143

TURNER ENTERTAINMENT NETWORKS

TELEVISION ENGINEERS

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
Turner Broadcasting System, Inc.
One CNN Center
P.O. Box 105366
Atlanta, GA 30348-5366
(404) 827-1638 office
(404) 827-1835 fax

TBS is an equal opportunity employer

ON-LINE EDITOR
FOR NEW YORK'S #1 INDEPENDENT

WPIX, Tribune Broadcasting's flagship station in New York, has an immediate opening for a Promo Editor. We are looking for a techo-artist with a flair for graphic design. You should know D2, 1", Beta, Sony 9100, 8000, DME 5000, Grass Valley 100 and DPM 700. The Quantel Paint Box and Picture Box along with the DFX are at your disposal too. If you combine technical mastery and creativity, you could be the person we want! WPIX is an equal opportunity employer. Send resume and demo reel (not returnable) to:

WPIX-TV
220 East 42 Street
New York, NY 10017
Employment A

KTVD-TV Denver, UPN affiliate looking for UHF Transmitter Engineer. 3 years experience. Great benefits. Send resume and cover letter to Channel 20 TV Company, 11203 E. Peakview Ave., P.O. Box 6522, Englewood, CO 80115-6522. EOE M/F.

Your ad here.

Fill a position and promote your company.
Advertise in *Broadcast Engineering's*
Help Wanted Classifieds!

CLASSIFIED

HELP WANTED

WTVM, DOMINANT ABC AFFILIATE, IS LOOKING for an Assistant Chief Engineer: Immediate opening for individual with experience in broadcast maintenance, ready to step up to the #2 position. Should have strong technical skills to include troubleshooting to component level of video and audio systems, cameras, videotape machines, monitors, switchers, RF systems, and computer systems. Must be a self-starter with good people skills. FCC general class license preferred. Must have good driving record and pass substance abuse test. Excellent compensation and benefits for the right person. Contact David Williams at 706-324-6471 or send resume to: Chief Engineer, WTVM-TV, P.O. Box 1848, Columbus, GA 31902-1848. Equal Opportunity Employer.

MAINTENANCE ENGINEER: Mid-South Post House has immediate opening for experienced assistant engineer. Digital and analogue equipment includes Sony switchers, editors, DMEs, D2, 1", Beta SP, monitors, ADO, Delta CG, Rank Cintel, Composium, Avid, etc. Mac and PC computer skills very helpful. Minimum 3-5 years experience required. Some night and weekend work required. Must have good people skills and be a self starter. Competitive salary and benefits. This is a good opportunity for a motivated individual with a clear vision and professional goals. Please submit cover letter, resume and salary requirements to: Erv Vanags, Elite Post, 1025 16th Ave. S, Suite 302, Nashville, TN 37212.

MAINTENANCE ENGINEER KTVB-TV, the top-rated station in Idaho seeks a Maintenance Engineer with a minimum of three years broadcast experience. Must be able to maintain TV broadcast transmitters and microwave systems. Ability to install and maintain computer networks a plus. FCC Lifetime General license or SBE certification or equivalent required. Come join us in beautiful Boise, Idaho, where you will find a blend of small town friendliness, a robust economy, and four distinct seasons offering a variety of recreational opportunities. Send resume and cover letter, along with salary requirements to Human Resources Administrator, KTVB-TV, P.O. Box 7, Boise, ID 83707. EOE.

CHIEF ENGINEER - Oversee, supervise and administrate all facets of the engineering department. Transmitter knowledge a must. Minimum 15 years of experience in the technical broadcast operations and a minimum of 5 years in supervisory capacity. Insure the station operates within the parameters set forth by FCC rules and regulations. Needs to establish, be responsible for and schedule equipment maintenance and repair. Must be able to troubleshoot, institute training and cross training with department staff. Send resume to: Personnel Department, KCCN-TV, 2200 Garden Road, Monterey, CA 93940. No phone calls accepted. HARRON TELEVISION OF MONTEREY/KCCN-TV is an equal employment opportunity employer and does not discriminate on the basis of race, color, religion, national origin, disability, sex, age or other factors prohibited by law.

BROADCAST TECHNICIAN Mid-West NBC affiliate has immediate opening for experienced broadcast VTR technician. Applicant must have at least 3 years experience in broadcast maintenance and electronics used in state of the art facility. Previous experience with GVG switchers, Panasonic MII, Sony 1" and Chyron helpful. Looking for team leader with ability to trouble shoot variety of broadcast systems. Please contact WKJG (219) 422-7474 for application. EOE.

