BROADCAST® engineering

An INTERTEC Publication

December 1994/$5.00

THE SUPERHIGHWAY

- Planning for HD production
- Hi8/S-VHS production systems
- Ringing up new profits for radio

Also Featured:
Building for duopoly

The ICS-2002 Visual Display Control Station.

Your Station Needs This Station.

TV stations around the world choose the ICS-2002 when they want the most **powerful** intercom station available: its backlit supertwist display screen indentifies key functions and puts system-wide programming capabilities at your fingertips. Flexibility is just one of the reasons that the Matrix Plus II intercom system is the new **industry standard** for high-performance intercoms. With a wide variety of stations, interfaces and accesories, the Matrix Plus II makes all of your communications easy and trouble-free.

Prefer Push-Buttons? Choose the new ICS-2102 Master Station.

The Matrix Plus II connects instantly to all intercoms.

The system is **fully integrated**, with built-in IFB and a comprehensive modular interface system that neatly ties together cameras, two-way radios, telephones, and party-line intercoms. And it comes with the highest level of service and support in the industry.

From two to one-hundred stations, there is a Matrix Plus II system that will fit your needs and your budget. Want all the details? Call us at 510-527-6666.

Matrix Plus™ II
FROM CLEAR-COM INTERCOM SYSTEMS

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

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

Circle (1) on Reply Card

It's astonishing that a full-grown, 20 ft. boa constrictor can fit an 80 lb. calf in its stomach.

It's even more astonishing that the new RTS ADAM™ Intercom can easily hold several hundred people in its system.

Introducing the ADAM™ intercom system, the most advanced system ever designed to fit your needs. Physically, it's about 1/10 the size of current systems, so you'll never feel *constricted*. Whether you're adding on or just starting out, its expansion capabilities will leave you room to grow. Effective communication is possible whether you are interacting with fifty people or several hundred. And, because the price is linear-based, the ADAM™ intercom system easily fits into your budget. The ADAM™ intercom system is also backward compatible, fitting in perfectly with your existing RTS/Telex key panels. When you're ready to replace or upgrade your current intercom, get the ADAM™ intercom system. It's one system that's easy to, uh, *swallow*.

RTS Intercom Systems. Exactly what you'd expect from a sound company like Telex.

RTS TELEX

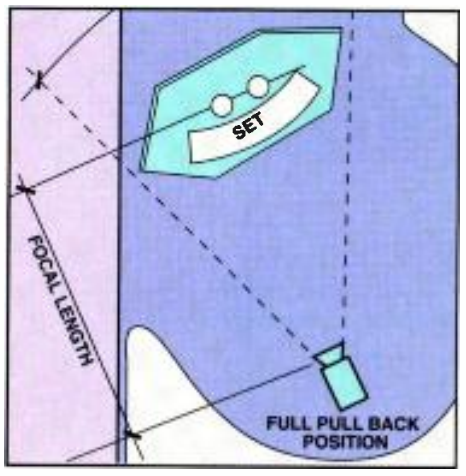
9600 Aldrich Avenue South • Minneapolis, Minnesota 55420 USA • 612-884-4051 Fax 612-884-0043

Circle (4) on Reply Card

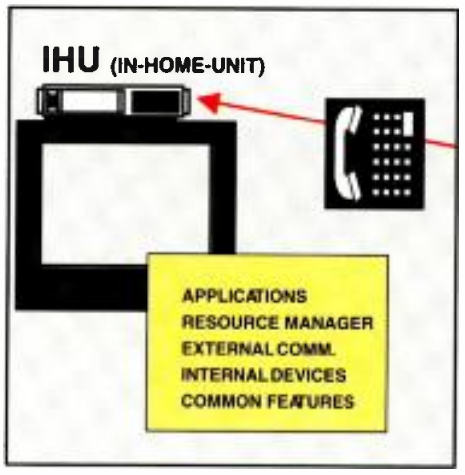
Contents

December 1994 • Volume 36 • Number 12

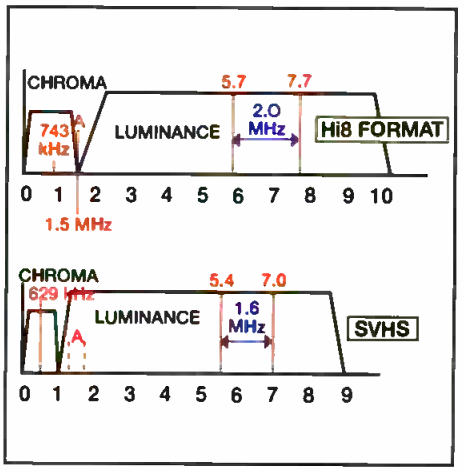
BROADCAST engineering®



Page 21



Page 36



Page 42

TECHNOLOGY FORECAST:

The coming changes in communications technology require that broadcasters and production facilities be attuned to the new opportunities and challenges that will develop. The successful survivors will be those that did their homework early, not waiting for others to lead the way.

DEPARTMENTS:

COLUMNS:

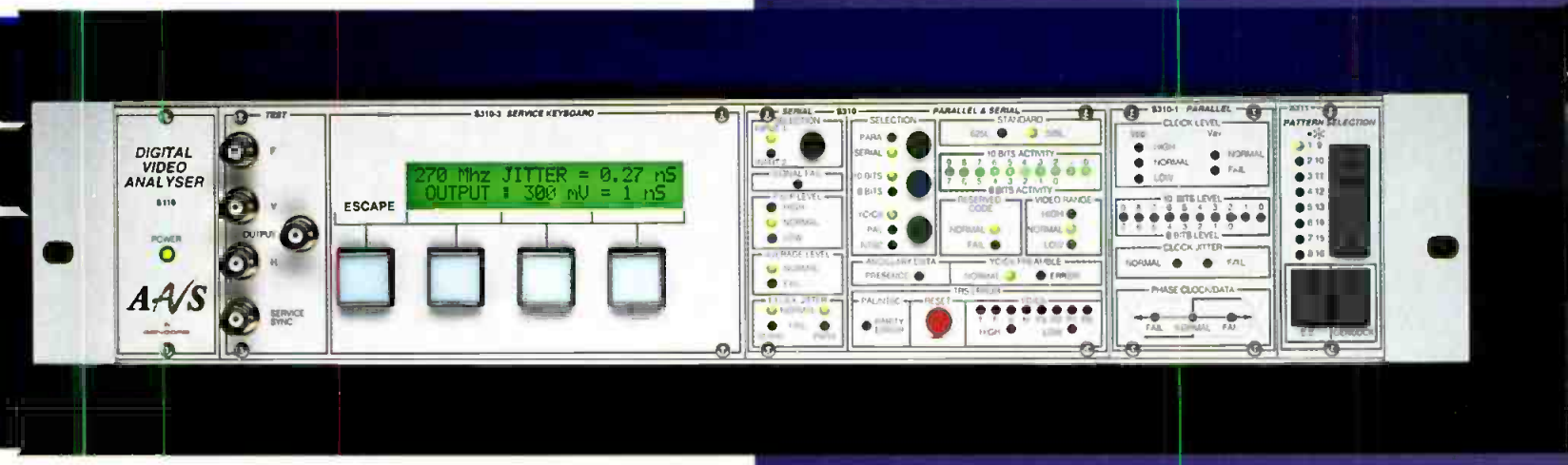
THIS MONTH...

ON THE COVER:

This month's cover conceptually illustrates the coming information highway. (Tailights photo by Andrew McKim/Masterfile Corporation.)

Digital Video Testing Just Got Easier . . .

The S310 Digital Video Analyser is the only patented, all-in-one analyzer designed to take the frustration out of digital video testing. The S310 performs real time, on-line tests of key signal parameters for both composite and component, serial or parallel digital video, without complex and time consuming interpretation.



With The S310 Digital Video Analyser

PATENTED

With over 18 different , easy-to-use tests and measurements, the S310 provides you with critical performance data such as:

- Serial jitter
- Parallel clock jitter
- Common mode voltage
- Clock to data skew
- Correct luminance & chrominance levels
- Individual luminance & chrominance sample analysis
- Signal levels
- DC offset
- TRS analysis
- Presence of reserve codes in active video
- Analog signal output
- And many more

In addition, the S310 is equipped with:

- User-selectable alarm thresholds that provide out-of-limit parameter warnings.
- Remote control software with an RS232C/ RS422 port for remote control monitoring and data logging.
- A comprehensive CCIR 601 component pattern generator with 34 test patterns, and exclusive error introduction.

Take the frustration out of your digital video testing by calling **1-800-769-AAVS** *to schedule a demonstration, reserve an evaluation unit, or to order a FREE video tape.*

Circle (5) on Reply Card

A-S By Sencore

The Name To Know In Digital Video Testing

Advanced Audio Visual Systems by Sencore
3200 Sencore Drive, Sioux Falls, SD 57107
TEL:1-800-769-2287 FAX:(605)335-637

News

By Dawn Hightower,
senior associate editor

FCC proposes unattended operation of stations

The commission is soliciting comments on a proposal to allow unattended operation of broadcast stations. According to the FCC, because of improvements in the stability, reliability and automatic control of transmission systems, it may be appropriate to waive the requirement for a licensed duty operator. Waiving this requirement would conserve FCC and station resources.

Currently, rules require each AM, FM or TV station to be operated by a transmitter duty operator holding a commercial radio operator license or permit. This person is responsible for the proper operation of the station's transmitter. The operator must be on duty at either the transmitter site, a remote-control point, or an automatic transmission system monitor and alarm point.

The availability of modern monitoring and control equipment may have made unnecessary the continuous attendance of the duty operator for many, if not all, stations. The FCC believes that broadcasters who automate their stations will exercise due diligence. The commission emphasized that the proposed rule changes will not diminish the responsibilities of licensees to monitor technical operations and to adjust and maintain their stations in compliance with the rules. The FCC will continue to hold the broadcast station licensee responsible for rule violations.

For those stations that choose to retain a duty operator, the commission proposes to waive the requirement that the operator hold a restricted permit. The commission also proposed updating and clarifying transmitter monitoring and control requirements in response to questions concerning their interpretation.

The monitoring and control of critical parameters must be performed by equipment that could take the station off the air or contact some person designated by the licensee in the event of a serious malfunction.

FCC replaces EBS system

By Darryl E. Parker, TFT Inc.

The FCC has adopted a new digital Emergency Alert System (EAS) to replace the 2-tone EBS. The EAS calls for a standard, non-proprietary protocol compatible with the National Weather Service NOAA Weather Radio digital transmissions. NOAA Weather Radio's WRSAME (Weather Radio Specific Area Message Encoding) is a standard for a digital header that precedes a voice announcement that can be carried on any audio medium.

The "intelligent" header is approximately one second long for a typical message. It contains a source identification, a description of the emergency, an indication of the severity of the emergency, a list of counties affected, and a date and time stamp. The header is followed by the 2-tone signal, the alert message, and then an end-of-message code. The EAS speeds up emergency alerting, and also provides features for unattended operation. Tests, as part of the new digital code, can be conducted unobtrusively and with greater reliability.

Broadcasters will be able to shorten the old 2-tone attention signal during a phase-in period. An implementation schedule has also been announced. (See table.)

	July 1, 1995	July 1, 1996	July 1, 1997	
Digital Encoding & Decoding	Optional	Optional	Mandatory	Mandatory
Present 2-Tone Encoding	22-25 sec.	8-25 sec.	8-25 sec.	8-25 sec. only for real alert or monthly test
Present 2-Tone Decoding	May be modified to respond to < 8-sec. tones	Must respond to 8-sec. tones	Not required	Not required

Cable operators will not have to comply until July 1, 1997. Details of the EAS will not be final until the FCC publishes a Report and Order on the dockets involved, which is expected later this month. (See "FCC Update," on p. 8 for more information.) ■

BROADCAST engineering

EDITORIAL
Brad Dick, *Editor*
Skip Pizzi, *Technical Editor*
Steve Epstein, *Technical Editor*
Dawn Hightower, *Senior Associate Editor*
Deanna Rood, *Associate Editor*
Tom Cook, *Senior Managing Editor*
Carl Bentz, *Directory Editor*

ART
Ruth Knotts, *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*
Susan Jones, *Advertising Coordinator*
Annette Hulsey, *Classified Advertising Coordinator*
Chris Coughlin, *List Rental Sales Representative*
Dough 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*
Eric Nell Angevine, *Broadcast Acoustics*
John H. Battison, *Antennas/Radiation*
Dennis Ciapura, *Radio Technology*
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 Broadcast 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 station management personnel at commercial and educational radio and TV stations, teleproduction studios, recording studios, CATV and CCTV facilities and government agencies. Qualified persons include consulting engineers and dealer/distributors of broadcast equipment.

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 in occupations described above. 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 66282-2937.

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.