MOBILE UNIT ENGINEER Mid South based mobile unit operation is seeking a qualified engineer. Looking for responsible individual capable of installation, maintenance and technical expertise in all areas of remote video production. Person must have a minimum of five years experience in related field. Must be able to deal effectively with clients and crew. This person will work directly for engineer in charge of mobile unit. Apply to: Director of Finance, WYES-TV/Channel 12, P.O. Box 24026, New Orleans, LA 70184-4026. WYES-TV is an equal opportunity employer.

TWO ENGINEERING POSITIONS available at KNME-TV, Albuquerque, New Mexico PTV station. Enjoy an excellent quality of life in 500,000 market: Gentle seasons, great hunting, fishing, skiing, reasonable cost of living. 1.) Broadcast Technical Manager, Requisition #953884-A: Develops and maintains a variety of broadcast systems related to the operation of a television station at the production, operation, and outside broadcast levels. Supplies needs assessment, problem solution, training, and supervision of assigned staff. Oversees implementation of new systems and technologies. Minimum Requirements: Bachelor's degree in Electrical Engineering or related field. Six years' experience in broadcast engineering of which three years are at the supervisory level. Desirable Qualifications: Knowledge of analog and digital broadcast equipment. Computer literacy and knowledge of computer communications, protocols, and standards (RS 232, 422 Ethernet). Knowledge of FCC rules and regulations. Knowledge of satellite, microwave and transmitter systems. Salary $2,303.58 to $3,168.50/month DOE. 2.) Broadcast Engineer III, Requisition #953883-A: Designs, installs, operates monitors, and performs general maintenance and major repair of television broadcast equipment necessary to produce, transmit, receive, record, and reproduce the NTSC color television signal. Minimum Requirements: Associate's degree in Engineering, technical or trade school degree. Five years of directly applicable experience in broadcast television maintenance and operation. Desirable Qualifications: Computer literacy and knowledge of computer communications, protocols, and standards (RS 232, 422 Ethernet). Salary: $1,764.50 to $2,426.67/month DOE. FCC Restricted Radiotelephone Operators Permit required for both positions. Knowledge of DOS, Windows, WordPerfect, Audio/Video CAD. RF experience, ability to drive 4-wheel drive vehicles desired for both positions. Equivalent combination of education and experience will be accepted in lieu of degree/certificate requirements on a one-year for one-year basis. To apply: Send resume with signed cover letter to UNM Human Resources Office at 1717 Roma NE, Albuquerque, NM 87131, between 8 am, Monday, April 10 and 5 pm, Friday, June 9, 1995. Resumes must list employment dates by month/year. Indicate requisition number and job title on the application/cover letter. Note: To apply for both positions, submit two applications. The University of New Mexico is an Affirmative Action/Equal Opportunity Employer and Educator.

TECHNICAL ENGINEER Cox CableRep is currently seeking an individual to head our technical engineering department for the Midwest cluster. Qualified candidate must possess ability to develop strategic plans and performance standards of quality and reliability for on-air look and contract completion. Will develop long range plans and budgets for insertion equipment reconfiguration, maintenance cycle and work with/support LAN's. Position requires a high school diploma or equivalent plus 2 years formal electronic training (NCTI, SCTE, etc.) and 3-4 yrs. experience as a lead technician in broadcast cable or related video playback, production equipment maintenance, planning or architecture of equipment set-up. Additionally, candidate should have 3-4 years management experience and ability to demonstrate training to staff. Some travel will be necessary. Office is located in North Canton, Ohio. Interested individuals should send detailed resume with salary history to: Cox CableRep, 4580 Stephen Circle Suite 304, Canton, Ohio 44718. No phone calls please. Cox CableRep is an equal opportunity employer.

TV STATION HAS OPENING FOR MAINTENANCE Technician. Requires 2-5 years experience troubleshooting and repairing various broadcast equipment, studio and field cameras, VTR's (1", Betacam and 3/4"), production, master control and routing switchers, Chyron CG's, microwave systems and UHF transmitters. Ability to move approximately 75 pounds, install cables and work at heights of up to 20 ft. Engineering degree and SBE certification preferred. Send resume to Broadcast Engineering, Classified Ad Coord., Dept. 760, 9800 Metcalf, Overland Park, KS 66212-2215. EOE.

SONY

Sony Broadcast Business and Professional Group has several opportunities for Broadcast Professionals in the following areas.

Field Engineers
Engineering Specialists
Depot Engineers

(San Jose and Cypress, CA; Chicago, IL; Teaneck, NJ; Norcross, GA; and Irving, TX)

We have openings for Engineers with a background in installation, maintenance, repair and troubleshooting of audio, video and telecommunications equipment. An AA degree in Electronics or equivalent and 3+ years' broadcast experience are necessary. Customer interface and travel will vary, depending on position. Must be willing to relocate.

Send your resume and salary requirements, along with locations you are interested in to Catherine Borders at the address or fax number listed below.

Sr. Video Systems Design Engineers

Contract/Temporary

We're looking for very seasoned Engineers to start immediately and work on designing large scale digital audio and video facilities. Candidates must be strong in system level engineering design, technical problem solving, team building and communications. Responsibilities will include the design of floor plans, equipment rack elevation layouts, and detailed signal flow construction diagrams. Fluency in Microsoft Excel for Windows is required; AutoCad, MS Word and MS Access software knowledge a plus. The ability to work with minimal supervision and training will also be key.

These contract positions require 5+ years' professional experience in the design, operation, maintenance and testing of large scale state-of-the-art analog and serial digital audio and video production, as well as broadcast facilities.

Contract/temporary positions require full-time presence at Sony's facilities located in San Jose, CA. Some travel will be required during installation and testing of facilities after designs have been completed. **Resumes should be sent to Christine Young at the address or fax number listed below.**

Send responses to: Sony Electronics, Inc., 3300 Zanker Road, MS: SJ-2C2, San Jose, CA 95134; FAX (408) 955-5163.

We are proud to be an EEO/AA employer M/F/D/V. Women and minorities are encouraged to apply. Also, we maintain a drug free workplace and perform pre-employment substance abuse testing.

AD INDEX

	Page Number	Reader Service Number	Advertiser Hotline
Acrodyne Industries, Inc.	5	12	800-523-2596
ADC Telecommunications	37	23	800-726-4266
ASACA/Shibasoku Corporation	73	58	310-827-7144
Audio Precision	7	10	800-231-7350
Belar Electronics Laboratory	73	60	610-687-5550
Belden Wire & Cable	36	19	800-235-3364
B&H Photo-Video	81-83	72, 73	800-947-9928
Broadcast Video Systems Ltd.	78	50	905-764-1584
BTS Broadcast TV Systems	17	7	800-962-4BTS
Canon USA Broadcast Lens	53	29	201-816-2900
Chyron Graphics	59	35	516-845-2173
Cipher Digital, Inc.	85	100	800-331-9066
Clear-Com Intercom Systems	27	17	510-527-6666
Conex Electro Systems	73	59	206-734-4323
DB Elettronica Telecomunicazioni	52	40	049-870-0588
Denon	29	9	201-575-7810
Dielectric	70	56	207-655-4555
DNF Industries	75	46	213-650-5256
Duracell USA	68-69	55	800-548-5489
Dynatech Video Group	77	49	800-453-8782
Frezzolini Electronics, Inc.	79	63-69	201-427-1160
Gepco	74	61	312-733-9555
Grass Valley Group	33-35, 62-63	18, 42	800-343-1300
Harris Allied	3	5	606-282-4800
HBO	78		212-512-1520
Henry Engineering	60	52	818-355-3656
Hotronic, Inc.	58	34	408-378-3883
ITS Corporation	55	30	412-941-1500
Intelligent Resources	IFC	1	708-670-9388
Ipitek	21	13	619-438-8362
Lamp Technology	85	101	516-567-1800
Leightronix, Inc.	75	48	517-694-5589
Leitch	BC	3	800-231-9673
Lightwave Systems, Inc.	64	43	214-741-5142
Louth Automation	19	8	415-329-9498
Lowel-Light Mfg., Inc.	50	37	718-921-0600
Matrox Electronic Systems	39	25	800-361-4903
NVision, Inc.	64A-B	44	916-265-1000
Odetics, Inc.	51	39	800-243-2001
Opamp Labs, Inc.	67	54	213-934-3566
Pacific Recorders & Engineering	IBC	2	619-438-3911
Panasonic Broadcast & TV	11		800-524-0864
Pioneer New Media Tech	43	28	800-421-6450
Pixel Instruments Corporation	22	15	408-354-9122
Quantel	65, 67	53	203-656-3100
Rane Corporation	56	32	206-355-6000
Sachtler Corporation of America	23	14	516-867-4900
Schneider Corporation of America	50	38	516-496-8500
Shure Brothers, Inc.	41	26	800-25-SHURE
Sierra Design Labs	42	27	702-831-7837
Sierra Video Systems	49	22	916-478-1000
Snell & Wilcox Ltd.	13-15	6	730-821-1188
Society of Cable TV Eng. SCTE	80	71	610-363-6888
Tascam/TEAC America, Inc.	47	21	213-726-0303
Tektronix, Inc.	45	20	800-998-3588
Telex Communications, Inc.	1, 61	41, 4	800-392-3497
Tentel Corporation	75	47	916-939-4005
Thomson Broadcast	9	11	800-882-1824
Ultimatte	71	57	818-993-8007
United States Broadcast	74	62	606-282-1802
Varitek	86	102	714-283-8980
Vega, A Mark IV Company	57	33	818-442-0782
Video Design Pro	38	24	800-VID-CAD6
Viz Technology	78	51	718-714-9873
Winsted Corporation	60	31	800-447-2257
3M Pro Audio/Video Products	25	16	612-733-1959