CORRESPONDENCE
Editorial and Advertising: 9800 Metcalf, Overland Park, KS 66212-2215. Telephone: 913-341-1300; Editorial fax: 913-967-1905. Advertising fax: 913-967-1904.

INTERTEC PUBLISHING

J15ax8B IRS

IFplus

Internal Focus

IFPLUS: WE'VE TAKEN A GREAT TECHNOLOGY AND MADE IT BETTER.

IFplus: The Future Is Now.
Having pioneered IF technology, Canon takes another step forward with IFplus, the latest breakthrough in Internal Focus that provides important features and benefits that meet the requirements of new wide screen formats. Now for the first time ever, you can shoot as close as .65m with a wide angle of 8mm (57.6°) using Canon's J15ax8B IRS lens. Enjoy higher resolution, higher MTF, reduced chromatic abberation and improved optical performance.

With the shortest MOD and widest angle of any standard lens, Canon's J15ax8B IRS lets you shoot in tight or restricted areas at the closest minimum object distance ever possible and capture more of the subject as compared (right) to conventional lenses. (For illustrative purposes only).

Unsurpassed Optical Quality.
Consistent with Canon's reputation for outstanding lens quality, the IFplus utilizes a new and improved glass, which is stronger by design and able to provide extremely low dispersion, while correcting chromatic aberrations. Wide angle images, with substantially reduced distortion, is just one benefit of this technology.

Meets The Demands of 16:9.
You can depend on Canon's IFplus technology to meet the challenges of new formats that require increased screen line density (Outstanding performance is also achieved in 4:3). Offering the highest MTF required, the J15ax8B IRS will meet and exceed your expectations.

Canon's J15ax8B IRS features:

- The shortest MOD in a standard ENG lens: 0.65m
- The longest focal range: 8-120mm
- The widest standard lens, with a wide angle of 8 mm (57.6°).

It all adds up to a lens you can rely on to let you get up close to the subject. We'd like to tell you more. Please call us at **1-800-321-4388**. *(In Canada, call 905-795-2012)*

Canon

The Number One Lens

Circle (11) on Reply Card

Editorial

Greatest thing since Marconi's first spark

Guglielmo Marconi probably had no idea of the industry he would spawn as a result of his "wireless" communication experiments. In December 1901 he transmitted what is considered by most to be the first example of what we now call broadcasting. Since those days of spark-gap transmitters, wireless communication has evolved into a multibillion dollar industry. From the first radio broadcasts from KDKA in 1920 to the digital ATV tests scheduled to be completed in 1995, this industry has seen technological changes even a visionary like Marconi couldn't have imagined.

Now, as we move ever closer to the magic year 2000, I'm reminded of some of the important technological changes that have taken place since our humble beginnings. Analog has become digital. Tubes have become semiconductors. Boards full of resistors, capacitors and transistors have been miniaturized into tiny integrated circuits. Modern electronics bear little resemblance to their tube-based, analog ancestry.

Today digital is the word. Our systems are more reliable, complex and feature-filled than ever before. Engineers no longer concentrate on component-level maintenance, but on systems maintenance. No longer restrained to only the repair of equipment, today's engineers and technology managers have moved into the front office, becoming an integral part of the total station and production facility operation. As the technology changed, so too has the coverage of *Broadcast Engineering* magazine.

More than 35 years ago, *BE* magazine began providing engineers with the most accurate and authoritative coverage of broadcast and production technology available. We promised leadership coverage of this industry's technology and we've kept that promise. Over the years, when our readers needed solutions, they always knew they could turn to *BE* for answers.

BE magazine has always led the way in showing readers how to solve problems and understand rapidly changing new technology. Through all the technological changes, from B&W to color television, from monaural to stereo FM, from NTSC to HDTV, *BE* has led the industry in accurate and up-to-date coverage of broadcast and production technology. Whether it was a feature article on building transmitter or studio facilities, or practical, solution-oriented tutorials, *BE* has been the source for technical managers for more than 35 years.

Now, as we enter our 36th year of publication, the magazine takes another important step by providing readers with even more in-depth coverage of technology and solution-based editorial.

Beginning in January 1995, *Broadcast Engineering* will expand into two magazines. TV readers will continue to receive *BE*, while radio readers will receive the new publication, *BE Radio*. This new radio magazine will be published six times per year and will be almost twice as large as it was in supplement form last year.

The advantage of expanding the magazine into two separate issues is that it allows us to provide more specialized coverage of radio and TV topics for both types of readers. This change will result in more TV coverage and more radio coverage, something which will benefit both types of readers.

Although *BE* didn't invent radio or TV broadcasting, we did perfect the accurate, knowledgeable and authoritative type of editorial coverage the industry wanted and needed. Now, as the broadcast and production industries continue to evolve, rest assured that *Broadcast Engineering* and *BE Radio* magazines will continue to provide readers the unequaled type of editorial that made us a leader in the first place.

Brad Dick

Brad Dick, editor

What do you get when you combine a 500 lb. chunk of ice and a TV transmitter?

Great support from Harris.
For WHBQ-TV, it was a nightmare come true. But Harris responded quickly and decisively. Three days after a quarter-ton chunk of ice destroyed their transmitter building, the station was back on the air.

"The Harris people were absolutely super to work with. Technical ability and crisis help were determining factors."

Tim Lynch
General Manager
WHBQ-TV, Memphis

In one week, they reached quarter power. But the spring ratings book loomed on the horizon, making a permanent solution even more urgent.

Harris responded again. In about six weeks, WHBQ-TV was at full power with a new 45 kW Harris transmitter.

Extraordinary circumstances? Perhaps. Extraordinary product support and service? Not at Harris. We make that extra effort every day. It's all part of our commitment to solving the problems facing broadcasters with the best technology, the best performance and the best customer support.

Of course, you don't need an emergency to take advantage of Harris technology and support. Call us today. We'll be there when you need us – now and in the future.

U.S. and Canada: 217-222-8200
or fax 217-224-1439

International: 217-222-8290
or fax 217-224-2764

HARRIS ALLIED

Circle (12) on Reply Card

FCC Update

FCC replaces current EBS system

By Harry C. Martin and Andrew S. Kersting

The FCC has replaced the current Emergency Broadcast System with a new Emergency Alert System (EAS). This system will allow stations to alert the public more quickly, reliably and efficiently. It will also be cheaper for broadcasters.

The digital system will include multiple source monitoring for emergency alerts, a shortened (minimum eight-second) alerting tone and automated and remote-control operations. A monthly on-air test will still be required in addition to weekly EAS tests, which will be inaudible and unobtrusive to viewers and listeners. The EAS has the ability to issue alerts in foreign languages and has provisions for the hearing and visually impaired.

Broadcasters will be required to modify their existing EBS decoders to handle the shortened 2-tone alerting signal by July 1, 1995. Transmission of the 2-tone signal for durations of between eight and 25 seconds will be allowed beginning on the same date.

Broadcasters also will be required to replace EBS equipment with EAS equipment by July 1, 1996. Beginning July 1, 1997, the 2-tone signal may be transmitted only as part of a monthly EAS test or in an actual emergency.

Class D FM stations and LPTV stations must modify their decoders by July 1, 1995, but they are not required to have decoders.

Cable operators will be required to participate in the EAS but are not required to install EAS equipment until July 1, 1997. Cable systems with 10,000 or fewer subscribers must provide an interrupt and audio message on all channels and a video message on at least one channel. Those systems with more than 10,000 subscribers must provide the audio and video message on all channels.

In order to encourage rapid manufacture and deployment of the new EAS equipment, broadcasters and cable systems may purchase and install the new EAS equipment in advance of the deadlines. The FCC will permit early replacement of current technical and operating procedures on a state or local area basis, provided certain criteria are met. At that time, new procedures, such as weekly unobtrusive tests, the use of a shortened 2-tone signal, and removal of EBS equipment may occur. (See "News" on p. 4 for more information.)

Martin and Kersting are attorneys with Reddy, Begley, Martin & McCormick, Washington, DC.

New international bureau

The FCC has established an International Bureau to handle all FCC international telecommunications and satellite programs and policies. The bureau will consist of three divisions: Telecommunications Division, Satellite and Radio Communications Division, and Planning and Negotiations Division.

The Planning and Negotiations Division, consists of a Negotiations Branch and Notifications Branch. It will represent the commission in negotiations with Mexico, Canada and other countries on international agreements that provide arrangements and procedures for the coordination of radio-frequency assignments. This is to prevent and resolve international radio interference involving U.S. licensees. In addition, the division will notify all new and changed U.S. radio stations to appropriate administrations. It also must respond to foreign notifications as required by the International Radio Regulations and bilateral agreements. The division will ensure that commission regulations, procedures and frequency assignments comply with international bilateral agreements. It also will process high-frequency (HF) international broadcast applications and applications to deliver broadcast programs to foreign stations.

Going off the air

Commercial broadcast stations may limit or discontinue operation for a period of up to 30 days without FCC authority. They must, however, notify the FCC no later than the tenth day of limited or discontinued operation. The stations must also continue to adhere to the requirements of the station's license concerning the lighting of antenna structures. If operation is restored prior to the expiration of the 30-day period, the station must notify the FCC of the date upon which it resumed normal operations.

When it is impossible to resume normal operations within 30 days, the station must submit a letter to the FCC requesting special temporary authority (STA) to remain silent no later than the 30th day of the station being silent. The request must include the date the station ceased broadcasting; a detailed explanation of the reasons why; the efforts being made to return the station to the air; and the date normal broadcast operations are anticipated to resume. An STA request also must include a certification stating that the licensee and any party thereto is not subject to a denial of federal benefits under Section 5301 of the Anti-Drug Abuse Act of 1988. There is no filing fee for a request to remain silent.

Temporary authority to remain silent generally is granted for no more than 90 days. If a station cannot resume operations during this period, the station must request an extension of its silence authority, prior to the expiration of the 90 days, and include reasons for the delay.

Stations must notify the commission by letter immediately upon resuming normal broadcast operations and provide the date upon which operations resumed. Any AM station that is silent for six months or more must, prior to returning the station to the air, file an FCC Form 302 for direct measurement of power. This should include a partial proof-of-performance for stations with directional antennas. No filing fee is required.

In the event broadcast operations are permanently discontinued, a station must notify the FCC at least two days before operation is discontinued. Immediately after going off the air, the station must forward its license and other instruments of authorization to the FCC in Washington for cancellation. ■

Dateline

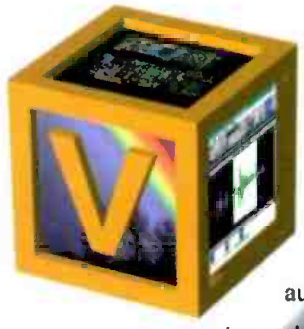
Feb. 1, 1995, is the due date for annual ownership reports for commercial broadcast stations in Arkansas, Kansas, Louisiana, Mississippi, Nebraska, New Jersey, New York and Oklahoma.

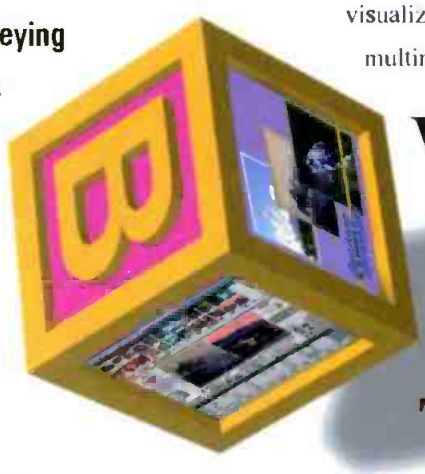
Now Available to Developers and OEMs

Digital Video Building Blocks

Choose the pieces you need to build your application.

- Broadcast-quality Digital Video
- CD-quality Digital Audio
- Realtime, 60 Field Motion-JPEG
- Industry-standard DV MCI Software Toolkit
- GUI Accelerator with Live Video
- 32-bit Videographics
- DVE, Switching, Mixing, Keying
- Nonlinear Random Access
- Machine Control
- TI MVP Array Processor





Digital Video Building Blocks deliver the superior performance required in demanding applications like: nonlinear editing, multimedia authoring, automated broadcast spot insertion, video-on-demand servers, instant access nonlinear VTRs, scientific visualization and simulation, medical image enhancement, professional multimedia kiosks, and video teleconferencing.

We know the Digital Video Building Blocks work. We've used them to create two blockbuster products of our own — Matrox Studio, the only desktop video editing system with nonlinear productivity and linear production power combined and Matrox Animation Xpress (MAX), a professional realtime digital animation recorder.

Tap into our expertise. Some of your competitors are probably using these tools. You owe it to yourself to check out our PROVEN state-of-the-art-hardware and the best software development tools in the business.

To speed your product to market, Matrox Digital Building Blocks are backed by the outstanding technical support team that has made Matrox a leading supplier of graphics, video and imaging solutions to OEMs the world over.

For more information call 1-800-361-4903 or (514) 685-2630

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

matrox
VIDEO PRODUCTS GROUP

Circle (13) on Reply Card

Strictly TV

SGI and CBS

By Curtis Chan

Last month, as part of its election coverage, CBS used SGI computers to superimpose live video onto the sides of a real-time, rendered animated and rotating multifaceted 3-D star.

CBS decided that it wanted a new look for the election coverage, including real-time superimposition of live video over animated graphics. After checking with about a dozen New York facilities to see what was possible, CBS contacted SGI. SGI believed that the project could be done with an Onyx Reality Engine². According to SGI's Breakthrough Marketing manager, Chuck Molyneaux, two strategic opportunities had to be met. One, was that the company wanted to be able to portray up-to-the-second election information superimposed onto any 3-D side of the animated star in real time... faster than the anchor could talk about it. Second, the graphics needed to be fast, crisp and clear; in fact, clarity had to be the number one issue for the viewers.

A single still of the 3-D rotating star used by CBS for '94 election coverage (Photo courtesy CBS).

After developing the concept and system implementation plan, Post Perfect in New York was contracted to develop the preliminary design work for the star. The company developed a Wavefront model for the look of the star model and its side panels where live video would later be superimposed. Molyneaux noted that the software methodologies were quite similar to flight simulation modeling, so he developed an on-air software model to take the frame-by-frame rendering of animation and produce a real-time version of it.

The heart of the system was an SGI Onyx configured with four processors, 128MB of RAM, a Reality Engine² and a Sirius Video option with an on-air software package. During the election coverage, Media Computing Inc. of Phoenix, AZ, took election results and developed a database of information in a bank of PCs. The PCs performed up-front processing and built screen images in a Chyron iNFiNiT! character generator based on information in the database. Screen pages were then sent to the Onyx through the Sirius Video interface where the images were extracted. The screen images were mapped onto the sides of the rotating star, based on controller commands. The Onyx processed and superimposed the live video onto the animation, and then outputted the 30fps signal in real time.

One thing this has shown is that computer technology has matured to a point where it's visually acceptable to perform real-time rendering for high data-rate applications. Today's advanced graphics computing environments have insatiable appetites for processing power and graphics performance. In the past, the highest graphics performance has been attainable only with special-purpose, proprietary computing platforms. The SGI Onyx is typical of the new breed of open-systems-based multiprocessor computers, which act more like a supercomputer but at a fraction of the cost. Such scalable platforms provide users with a unique combination of CPU computing power, advanced graphics, throughput (I/O), and real-time video performance.

For the CBS project, a four MIPS R4400 64-bit RISC microprocessor-based system was used. The Onyx supports from two to 24 R4400 microprocessors (up to six CPU slots of two or four CPUs/board) all operating together to provide balanced integer and floating-point multiprocessing performance. The standard I/O panel on the Onyx also is indicative of the new breed of computers aimed at high-end multimedia. The panel contains a host of I/O connections including: 1) swap-ready connections to synchronize multiple units for frame rendering (visual simulation); 2) composite video output and alpha channel for blending multiple graphic streams; 3) gen-lock capability; 4) RS-422, RS-232, parallel and Ethernet ports.

The Reality Engine² used is a scalable subsystem that delivers 1.2GFLOPS of processing power or equivalent to 1.6 million triangles per second. It supports up to four Raster Manager boards to provide pixel fill capabilities at up to 320 million pixels second. In addition, the Reality Engine² also has a built-in encoder that provides NTSC, PAL and S-Video outputs for direct recording; a programmable pixel clock to drive a wide array of resolutions including 640x480, 1,920x1,035 and 1,600x1,200 and a display generator that takes rendered frames and outputs them as analog video, or as a digital signal to the Sirius Video interface.

As the speed and processing power of today's computer systems increases, they will find uses in even more broadcast applications. Election coverage has always been a showcase for the latest technology, expect to see even more in 1995. ■

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

The author would like to thank Chuck Molyneaux, Breakthrough Marketing manager/SGI and Mark Harris, director of News Systems Engineering/CBS, for their help with this article.

MAXELL ON THE MARCH

maxell digital

the intelligent ones.

Maxell Is On The March with the exacting digital performance of our D-2 and D-3 videocassettes. Using advanced magnetic tape technology, featuring Ceramic Armor Metal particles, Maxell has produced the perfect production tapes for every recording application from ENG/EFP to broadcasting. Both D-2 and D-3 feature unmatched error rate and consistant quality, even under the severe operating conditions. Add an incredibly strong binder system for increased durability and lower error rates, and you'll be using the superior digital videotapes that keep *Maxell On The March* creating innovative tape technology for demanding professionals.

In Your Hands, Our Science Turns To Art

maxell

Circle (14) on Reply Card

Maxell of America 22-08 Route 208, Fair Lawn, NJ 07410 Phone 1 - 800 - 533 - 2836

Part 1

Management

Managing your own career

Positioning yourself for a raise

By Rick Morris

Managing engineers spend their time seeing that the station is running smoothly and reliably, making sure that remotes are successful, keeping up with technology, serving on community engineering committees and planning for the future of their station. Yet, they forget to plan for the future of their own careers. This series opens with a discussion on taking control of your career future, beginning with the most immediate concern — getting a raise.

Employee reviews

Many stations have an employee review system in which the employee's supervisor conducts a formal review. Other stations have informal review processes in which raises are given once a year and are based on a concept of performance in the boss's mind. As a chief engineer, your supervisor is probably the general manager (GM) — who most likely has a different background than you and performs different jobs. It is your responsibility to keep your boss informed of how well you are doing your job.

Although engineers are generally modest about their accomplishments, it is important to be self-confident and proud. Engineers must develop a method to communicate the quality and significance of their work.

Furthermore, a smooth-running station is the sign of a good engineer. Unfortunately, no one will recognize this success unless you make it a standard operating practice to keep the GM properly informed.

Performance first

The first key to getting a raise is to deliver on the goals you and your boss set. Also, performance is paramount. Are you under budget? What is the turnaround repair time of a piece of equipment? What is the transmitter reliability? How motivated and productive is your staff? How innovative and bold are you?

Mere competence is not enough. Judgment and adaptability are characteristics that will make you stand out as more than just the average engineer.

Morris is an assistant professor of radio/TV/film at Northwestern University. He is a former chief engineer and a former manager of engineering and maintenance for a major TV network.

Sharing accomplishments

Your written communications should be done on a regular basis. Many stations require a weekly report, which is a good way to document the success of your department. Your report should include the challenges, successes, opportunities and cost savings that you and your department have accomplished. If there are difficulties, discuss them honestly in your report. Once they are resolved, record the steps that were taken to achieve an acceptable result, as well as the knowledge or experience gained.

The first key to getting a raise is to deliver on the goals you and your boss set.

State goals that are meaningful to your boss

When compiling your report, keep in mind that you are writing it for your boss. He may not care that you have an astounding 85db noise floor on your audio. However, he will care and understand that your signal is near-CD quality throughout and cleaner than the competition. Having a quality product, a competitive position and consumer satisfaction are the issues that concern the station manager. Therefore, consider your writing carefully. Don't use technical jargon that the boss won't understand. Write in layman's terms, so others who aren't engineers can read and understand your reports.

Consider also what is important to your GM and how your job helps him. At a commercial station, the GM's main concern is the profits. Almost everything engineering does affects profits. Therefore, whenever it is possible and appropriate, discuss how your work affects the bottom line. Did your troubleshooting and maintenance save money? Did you install new equipment that permits salespeople to approach new clients? Did you reduce overtime? Did you successfully negotiate a substantial discount on a purchase? Did your actions help increase ratings? If so, explain how.

Reminders during the raise review process

Even with regular communications, your boss can forget what important accomplishments and contributions you have made to the station. So you must find a way to remind him. Let your boss know how your department made improvements in the station's look, which increased viewers. Document how downtime was reduced and how maintenance kept equipment costs down. State how valuable you feel these changes are to the station. Your boss may not have appreciated the importance of your actions, or the value of what you did may not have had an immediate impact. So you may need to remind your boss of things that happened months ago.

Some companies have their employees fill out a self-evaluation before their supervisor evaluates them (and sets their raise). This practice permits employee input before it is too late to remember valuable contributions and reward them. If your company does not have a self-evaluation, you may consider an annual memorandum of the accomplishments of your department and the status of ongoing projects.

Assemble comparative data

Be ready with comparative data. You may not need to use it, but you should know what other chief engineers are making in your market — at similar stations or in similar cities. Use this to justify a larger increase if you are not at least competitive. Also keep information on other competitive aspects of engineering. What is the typical engineering budget at similar stations? Are you more efficient?

Be confident

Have confidence in your work. You may get that raise you are looking for. If not, continue to build your record and keep up the quality of your work. If you repeatedly are underappreciated at raise time, you could use the documentation of how much you helped the station to prepare your resume. ■

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 (6) on Reply Card

IFB systems

By Larry Wilkins

If it's coming in good, cut the music. Old-timers may remember the way remotes used to be checked out. Today, stations use 2-ways, SCAs and dial-up cue circuits to return interrupted foldback (IFB) signals. IFB has been used by TV stations for some time and now radio stations are discovering how convenient it is.

IFB systems feed program audio to the talent at a remote site that can be interrupted with audio cues from the studio announcer. It doesn't matter how good the program video or audio is, if you can't communicate with the talent, the show suffers. Although many engineers use and are familiar with IFB circuits, a review might be helpful for those that are not.

Studio setup

Currently at Colonial Broadcasting, we average 30 to 35 remotes a month on our two AM and two FM stations. Often, three of the stations are doing remotes simultaneously.

Our first IFB system was homemade. A 4-channel system was installed when we moved to a new studio. Channel one feeds the 67kHz SCA (see Figure 1), Channel 2 feeds the 92kHz SCA, Channel 3 and 4 feed auto-answer telco units and ISDN codecs for use on out-of-town remotes. Each channel can be fed with different return audio from an assignment switcher, which allows selection of any number of inputs from different control rooms. The ability to switch different audio to the IFB channels, either by routing switchers or patchbays, increases flexibility. Remote switchers are located in all of the control rooms and the engineering racks, which allows easy access to any of the four channels.

In each control room, a feed from the announcer mic runs through a small pre-amp and is fed into the remote IFB control unit. This allows the mic level to be adjusted to match the level of program audio that is being fed to on-site talent.

The term "mix-minus" has made its way from TV stations to radio stations. Mix-minus means feeding the talent everything but their own audio. At the site, the talent's audio is mixed into the IFB audio.

The use of an IFB system makes remote broadcasts run easier and smoother. Also, having a flexible system in place simplifies last-minute setups.

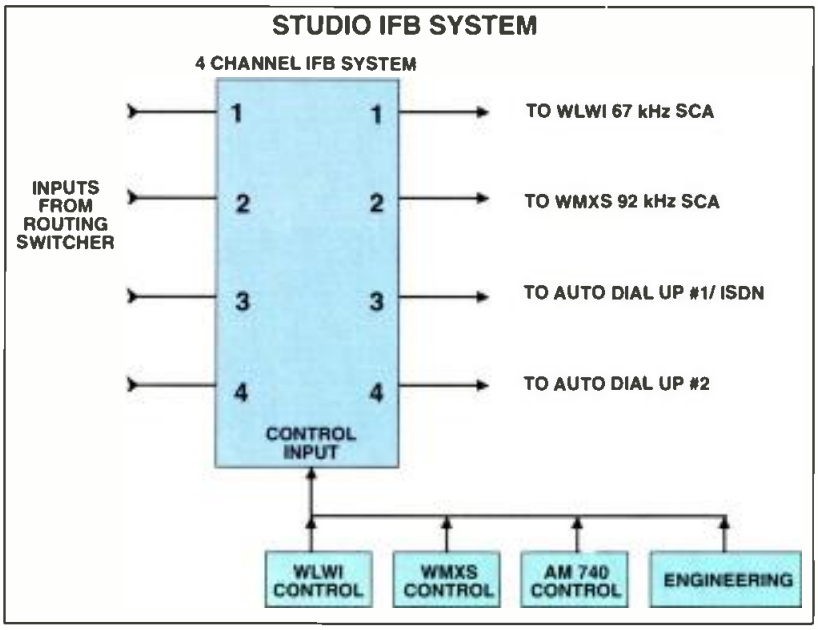


Figure 1. *Studio setup of the IFB system, including outputs from the routing switcher and control inputs.*

The delay inherent in satellite and ISDN back-hauls can confuse the talent when they hear themselves.

Remote setup

In our remote truck, a Vega IFB transmitter is fed from a selector switcher, which allows normal studio IFB, on-site IFB or remote pick-up (RPU) transmitter audio to be fed to the talent. The talent wears a beltpack receiver, which, along with a wireless microphone, allows for roaming around the remote site. The monitor feed from the RPU transmitter is useful when setting up a remote by yourself. You can hear the wireless mic on the IFB receiver to check for dead spots.