SALES OFFICES

NEW YORK, NY
Gordon & Associates
Josh Gordon
210 President Street
Brooklyn, NY 11231
Telephone: (718) 802-0488
FAX: (718) 522-4751

Joanne Melton
888 7th Avenue, 38th Floor
New York, NY 10106
Telephone: (212) 332-0628
FAX: (212) 332-0663

OXFORD, ENGLAND
Richard Woolley
Intertec Publishing Corporation
Unit 3, Farm Business Centre,
Clifton Road, Deddington,
Oxford OX15 4TP England
Telephone: +44 (0) 1869 338794
FAX: +44 (0) 1869 338040
Telex: 837-469 BES G

AGOURA HILLS, CA
Duane Hefner
5236 Colodny Ave., Suite 108
Agoura Hills, CA 91301
Telephone: (818) 707-6476
FAX: (818) 707-2313

SANTA MONICA, CA
MC² Magazine Communications Marketing Corporation
Jason Perlman
Telephone: (310) 458-9987
FAX: (310) 393-2381

CHICAGO, IL
Vytas Urbonas
55 East Jackson, Suite 1100
Chicago, IL 60604
Telephone: (312) 435-2361
FAX: (312) 922-1408

TOKYO, JAPAN
Orient Echo, Inc.
Mashy Yoshikawa
1101 Grand Maison
Shimomiyabi-Cho 2-18
Shinjuku-ku, Tokyo 162, Japan
Telephone: (3) 3235-5961
FAX: (3) 3235-5852
Telex: J-33376 MYORIENT

CLASSIFIED ADVERTISING
OVERLAND PARK, KS
Classified Ad Manager
P.O. Box 12901
Overland Park, KS 66282
(913) 967-1732 Fax: (913) 967-1735

LIST RENTAL SERVICES REPRESENTATIVE
Chris Coughlin
9800 Metcalf
Overland Park, KS 66212-2215
Phone: 913-967-1928
FAX: 913-967-1872

BROADCAST ENGINEERING®

EDITORIAL
Brad Dick, *Editor*
Skip Pizzi, *Technical Editor*
Steve Epstein, *Technical Editor*
Dawn Hightower, *Senior Associate Editor*
Deanna Rood, *Associate Editor*
Carrie Poland, *Editorial Assistant*
Tom Cook, *Senior Managing Editor*
Carl Bentz, *Directory Editor*

ART
Stephanie L. Masterson, *Associate Art Director*

BUSINESS
Raymond E. Maloney, *President*
Cameron Bishop, *Group Vice President*
Dennis Triola, *Publisher*
Tom Brick, *Marketing Director*
Stephanie Hanaway, *Group Director, Special Projects*
Kathryn Buckley, *Promotions Manager*
Sandra Tomczak, *Promotions Coordinator*
Dee Unger, *Director Advertising Services*
Nancy Hupp, *Advertising Production Manager*
Annette Hulsey, *Classified Advertising Coordinator*
Pat Eisenman, *Senior Ad Production Coordinator*
Susan Jones, *Advertising Coordinator*
Doug Coonrod, *Corporate Art Director*
Barbara Kummer, *Circulation Director*
Eunice Longanecker, *Circulation Manager*
Customer Service: 913-967-1711 or 800-441-0294