On sports call-in remotes, there is a need for multiple mics and headphones. To keep the system wireless to and from the truck, a mixer feeds a beltpack wireless mic transmitter, and the IFB receiver is fed to a headphone amp. As a result, the board operator can talk directly with the talent.

As a backup to the SCA feed, a VHF transmitter can be switched on via remote control should the SCA fail. A cellular phone equipped with a line jack interface, also serves as a backup on long-distance remotes.

Frequency coordination

While planning for a remote truck, check with the local SBE frequency coordinator. Because wireless mics and IFB transmitters are not normally licensed, it is easy to run into problems. Coordinators generally include wireless frequencies as part of the main database.

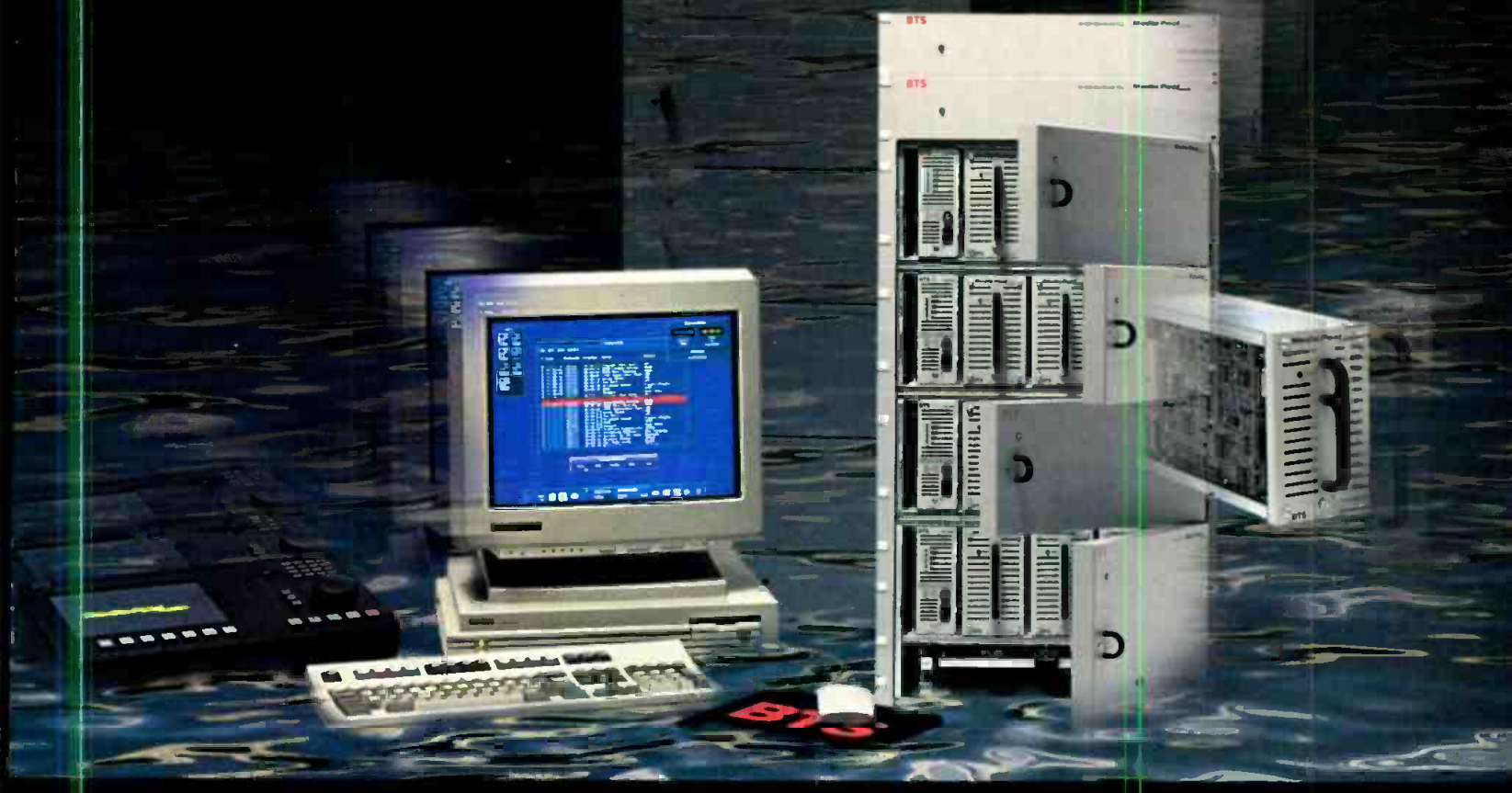
For remotes out of the local area, call ahead and check on the frequencies in use. We handle the production for the Auburn Network broadcast of football and basketball games. On a recent road trip, there was a bass guitar coming in on the sideline wireless frequency. Across the street from the stadium, a fraternity was having a pre-game party, and the band's bass player had a wireless mic on the same frequency we were using. Luckily, the party ended before kickoff.

Once a flexible IFB system is installed, last-minute remotes and programs can be accomplished without worrying about return audio and cues. ■

Wilkins is chief engineer at Colonial Broadcasting, Montgomery, AL, and newsletter editor of SBE Chapter 118.

➡ *For information on manufacturers of wireless microphones, intercom systems and subcarrier systems, see pages 54-55 and 67-68 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

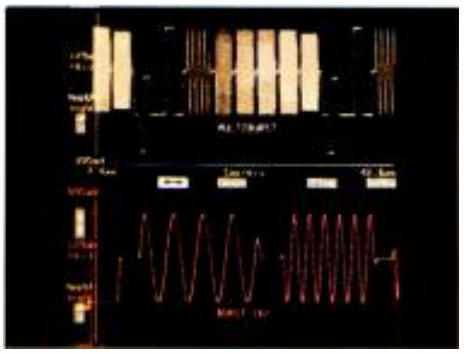
Circle (7) on Reply Card

Part 2

Troubleshooting

Component analog video

So little agreement



By Steve Epstein, technical editor

Last month we looked at the various forms of component analog video (CAV). This month we will examine the color-difference standards. As mentioned last month, differences exist between the GBR standards, and the same type of differences exist in the color-difference component standards.

In the SMPTE/EBU N10 standard, each wire carries a 700mV signal; there is no black setup and sync tip is -300mV. Sync is carried only on channel 1, the Y (luminance) channel. Channel 2 carries the blue difference signal (P_B) and channel 3 carries the red difference signal (P_R). The P_B and P_R signals are distributed as ±350mV peak to peak. Many times when displayed on a scope, both are offset by +350mV so that the signals all occupy the same range on the waveform display.

Acknowledgment: The information presented in this column is based on the Tektronix booklet "Solving the Component Puzzle" Copyright 1990, Tektronix Inc. Used with permission.

Betacam and MII

The signals used for Betacam include a luminance channel with 714mV peak white, 54mV setup and a -286mV sync tip. The color-difference signals are distributed at 933mV, 4/3 the 700mV range of the SMPTE/EBU N10 signal. Sometimes, Betacam equipment is calibrated using 75% signals, rather than those mentioned above. In these cases, the 714mV peak white is reduced to 549mV and setup level remains 54mV. The color-difference signals are reduced from 933mV to 700mV peak-to-peak.

For MII, the three signals used comply with the SMPTE/EBU specs in regions of the world using 50Hz standards, however, in the 60Hz regions, a different set of specs is used. On the luminance side, if setup is part of the signal it is recorded at 53mV. Peak white is limited to 700mV. If setup is part of the signal, the luminance range is reduced to 647mV (700mV-53mV). When this happens, the color-difference signals are scaled to match. One other quirk in the system is the use of 75% color-difference signals combined with a 100% white peak on the MII alignment tapes. All of these values are summarized in Table 1.

		SMPTE/EBU N10	BETACAM	MII
100% COLOR BARS	**LUMINANCE**			
	100%	700mV	714mV	700mV
	MAX	700mV	714mV	700mV
	MIN	0mV	54mV	53mV
	RANGE	700mV	660mV	648mV
	CHROMINANCE			
	MAX	350mV	467mV	324mV
	MIN	-350mV	-467mV	-324mV
	RANGE	700mV	934mV	648mV
	SYNC	-300mV	-286mV	-300mV
	P-P	1V	1V	1V
75% COLOR BARS	**LUMINANCE**			
	100%	700mV	714mV	700mV
	MAX	525mV	549mV	539mV*
	MIN	0mV	54mV	53mV
	RANGE	525mV	495mV	486mV
	CHROMINANCE			
	MAX	262.5mV	350mV	243mV
	MIN	-262.5mV	-350mV	-243mV
	RANGE	525mV	700mV	486mV
	SYNC	-300mV	-286mV	-300mV
	P-P	1V	1V	1V

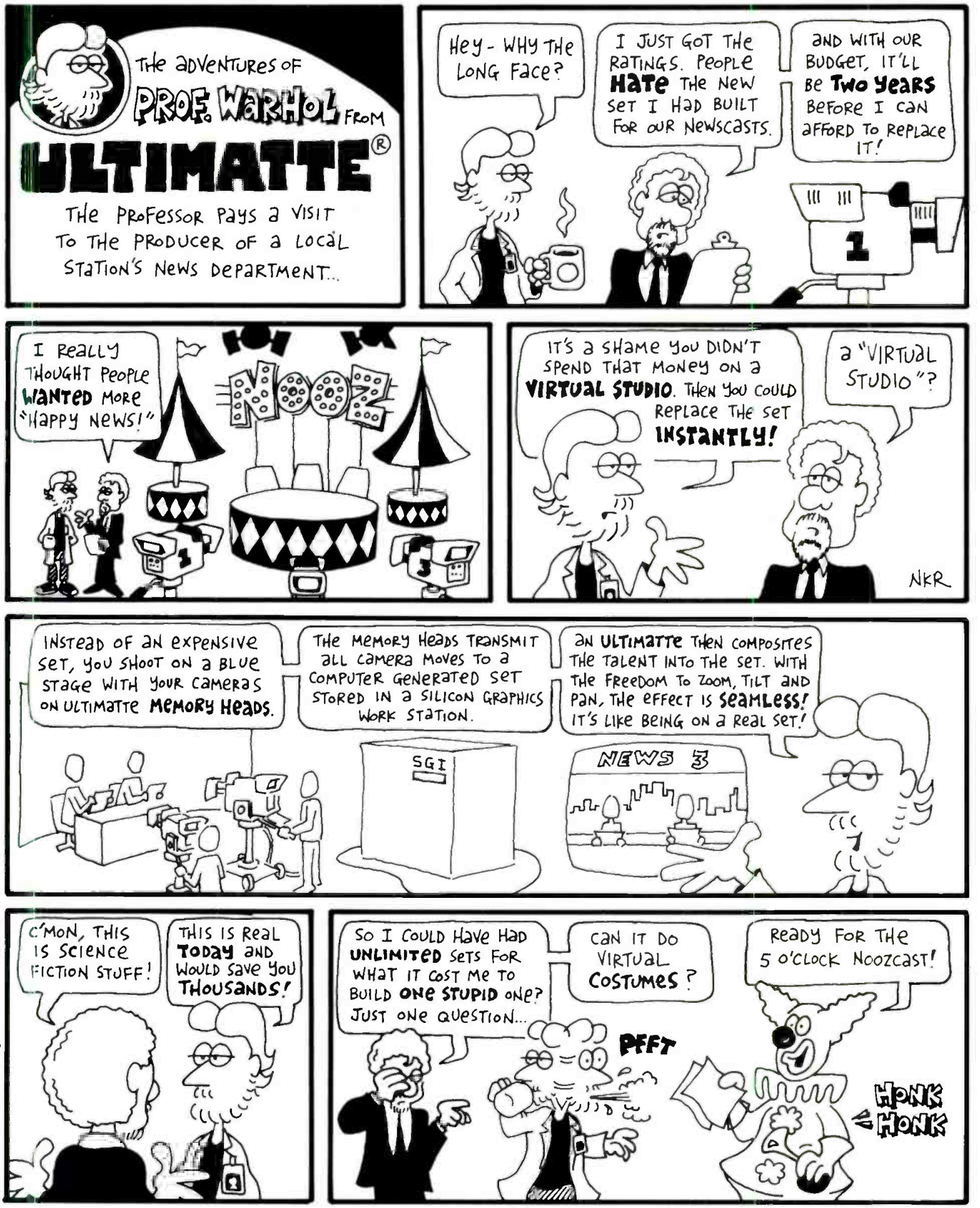
*Table 1. Color-bar specifications for the various component analog video color-difference standards. (*75% color bars include a 100% (700mV) white level.)*

Interconnection

Interconnecting these different standards can be a problem. In many cases, the machines have been directly interconnected without any knowledge of, or provision for, the different signal levels involved. One of the reasons for writing this column was some recent Betacam to MII dubs that came from a West Coast dub house. The machines were directly connected (probably through a router) and the chroma on the MII tapes was oversaturated.

To correctly interconnect these various formats, first identify which of these exist in your facility. One of the best ways to handle the signal differences is to set a standard for the facility and use DAs to adjust any equipment that does not comply to the house standard. Unfortunately, this method also is expensive. The cost of 3-channel CAV DAs can be $500 and two are required for each non-complying tape machine. Another method is to make operators aware of the differences and have them adjust front-panel controls accordingly. Time is money, and the long-term costs of this method can be substantial. It's possible to construct a few small amplifier circuits to accomplish the conversion process, but make sure they solve more problems than they create. One final possibility, depending on the equipment involved, would be to modify or adjust the input and output circuits. You could consult the manufacturer for help on this item, but don't expect too much.

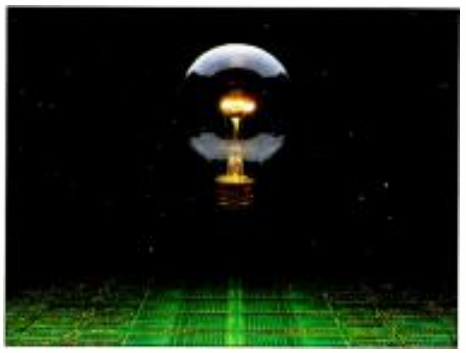
A proposal does exist for standardizing the distribution of CAV, however, the document (SMPTE No. 253) is still behind closed doors. Attempts to obtain a copy were turned down by SMPTE because some major industry players have yet to sign off on it. Until agreement is reached, everyone involved with CAV distribution and interface will have to deal with the differences whenever these different standards are encountered. ■



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

Technology News

Real-time data backup and retrieval



By Curtis Chan

One of the biggest bottlenecks in the computer graphics industry is backup and retrieval of data. Products addressing the problem will be released by at least two manufacturers during the first quarter of 1995. Viewgraphics' Dataview serial digital adapter and Miranda's Espresso (SCSI to digital video interface) are sure to bring new life to current D-1 recorders. In addition, they may help improve a facility's bottom line by reducing the time required to backup large image and data files. Both products will essentially turn a D-1 recorder into a pseudo real-time data recorder. This allows not only a tremendous increase in production throughput, but also a fundamental shift in the production process. This makes tape access almost as fast as on-line computer disk devices, which may eliminate the need for massive disk subsystems. Production flow and creative freedom may also be improved, because users will have a high-speed media exchange solution and quick access to large tape archives.

Although faster processors can accelerate the compute speed, they can do little about slow I/O performance.

The magnitude of the problem

For non-graphics-related computer processing, most applications involve compute-bound problems, few have I/O-bound problems. Even for demanding supercomputer problems, I/O files may be on the order of a GB, and the results require days of processing. However, in the video and film industry, the opposite is true. Ten seconds of RGB RS-170A resolution video is more than 250MB and 10 seconds of film-resolution data can be more than 10GB. For most applications, relatively little computer processing is done when compared to the bottleneck of getting the material on and off the host computer.

Although faster processors can accelerate the compute speed, they can do little about slow I/O performance. In the case of using one of the two digital interfaces and a D-1 recorder, film can be scanned directly onto tape at 18MB/s to 20MB/s. An additional benefit is that disk subsystems no longer need to be sized to hold an entire day or even weeks worth of work. In fact, it's not even necessary to load entire clips since a few seconds at a time can be easily loaded, processed and recorded back to tape, reducing system costs with no adverse effect on performance.

The solutions

The soon-to-be-released Dataview SDA-20/21 serial digital adapters will address the issues of computer data backup/archival, high-resolution image archival and real-time D-1 video I/O. The 9U device incorporates a VME host interface on the front-end, a sophisticated memory and controller system, an ECC codec, serial digital I/O, timing and gen-lock circuits, and an RS-422 controller. Users get an interface product that allows existing D-1 recorders to double as true data peripherals, connecting directly to high-end computer graphics computers (SGI Onyx or Challenge) for real-time image retrievals and transfers.

The secondary ECC circuitry plus read-after-write ensures high data integrity during backup and restore operations at up to 20MB/s. The D-1 machine provides 100GB of removable storage at a fraction of the time and cost of previous methods (assuming you already own a D-1 machine). The SDA-20 is designed for digital video transfer operations, while the SDA-21 provides two modes: 1) selective backup and restoration of computer data files and 2) input and output of component digital video in real time. Buffer memory configurations provide various data flow control capabilities and up to 20 seconds of video storage on the board.

Miranda's Espresso provides a high-quality bridge between serial digital video and a computer system, using fast and wide SCSI channels. Images are transferred at speeds up to real time in either direction, and the SCSI interface uses from one to four independent channels. The unit is divided into three major blocks: a video processing card, a SCSI interface card and buffer memory. The video card has two serial digital video inputs and outputs and a reference analog video input. Outputs can be configured as two independent 4:2:2 signals, one 4:2:2:4 signal or one 4:4:4:4 signal. Data at each input is deserialized, re-scaled and color space converted to RGB. On the output side, the opposite happens with each output block passing through a color space converter, re-scaling circuit and serializer. The video then can be routed to the SCSI interface or output. Later, an option card is planned that will allow the unit to produce low-resolution "thumbnails," which can be sent to the host in real time.

Data from a single image may be transferred by one, two or four SCSI channels operating together to increase the total bandwidth. The memory card can store two frames of NTSC or PAL video, and the unit has three RS-422 ports for external hookup.

Dataview and Espresso are examples of products that will have a dramatic impact on the video and computer industries. Both products will allow facilities to increase work flow and cut costs simultaneously. Loading projects overnight, subcontracting parts of projects or stopping work in progress may become things of the past. ■

➡ *For more information on the Viewgraphics Dataview, circle (301) on Reply Card. For more information on the Miranda Espresso, circle (302) on Reply Card.*

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

DYNAMIC METAL.

VERY DYNAMIC METAL.

WHOA!

Introducing the 3M BC-Metal videocassette. The extremely dynamic, new Betacam SP™ tape designed to raise the standards by which all others are judged and destined to popularity. In fact, we wouldn't be surprised if you've already heard about it. But if you haven't, rest assured, you will.

3M Audio and Video Markets Division
3M Center, St. Paul, MN 55144
Within the 703 area code: 1-800-831-8726
All other US: 1-800-752-0732 ©1993 3M

3M

Circle (9) on Reply Card

TECHNOLOGY FORECAST

Don't fall behind!

Three tomatoes were walking down the street — papa tomato, mama tomato and baby tomato. As they walked along, baby tomato kept falling behind. Despite all of papa's yelling for him to hurry up, baby tomato fell further behind. Finally, in a fit of anger, papa tomato walked back to baby tomato and stomped him flat. "I told you to catch up," he said.

Okay, so the joke isn't as funny as it was when told in the movie *Pulp Fiction*, but it illustrates a point. Our world of entertainment and communication is moving faster and faster. That new computer you bought will be technologically obsolete within the year. Satellite-delivered programming is gaining customers faster than anyone thought possible. Computer online services used to be something limited to universities and a few computer nerds. Today, the Internet signs on 160,000 new users every day. Such radical changes represent but the tip of the iceberg in terms of where this industry is going. What does this mean to you?

In short, it means catch up or get squashed. Technology managers that lag behind in maintaining their technical and managerial skills are doomed to the same fate as the baby tomato. Fortunately, help is at hand. Read on as *Broadcast Engineering* magazine leads you to the solutions you'll need to stay ahead of the competition in 1995 and on to the year 2000.

Brad Dick

Brad Dick, editor

Preparing for a high-definition future

Facilities need to take advantage of the 3-phase approach to HD.

By Roger L. Kingsland, AIA

The Bottom Line

Sweeping changes in worldwide communications systems have added new variables for broadcasters. Many of these changes call for new ways of doing business. Some can be integrated into current facilities, others will require more substantial changes. Facility construction is a major undertaking. Providing flexibility as an integral part of the design may add significant costs today, but can potentially pay dividends for years to come.

$

The broadcast industry is undergoing two simultaneous revolutions. One is the technical change associated with the adoption of ATV, which involves new equipment, redundant broadcasting and even a change in the product aspect ratio. The other is the vast expansion of players in the marketplace. With roughly 1,500 TV stations nationwide, the broadcast community used to be a relatively tight-knit, secure clique. Digital compression has both increased the rate of delivery and expanded the number of mediums that can deliver video signals. Big players are in the game, and no one knows what will eventually happen.

This article looks at the major issues affecting the industry and attempts to derive some logical conclusions as to how these issues will affect facilities. It addresses the underlying concepts upon which facility design should be based rather than specific technical aspects. Understanding these concepts will greatly affect your ability to compete in this brave new world.

In this business, facility managers are typically directors of engineering and, therefore, place a high priority on systems and equipment. What may not be apparent is the need for a complementary balance between equipment and facilities. Facilities are important for many reasons. First, physical plants are expensive, both in terms of first cost and operating cost. Second, they are static and can be inflexible (after all, it's a lot easier to change equipment in a building than change the building itself). Third, they take a long time to plan and implement and, therefore, are on the critical path of any planned strategic changes.

Kingsland is managing partner of Kingsland Scott Bauer Havekotte Architects, Pittsburgh.

Reasonable assumptions

As design consultants on the periphery of the broadcast industry, we have a perspective uncluttered by day-to-day involvement. After speaking with specialty consultants (including systems designers, lighting designers and mechanical/electrical engineers), as well as our broadcast, film industry and general business clients, we have developed the following assumptions:

Digital compression has both increased the rate of delivery and expanded the number of mediums that can deliver video signals.

1. Most studio facilities (and perhaps associated staff) are underutilized. With three or four newscasts per day, plus assorted local programming, many studios are used less than one-third of the time available. Income available from increased use (closer to 100%) can offset the additional cost of equipment and improved facilities.

2. The number of shows produced in the future will increase dramatically. After all, how many M*A*S*H reruns can one society absorb? If George Gilder's narrowcasting (a term he used in his book "Life After Television") prediction comes to pass, then the need for economical production will increase substantially.

Of all the players in this new market (cable, broadcast, telephone, satellite), the broadcast industry has arguably the greatest production expertise and the best pool of resources. Private video production shops will certainly compete for production services. However, stations that adopt ATV will be the first to develop an understanding of the 16:9 format. Also, by increasing utilization, stations can increase production without substantial capital expenditure.

3. As studio usage increases, stations will need to accommodate outside talent and technical personnel using the production facilities. The wider variety of productions will put a greater demand on shop areas, edit booths and dressing rooms. The production of news will have to balance a need to share facilities with the need for privacy to work more efficiently.

HDTV's 16:9 aspect ratio will affect studio control rooms. In addition to installing new equipment, the size and shape of monitor walls will have to be addressed.

4. A typical TV station has three primary functional components: production, sales and broadcasting. In the future, there will be so many inexpensive ways to deliver a signal that the broadcast component may be less of a priority. Sales will remain important; however, the orientation may move away from just the sale of advertising toward the sale of production services. Production will increase in prominence. Local news will remain important; however, news production will have to coexist with vastly increased use of production facilities and staff.

A station's ability to respond to rapid changes in the marketplace will be critical to its survival.

5. Studios and their support spaces including edit booths, control rooms and shops will need to become highly efficient machines for production of content and will be used 24-hours-a-day. Those that succeed will work more efficiently than their competitors. Stations will become adept at producing a wider variety of shows, ranging from corporate teleconferences to specialized programs developed in partnership with narrowcast producers.

6. The change in aspect ratio from 4:3 to 16:9 appears to be largely in response to the movie industry and the vast quantity of motion pictures available to satisfy the market's demands for programming. The film industry may be an excellent resource for broadcasters interested in increasing their production capabilities. First, the film industry understands how to work with the wider aspect ratio; second, it's accustomed to producing a wider variety of product than is currently typical in the broadcast industry.

How facilities' changes will occur

Assuming that changes in technology and the marketplace will generate changes in facilities, the questions are: how will they occur, when will they occur and what will the nature of the changes be? We envision three phases with the following characteristics:

•*Phase I – Adapt existing facility:* This will be the initial phase for most organizations. It will involve adapting existing facilities to respond to changes needed and be primarily equipment oriented. It's conceivable that news sets will be redesigned or substantially modified. The use of in-house electronic graphics will grow and may even use a portion of the additional horizontal field. Directors will experiment with solving proportion problems created by the 16:9 ratio with equipment changes rather than facility adaptations.