TECHNICAL CONSULTANTS
Jerry Whitaker, *Contributing Editor*
Richard Dean, *European Correspondent*
Eric Neil Angevine, *Broadcast Acoustics*
John H. Battison, *Antennas/Radiation*
Marjorie Costello, *Contributing Editor*
Dane E. Ericksen, P.E., *Systems Design*
John Kean, *Subcarrier Technology*
Donald L. Markley, *Transmission Facilities*
Harry C. Martin, *Legal*
Curtis Chan, *Audio/Video Technology*

MEMBER ORGANIZATIONS
Sustaining Members of:
- Acoustical Society of America
- Society of Broadcasr Engineers
- Society of Motion Picture and TV Engineers

Member, American Business Press ABP
Member, BPA International BPA

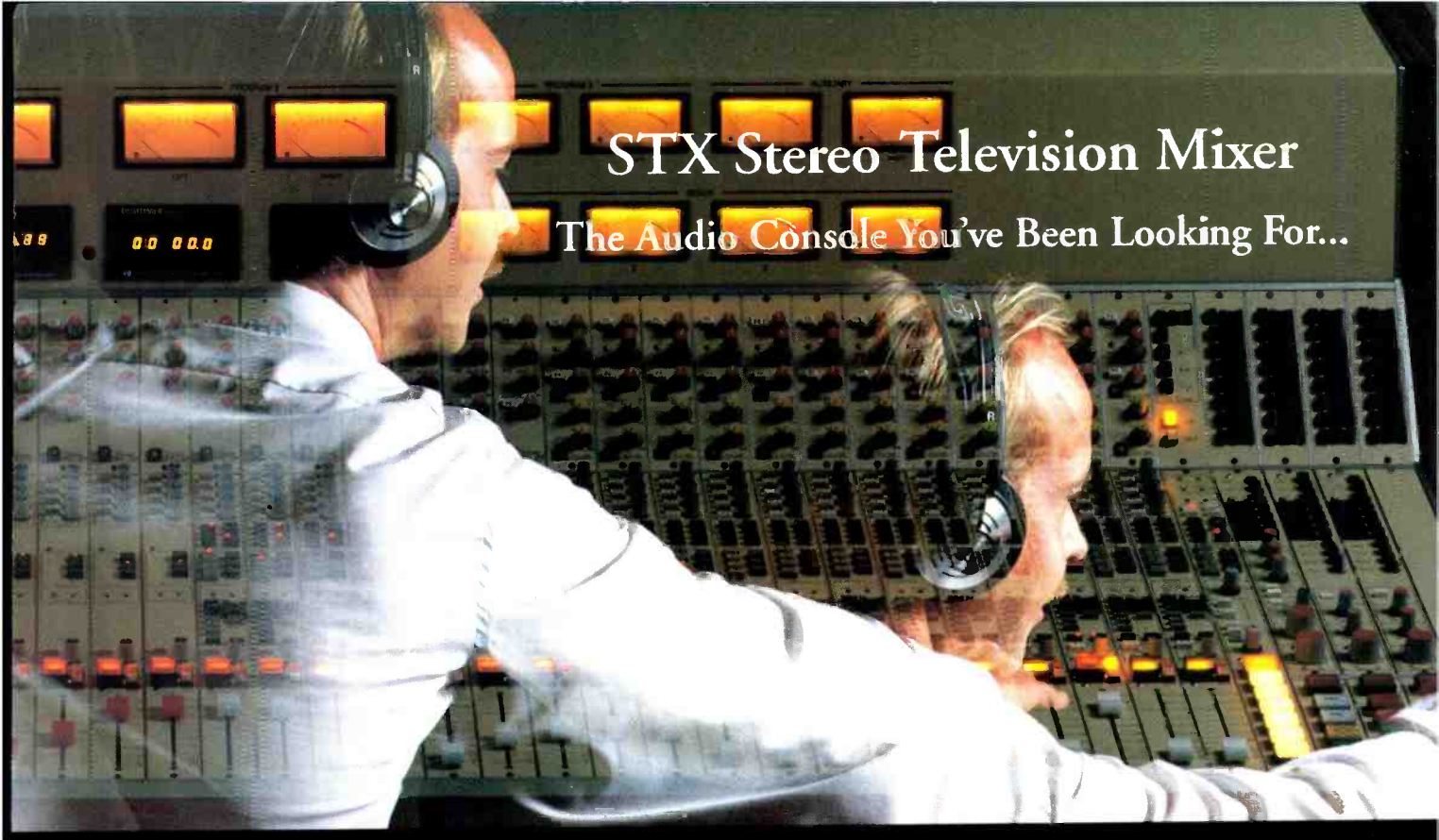
BROADCAST ENGINEERING is edited for corporate management, engineers/technicians and other management personnel at commercial and public TV stations, post-production and recording studios, broadcast networks, cable, telephone and satellite production centers and networks. Qualified persons include consulting engineers and dealer/distributors of broadcast equipment.