Phase I will clearly help define which production problems can be solved with equipment and which need to be solved with facilities changes. Mechanical and electrical systems will be largely ignored unless they prevent proper function of the equipment. Most stations will go through this phase, particularly those that already have adequate facilities, along with stations whose philosophy is to wait and see where the industry is going.

The best facilities' response during this period is to develop a clear understanding of existing conditions and how changes can be made at minimal cost. Particular attention should be paid to spaces adjacent to the studios and possible scenarios for reorganizing space outward from the studios. A program of space requirements, which specifies each space and its size and relationship to other spaces, should be developed and modified as the understanding of space needs changes during the transition. Minor modifications can be based on the needs defined by this document, rather than simply forcing uses into inappropriate spaces. In addition, groups of uses can be identified for off-site locations in the event that the additional production and broadcasting uses demand more space than is available.

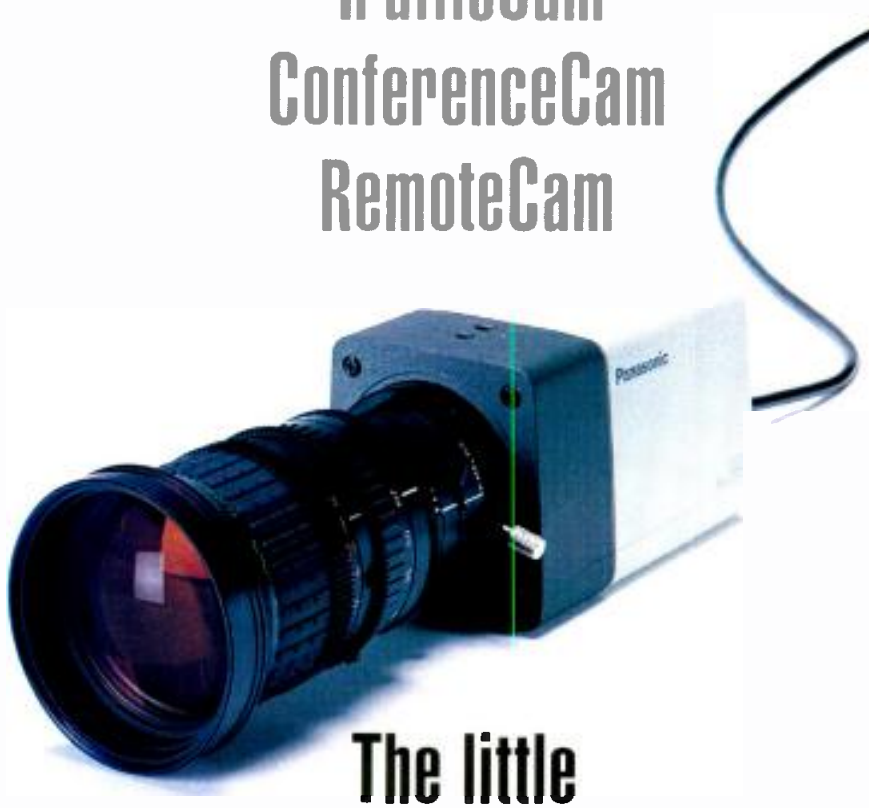
The best facilities' response during Phase I is to develop a clear understanding of existing conditions and how changes can be made at minimal cost.

•*Phase II–Generic facilities response:* This involves substantial changes to existing facilities or relocation to new facilities. Stations that have gone through Phase I will have learned a lot about their new facility needs. It will, however, be critical that any architectural or engineering design solution recognizes the need for flexibility.

Because a station's ability to respond to rapid change in the marketplace will be critical to its survival, the underlying concept behind all design solutions should be ultimate flexibility. This will require a

Continued on page 27

FedCam
MedCam
EduCam
POVCam
MicroCam
GrahpiCam
FireCam
TrafficCam
ConferenceCam
RemoteCam



If you can't judge a book by its cover, you certainly can't judge the performance of the WV-E550 by its size. Its specs (+62dB Signal-to-Noise Ratio, 800 lines of horizontal resolution, f8 at 2000 lux) place it in a league with some of the finest cameras of any size or any price. Yet, its size and ease-of-operation let it go places where few other cameras will even fit.

It's all made possible by Panasonic's Emmy award-winning DSP technology. Now, not only are set-up, camera matching and scene filing push-button simple; Digital Noise Reduction improves picture quality—not just in low light—but throughout the WV-E550's entire operating range.

From saving firemen's lives to improving the clarity of international video conferencing, there's hardly an application where the WV-E550 can't do the job of much bigger, more expensive cameras. If you've got a challenge other cameras can't do, it just might be a job for the WV-E550, the "Can-Cam."

The little camera that could.

Panasonic
Broadcast & Television Systems Company

For more information call 1-800-528-8601 (Upon request enter product code 28) One Panasonic Way, Secaucus, NJ 07094

Tektronix brings non-linear thinking

Introducing **Pro***file*® Disk-Based Video and Audio File System.

PROFILE BY TEKTRONIX

Specify **Pro***file*® *from your video system integrator.*

to an otherwise linear world

Tektronix Image Quality

Intelligent Compression™

Simultaneous Record/Play Across All Channels

Integral Video Router

Open Architecture

Multiformat

High Reliability

This is no mere evolutionary advance. The new Pro*file*® Disk-Based Video File System is a quantum leap forward in form, function and value.

For starters, Pro*file* provides CD quality audio and first generation Betacam® SP quality video. While Intelligent Compression™ lets you specify the exact video quality you need for every application. Pro*file* makes the many advantages of disk recording both affordable and practical.

With four independent record/play channels, a single Pro*file* streamlines commercial insertion, newsroom editing and program delay operations that tie up multiple tape machines. And it does so more simply and economically. With virtually no downtime.

An integral 32x32 digital router makes it easy to integrate Pro*file* into any video environment. And, its open architecture lets you expand and upgrade with plug-in cards.

Don't be limited by linear thinking. For complete information call your local Tektronix sales office.

Tektronix

Circle (16) on Reply Card

16:9 and the studio

Some considerations

The new ATV aspect ratio can't help but change the way studio space and sets are used. Assuming no change in the vertical field-of-view (FOV), 16:9 increases the horizontal FOV by 33%. However, some directors may prefer to increase the vertical FOV to compensate for the increased horizontal FOV. A 20% increase in the vertical FOV results in a 60% increase in horizontal FOV and a 92% increase in the overall FOV. (See Figure 1.)

Let's look at a typical studio (if there is such a thing). Figure 2 shows a corner set with an open area for cameras. Approximately one-third of the space is dedicated to staging area for equipment not in use. Figure 3 shows the area required for cameras, if the focal length of the lens remains the same and the field is increased 92%. The result is a drastic reduction in the space available for equipment staging.

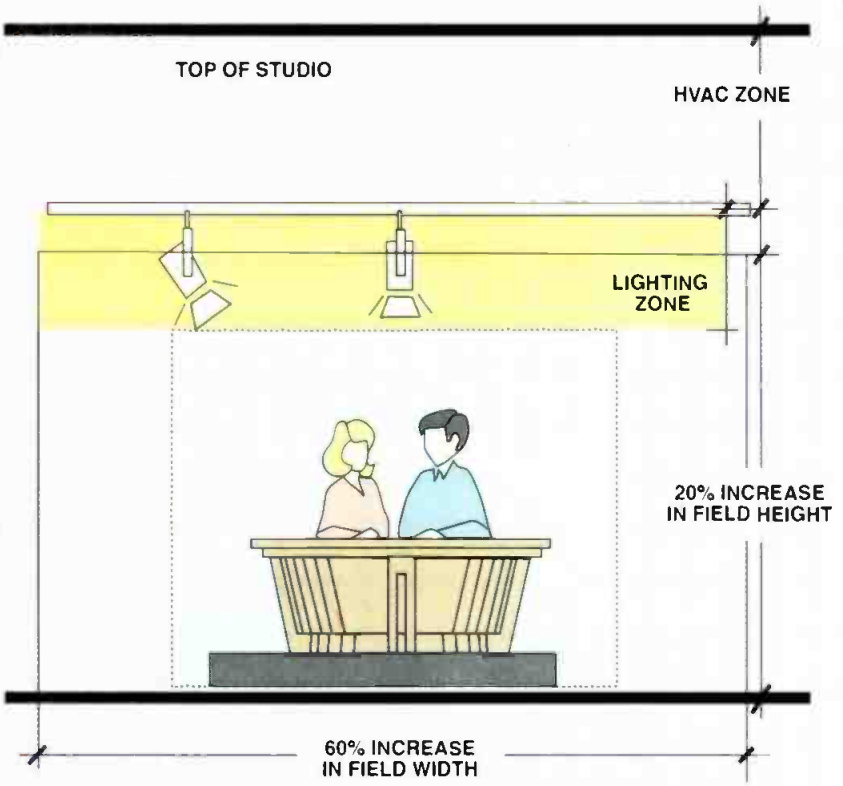


Figure 1. When changing from 4:3 to 16:9, increasing the vertical FOV by 20% results in a 60% increase in the horizontal FOV and an increase of 92% overall. This affects both set and studio design considerations. (Figures designed by Grant E. Scott, AIA.)

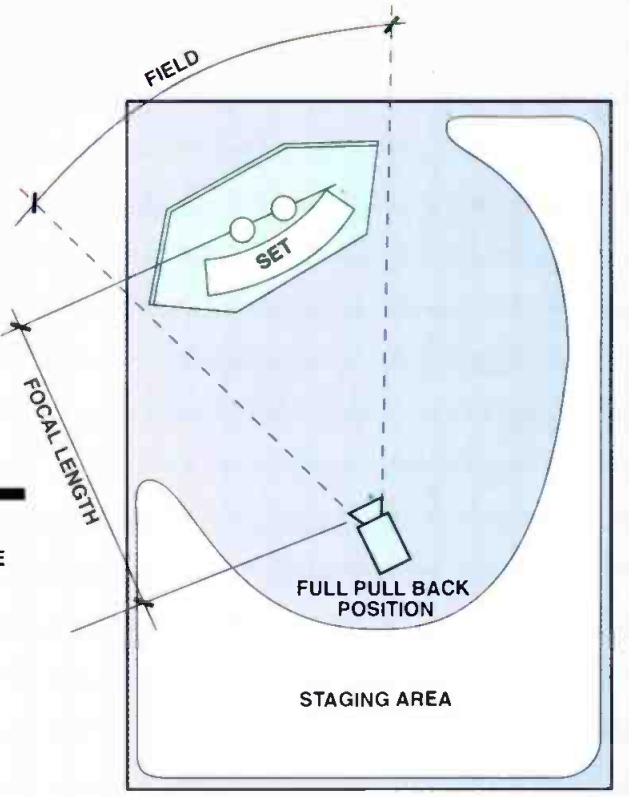


Figure 2. A typical studio may have a corner set, with space aside for cameras and the remainder of available space used as a staging area.

The logical conclusion is that equipment will be stored in areas outside the studio, which will have two effects. First, a decrease in production efficiency; and second, displacement of other uses currently adjacent to the studios. Stations that do not have enough surplus space to absorb the spillover may need to consider locating spaces less critical to studio operations, such as sales, to remote sites.

Other considerations relating to the new aspect ratio might include:

1. The use of shorter lenses to increase FOV and reduce pullback distances.
2. Increased lighting grid heights due to the increased vertical FOV.
3. Studios that are marginal for 4:3 production may be unusable for 16:9 production.
4. Due to ATV's increased resolution, designers may need to review the quality of set finishes, graphics and makeup.
5. The decreased background noise of digital audio may (reveal) additional studio noises, such as HVAC systems. ❑

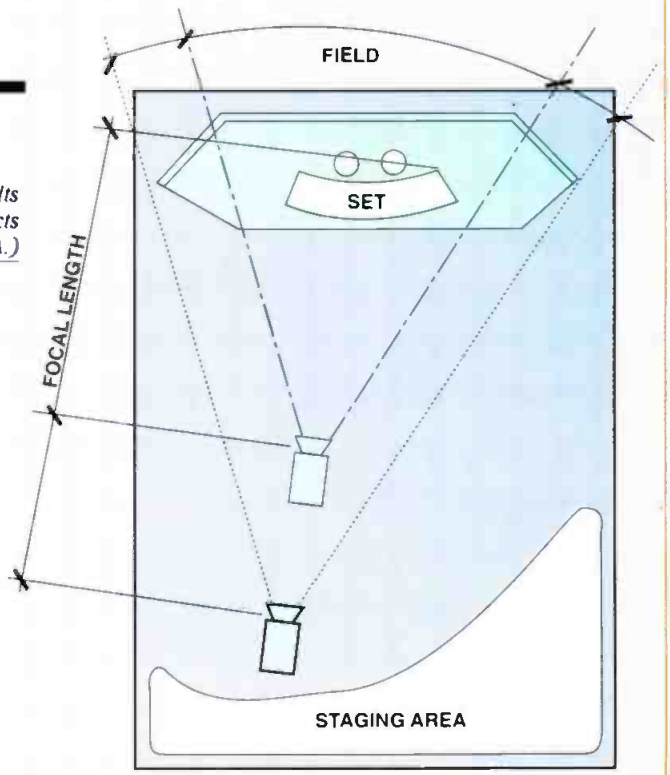


Figure 3. With 16:9, additional space may be required for both cameras and sets, therefore reducing the staging area. Space requirements may spill over into other nearby areas.

whole different plane of thinking about space needs. Users need to think about function, not room labels. Wherever possible, spaces should be combined. It should be anticipated that all space use will be temporary and spaces should change quickly with minimal disruption to ongoing operations. Generic standards should be developed for the entire space that establish minimum requirements in terms of ceiling heights, lighting, power, acoustics and HVAC (heating, ventilation and air conditioning). The result will be a "white box" volume, into which specific functions are placed.