SUBSCRIPTIONS: Non-qualified persons may subscribe at the following rates: United States and Canada; one year, $50.00. Qualified and non-qualified persons in all other countries; one year, $60.00 (surface mail); $115.00 (air mail). Subscription information: P.O. Box 12937, Overland Park, KS 66282-2937.

Authorization to photocopy items for internal or personal use, or the internal or personal use of specific clients, is granted by Intertec Publishing, provided that the base fee of U.S. $2.00 per copy, plus U.S. $00.00 per page is paid directly to Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923. The fee code for users of the Transactional Reporting Service is ISSN0361-0942/1995 $2.00+00.00. For those organizations that have been granted a photocopy license by CCC, a separate system of payment has been arranged. Prior to photocopying items for classroom use, contact CCC at 508-750-8400. Organizations or individuals with large quantity photocopy or reprint requirements should contact Chris Lotesto, 312-435-2359. Microfilm copies of Broadcast Engineering magazine are available by calling or writing UMI, 300 North Zeeb Rd., P.O. Box 1346, Ann Arbor, MI 48106-1346. Phone: (313) 761-4700 or (800) 521-0600.

©1995 by Intertec Publishing
All rights reserved.

INTERTEC PUBLISHING



STX Stereo Television Mixer

The Audio Console You've Been Looking For...

Managing audio in television is never easy, and your audio mixing console should certainly not make it more difficult. But many consoles do just that by presenting operators with hard-to-use formats, confusing control layouts and unreliable operation. We would like to introduce you to the console that changes all that, the STX stereo television console.

STX has all the powerful features you need, but is designed for intuitive operation. With its fully logic-controlled inputs, flexible mix-minus system, expansive stereo distribution amplified outputs and processing options, the STX effortlessly handles the most complex programming. Equally important, your board operators will find the STX very easy to learn and use, which results in fewer embarrassing, sometimes expensive, on-air mistakes.

Of course, STX is built like all PR&E consoles and will easily demonstrate its reputation as the most reliable piece of high-performance hardware in your facility. Please call today for your full color brochure.

Easy to Use

Fast to Learn

Bullet-Proof Reliability

Pacific Recorders & Engineering
2070 Las Palmas Drive, Carlsbad, CA 92009
Tel: 619/438-3911 FAX: 619/438-9277
GSA GS-03F-4064B

DESIGNS THAT MAKE THE DIFFERENCE

Circle (2) on Reply Card

Introducing A Stillstore for $12,995.

A stillstore for an amazing $12,995? Not just a stillstore, but a Leitch StillFile™. Leitch, the market leader in still storage, introduces the StillFile PC™.

STILL FILE PC Utilizing new PC technology has enabled us to build an incredible stillstore at an incredible price: $12,995! This stillstore provides powerful features typical of the popular StillFile™ family: fast record and playback, compression, sophisticated database, powerful picture search functions, sequence lists and multi-picture browse and networking options. What's more, it has proven reliability, is upgradable and will integrate with the Database Workstation™ and other StillFile™ systems now and in the future.

Optional Control Panel.

Call Leitch now and take advantage of a great product at a great price: $12,995.

The StillFile PC™ is a powerful, low cost version of the popular StillFile™ stillstore. It has NTSC/D2 inputs and outputs, a full database, browse screen option, stores 3000 fields, networking capability and is upgradable.

OPEN MEDIA FRAMEWORK™

LEITCH®

GSA GS-03F-40488

Call 1-800-231-9673 and ask for more information on the new StillFile PC™ stillstore.

Leitch Incorporated, 920 Corporate Lane, Chesapeake, VA 23320 - Tel: (804) 548-2300 or (800) 231-9673 Fax: (804) 548-4088