To the greatest practical extent, functions placed within the volume should be easily modifiable. Furniture should be freestanding, not built-in, and allow easy access to wiring. Lighting should be plug-in, not hard wired. Mechanical systems should be modular, allowing quick modification for new uses. Wiring should run in exposed cable trays, not conduit. Ceiling heights should be higher than the anticipated need. Spaces requiring acoustical privacy should be visualized as islands within the overall volume and constructed of demountable partitions.

Flexibility is not achieved without cost. However, in the long run, substantial savings can be realized through the reduced cost of modifications and increased efficiency.

Most broadcast facilities can't even keep up with their current space needs, let alone respond to future requirements. How many stations' private offices have been turned into edit suites? How many are living with a patched-up HVAC system that has been modified so many times it is impossible to balance?

The future will require constant adaptation to changes in the marketplace and shows produced. Work teams, edit suites, sets and studios will all need to be reconfigured on an ongoing basis to meet specific challenges. If the reconfiguration takes too much time and money, opportunities will be lost. If the facility limits opportunities for a reconfiguration, staff will not be able to function efficiently in what promises to be a highly competitive marketplace. The cost of not being able to compete can far outweigh the additional cost of building flexibility into new or renovated facilities.

It's conceivable that some stations may not undergo phase I and proceed immediately to phase II. These are stations that currently have dysfunctional facilities that require substantial change now. It also includes stations taking an aggressive posture and pioneering the inevitable changes in the industry. Under either circumstance, the need for flexibility becomes even more important.

Among the items that need to be considered when planning for HDTV are studio sets and lighting. Grid height and set size may have to be increased to accommodate the change in aspect ratio. (Photos courtesy of KSBH Architects and WPXI, Pittsburgh.)

The appropriate architectural/engineering design response in phase II is twofold. The design team must develop a conventional design solution that accommodates all known functions in an efficient, productive manner. The traditional design process works well to achieve this goal. The design team, led by the architect, should first develop an understanding of the organization's immediate needs and make certain the design responds accordingly. However, beyond the appropriate solution when the facility is first occupied, it will be absolutely critical that the design accommodates flexibility for change.

The design team must focus the client to look at opportunities five and 10 years out. The underlying design concept behind a facility should be a common denominator of requirements that can meet the widest variety of possibilities within current funding constraints.

Besides satisfying immediate functional and practical requirements, the design team must act as the catalyst in helping the client define their vision for the future and various alternate market strategies. After the architect has developed a variety of solutions and explained the opportunities and constraints of each, the client then can select the most appropriate solution based on that vision.

•*Phase III – Specialization:* At this stage of development the industry has settled into definable patterns with some organizations determining their appropriate niche. Under this scenario, specific space needs are more easily defined and facilities are fine-tuned to perform efficiently under more narrow use requirements. An example might be a TV station that has developed partnerships with one or more narrowcast producers of specific shows.

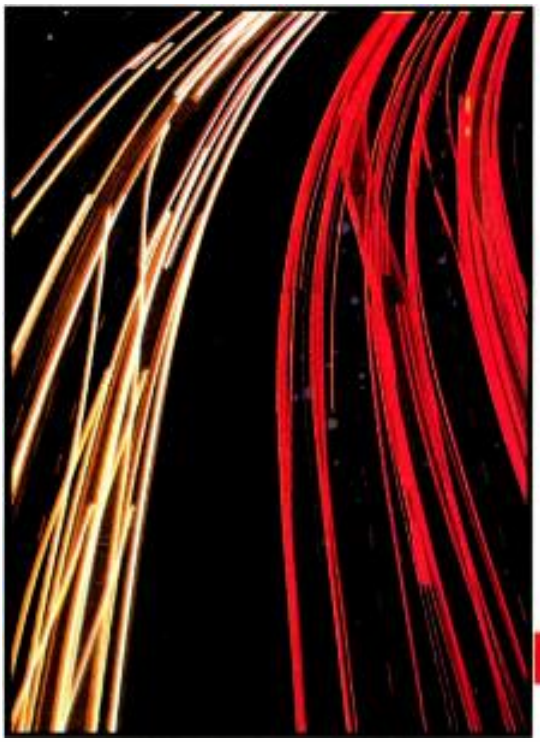
The organizations making the transition to phase III will be those that have proven profitability within specific niches. They will include firms that have adapted general-purpose spaces to specific needs and recognize that they can improve efficiency by developing specialized facilities. The appropriate architectural response then is fine tuning. The design team must develop a detailed technical understanding of production requirements (if any), management preferences and staff communications.

Summary

The future holds many exciting challenges and opportunities. A facility can either restrict the ability to respond or support a smooth transition. It's important to recognize that electronic systems and physical plants need to be properly balanced, complement each other and respond to future needs. In all likelihood, the most appropriate response to the future is flexibility. Although greater flexibility increases costs at first, long-term costs can be substantially less, particularly if efficiency is improved.

One worthwhile consideration would be to begin planning for the total reconfiguration of your TV facility. The life cycle changes it has undergone over the decades may well have rendered it useless in preparing for tomorrow's technology. The industry will soon need to compete in a vastly expanded market against companies that have developed considerable expertise in improving efficiency. If the broadcast industry combines its unique expertise with the right facilities and a well-managed staff, it can and will become an integral part of the communications industry that eventually emerges.

■



Broadcasters and the IWay

For broadcasters the future may at first appear dim, however, opportunities abound.

By Curtis Chan

The Bottom Line

When the information superhighway is discussed, broadcasters are often left out of the discussion. One reason is that broadcasting is currently a one-way delivery system. What is forgotten is the wealth of content and services broadcasters provide to their local community. The information superhighway will be a 2-way interactive network, and broadcasters need to embrace systems that provide feedback from their viewers and stake their claim in tomorrow's communication web.

The National Information Infrastructure (NII) is a phrase coined by the Clinton Administration to describe the convergence of telecommunications, information technology, and the entertainment industry. Of late, the NII's oblique meaning has been substituted with the "Information Superhighway," Infobahn or the latest entrant, IWay. In reality the IWay is already here, the government and private sector have been active participants for some time.

The government's NII objective is not to dig a trench from coast to coast, fill it with fiber and call it the IWay. Rather, the IWay will be privately built, owned and operated. Most likely, the federal government will encourage its development through research funding, standards efforts and regulatory changes. Much of the IWay already exists in the national communications web comprised of fiber-optic strands, coaxial cables, RF, satellites and copper wire.

What's needed for completion can be broken down into several categories. On the technology side, improved access, encryption, protocols and bandwidth are needed. A core technology that may ultimately determine the practicality and feasibility of the IWay is data compression. The infrastructure needs better policy, organization, and the homogeneous support of the players. Content, along with all of the conveniences and services offered, will determine to a great extent the success or failure of the NII.

Who, what and how

The first question concerns who will build the IWay. The answer is multifaceted. Each of the players will bring to the table different technologies and points of view. Some of the players include the Internet, AT&T and the seven Regional Bell Operating Companies (RBOCs). Other players include universities and research organizations, computer software/networking companies, on-line service and content providers, the government, cable and TV broadcast companies.

The next question is what will be on the IWay. A recent study attempted to determine which applications will be doubly important within three years. Answers included electronic mail, file and data transfers, and interactive information (video, audio, data) access.

The study also asked who will pay for the IWay and how services should be billed. The answers varied from users and content providers to advertisers and taxpayers. Possible billing methods include a combination of free and pay services, usage-based service, flat rate service and premium-priced services.

The IWay's backbone will use current and envisioned wide-area network (WAN) technologies including fiber, satellite and microwave. On- and off-ramps connecting users to the backbone will be fiber, coax, copper twisted pair and wireless. Users will inevitably want direct interface through the use of PCs, palmtops and PDAs, smart phones, set-top Network Interface Unit (NIU) boxes and smart televisions. Many new software products are possible including operating systems, user interfaces and a new generation of middleware for navigating the IWay. The marriage of these different technologies creates unresolved issues centering on protocols and bandwidth.

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

Protocol

There are many protocol issues but one of the main concerns is the ultimate role of Transaction Control Protocol/Internet Protocol (TCP/IP). It is the current protocol that binds the Internet and Unix-based LANs together. Aided by the assistance of the Internet Engineering Task Force (IETF), TCP/IP has continuously evolved. But it suffers real-time drawbacks that could threaten its use when multimedia traffic plays a greater role on the IWay. TCP/IP wasn't originally designed for real-time data delivery. It's essentially a routed connectionless, datagram (packet) protocol, which divides network traffic into unequally sized, individually addressed chunks that are routed through the network over a dynamically assigned path.

An emerging option is ATM. It is a hybrid circuit-switched and packet-switched networking scheme that performs well in real-time applications (video, audio) but lacks TCP/IP's software base. ATM will probably ride on top of Synchronous Optical Network (SONET), which is a CCITT/ITU standard that defines various levels of digital telephony service over fiber. ATM basically splits data into small cells or packets of equal size (48-byte data plus a 5-byte header). Instead of routing each cell individually, ATM sets up a virtual circuit and streams the cells across the network. Aside from its scalability and ultrafast switching capabilities (from 53Mb/s to 9,953Gb/s), ATM's attractiveness for video and multimedia content is its ability to allocate bandwidth on demand and assign priority levels to cell streams, guaranteeing nearly real-time delivery of digital video data.

Bandwidth

ATM's attractiveness for video and multimedia content is its ability to allocate bandwidth on demand and assign priority levels to cell streams.

Bandwidth and the allocation of frequency spectrum is a major issue amongst the players. Bandwidth necessary to connect providers and users onto the IWay depends on the applications being used. For instance, on-ramps need far greater bandwidth for interactive digital video than e-mail. Another equally important issue involves the allocation of bandwidth into and out of customer sites. A system optimized for data delivery with a high ratio of downstream to upstream bandwidth implies information consumption, whereas one with symmetrical or dynamically assigned capacity implies communication.

The consumer broadband spectrum assignment chart (see Figure 1) is an example of how providers will utilize the already scarce allocatable bandwidth. Frequencies between 50MHz to 750MHz will be used for downstream broadcast, while the frequencies from 5MHz to 42MHz are available for upstream data. At 6MHz per channel, six channels of video, or more compressed channels of video and other data can be piped upstream. Another idea is to use two coax cables for each feeder and leave one "dark" for future use. The primary active cable will be configured with asymmetrical bandwidth as in the previous example. The upstream bandwidth will be enough to support voice phones, 2-way data, Personal Communications Services (PCS), the new wireless spectra to be auctioned off by the FCC, and video telephony. The second dark cable, when activated, will be mid-split with free portions of the 500MHz bandwidth being allocated in each direction. This empowers subscribers to become originators of content and not just

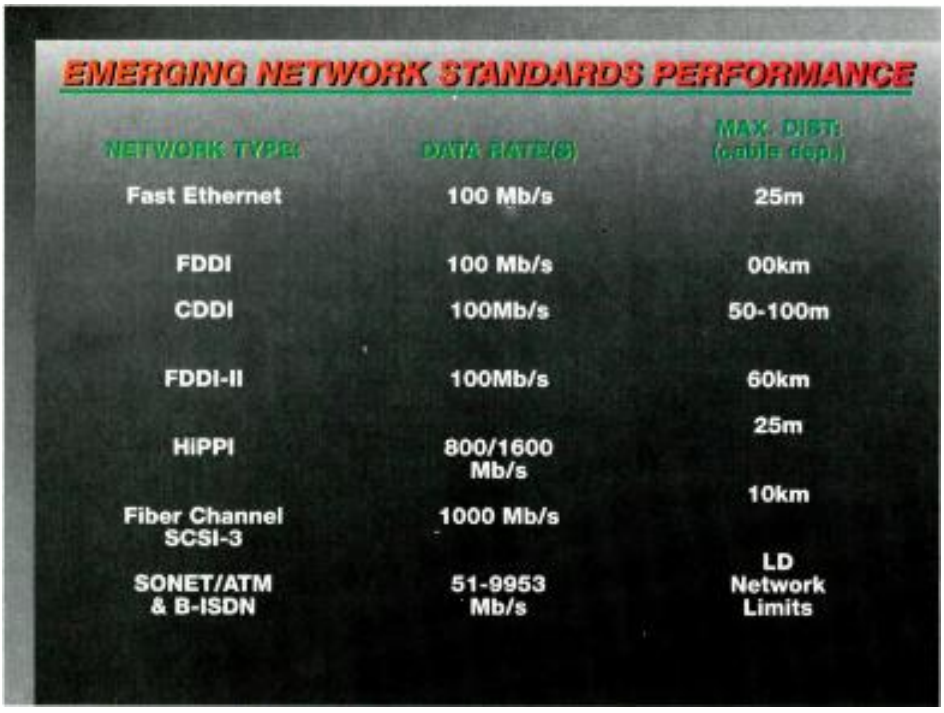


Table 1. *Specifications of some of the current and emerging standards for network distribution of digital signals.*

consumers.

Several cable companies are serious about using the upstream bandwidth to compete with the RBOCs in local phone access. This would allow users access to long distance networks through the cable system and could give the RBOCs a run for their money.

IWay backbone players

As discussed earlier, the IWay will not be built by a single entity, but by numerous existing institutions that can provide content and/or the ability for end-users to communicate with one another. The IWay must be affordable, secure, easy to navigate, information rich, and have information people want to use. Three main players come to mind, the telcos, Internet and the cable companies. To a lesser degree are the broadcasters, which offer information-rich content, but lack the interactive ability to communicate with end-users at a high level. However, this will change as broadcasters form strategic alliances with communications carriers and/or develop an infrastructure to accommodate bidirectional interaction.

For the most part, the cable companies see the IWay as synonymous with enhanced entertainment and business services. Possibilities might include services for (near) video-on-demand, home shopping, viewer polling, information-on-demand, data and voice telephony and access to on-line service bureaus. One of their primary advantages is existing coax stretching into more than 60 million U.S. homes and millions more around the world. On the downside, cable systems

tend to be proprietary and not interconnected. A major challenge will be agreement on common standards and protocols, as well as the actual interconnection of the various systems.

Telephone companies show strength where cable companies are weak. At present, cable uses a one-to-many, trunk-and-branch topology with little provision for upstream or return communications. The phone system has evolved to become the world's largest switched, distributed network. It provides ultrareliable instantaneous point-to-point communications and precise methods to track and bill for usage. However, bandwidth problems still have to be addressed at the local or regional level. Although the trunk lines or backbone to the major metropolitan cities are of high bandwidth capacity, the local loops are typically 2- and 4-wire unshielded copper running at limited bandwidth. For telcos to transmit and process real-time video and multimedia information, bandwidth and protocol issues need to be addressed.

A possible solution is Asynchronous Digital Subscriber Line (ADSL) and Discrete Multitone (DMT). ADSL uses existing copper for broadband interactive video and other high-speed digital services. Coupled with DMT, four one-way video channels (compressed 1.5Mb/s channels), a 2-way interactive back channel, two ISDN channels and regular telephone information can be squeezed onto ordinary twisted pair wiring. ADSL is no match for 50 channels of cable video, but with a set-top box and an A/B switch, consumers could receive content feeds from the cable and phone companies. At the forecasted speeds, it is possible that on-line services like America-On-Line or Compuserve could become multimedia service providers.

A high ratio of downstream to upstream bandwidth implies information consumption, whereas one with symmetrical or dynamically assigned capacity implies communication.

Where the telcos and cable providers are weak, the Internet is strong. It's said that the Internet is a government-subsidized experiment in distributed computing, electronic community and controlled chaos. This content-rich and open-access playing field is growing by as many as 150,000 users per month. The most likely scenario would be that the Internet's rich human and informational resources will be harnessed for the IWay. The real issues for the Internet and other on-line services are how users will interact with the network and what they will find there. Being linked to everybody and everything is useless if you can't use or locate what you need.

Because of these concerns, the following trend is possible. According to Steven Wolff, National Science Foundation (NSF) director of the networking division that oversees the Internet core, the NSFnet backbone is going to be replaced by a combination of linked commercial subnetworks and a restricted access research backbone. Instead of providing educational institutions and research centers with free access, the government may get out of the network business and offer users vouchers or grants to buy access to commercial Internet providers. Approximately 50 of these mid-level network providers already exist and most are linked under an umbrella called Commercial Internet Exchange (CIX). However, many may merge or be acquired by telcos, cable and broadcast companies, or

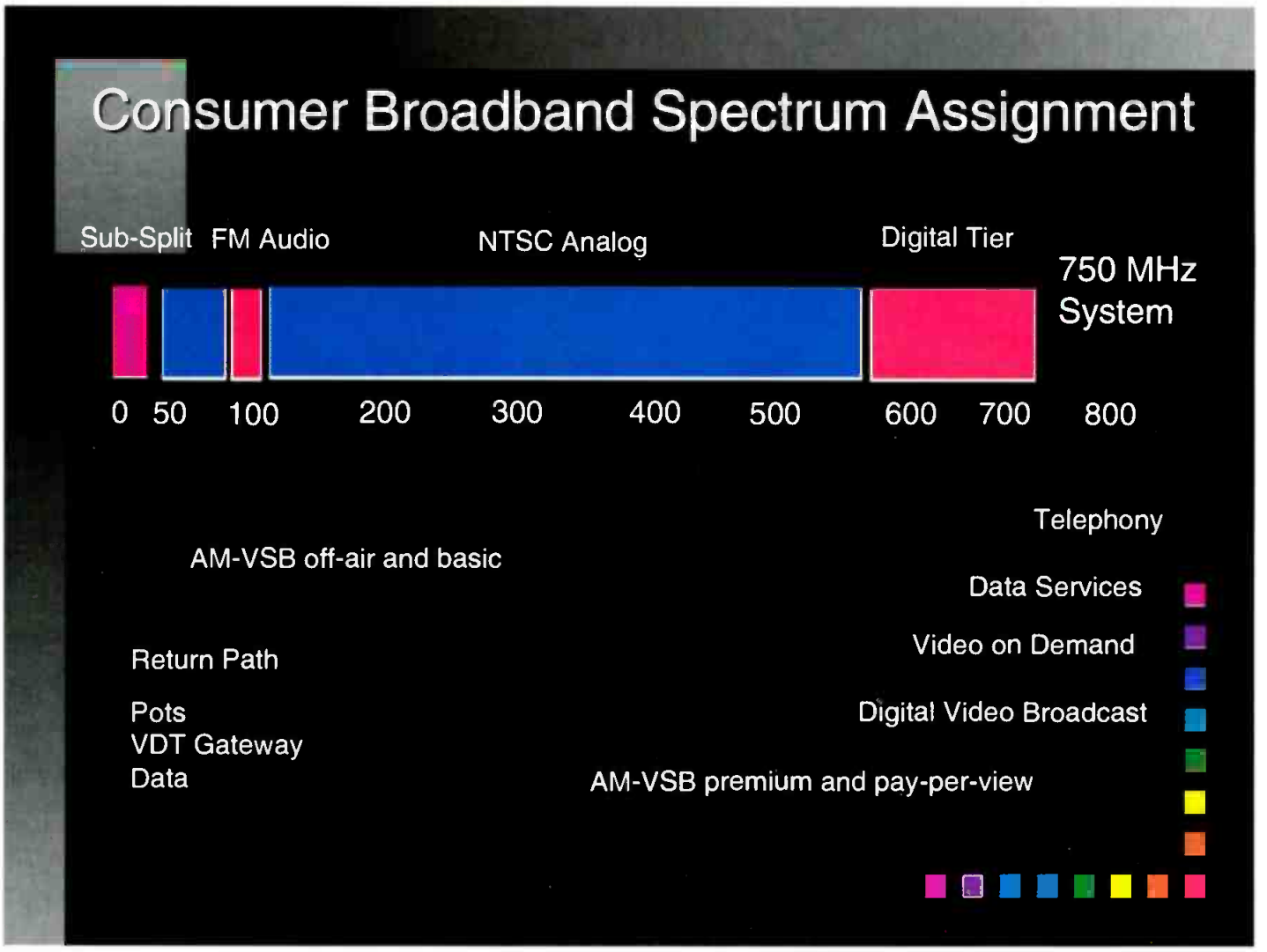


Figure 1. *One possible scenario for spectrum allocation on a system with a single cable. Frequencies from 5MHz to 42MHz would be available for upstream data. Frequencies from 50MHz to 750MHz would be used for downstream data.*

on-line providers.

Just as the Internet's backbone is changing, so are the on-ramps. Programs like Continental Cablevision's link to PSI are opening up the net to a new class of users and bringing its services to the same devices that we use to view videos or make phone calls. Imagine all of the resources of the Internet being available through the same user interface used to conduct a videoconference or to order a take-out. On the opportunistic side, the Internet's population is a marketing bonanza for would-be commercial entities seeking to make a profit from this worldwide communal web. One of the daunting challenges for profit-seeking content providers will be to create a means to bill for on-line usage.

With all of these players, policymakers are trying to resolve issues concerning the IWay. Legislation to ease regulation for the cable/broadcaster and phone companies has already gained support. If the IWay is to become a national asset, access to it must be affordable to all. This is not just a domestic issue, countries including Japan, Canada, Germany and other parts of Europe have begun similar projects to build national networks.

Today's phone, broadcast and cable companies use a multiplicity of technologies to deliver their services. The phone system is switched, symmetrical and interactive. Backbone lines are usually digital fiber with analog copper wires delivering service into businesses and homes. The cable system is unswitched and distributive, built on a backbone of analog fiber and satellites, with analog coax going into user sites. Broadcasters use a combination of terrestrial, DBS and landlines to forward their content-rich information. In the future, one possible communications environment might have interconnected signal connection and routing points feeding services via fiber to the local loop site or curb. From these nodes, data will enter businesses and homes on a mix of coax, copper wire and fiber to reach set-top boxes, computers and phones. These systems will be switched and 2-way, though they don't have to be symmetrical or all digital.

Haves and have-nots

One major concern facing providers is that all this will be meaningless if the cost is too high. If not addressed early on, the IWay might become the province of the educated and economically privileged, pulling the country closer to a land of haves and have-nots. Lowered regulatory barriers between the content providers and the telcos, coupled with the increasing number of content-for-hire media conglomerates may lead to new monopolies and strong competition over services and prices. Like the interstate freeways that stretch from coast to coast, the IWay will profoundly alter our society. Major issues relating to technology, legal implications and economics still have to be faced. But once resolved, opportunities lie ahead for providers and users. Vice President Gore's comment may sum up the situation best, "Better communication has almost always led to greater freedom and greater economic growth."

The IWay is filled with opportunities that allow access to a wealth of information. The architecture will be designed to encourage individuals and organizations to become information creators, and not just consumers. It will be exciting to watch and be a part of the opportunities and challenges ahead. ■

Interactive

pate is the most immediate and attractive business to the TV industry as we know it. Once a broadcaster or cable programmer has the ability to process and create interactive applications, there are many new business opportunities.

Existing advertising revenues can increase due to more direct, personalized and usage-based capabilities. New advertising, direct response and promotional opportunities result from printed and electronic methods, such as coupons, home shopping, retail smart cards and related services.

The key to these innovative new business opportunities for broadcasters lie in technology that only now is becoming possible. The remainder of this article discusses the architecture, features and processes necessary to implement interactive applications within scheduled or VOD commercials and TV programs.

The VETS installation located in Portland, OR, NBC affiliate KGW-TV.

Underlying architecture

After analyzing the requirements, the distributed system shown in Figure 1 is necessary to support the interactive home. The architecture includes a video encoding and transport system (VETS). The VETS encodes interactive prompts and is a time reference to a video frame. The in-home unit (IHU) presents interactive tasks to the viewer. The interactive processing system (IPS) provides main frame computer resources and is a 2-way addressable communication network.

The IHU is the core of the system. It is a device that allows the viewer to electronically communicate with a live, or pre-recorded broadcast event. For a monthly subscription fee, the service includes game participation, product orders, promotional information, coupons, survey participation, information reports and other computer and video applications. Additional services are usually available on a pay per use basis. When the viewer presses a button on a remote-control in response to a prompt, a

new window of interactive opportunity opens up.

Upstream to the IHU is a VETS facility. It is responsible for the script and encode tasks to create prompts that reference an IHU application with a TV event to allow viewer interaction. The VETS video frame link to a specific IHU application and task implements time-sensitive prompts that a viewer initiates. Depending on the program or commercial distribution method, a network of VETS facilities operates as national, regional or local process centers. Each broadcaster providing interactive capability must install a VETS processor as far downstream of the signal path as possible.

The VETS hardware costs less than $50,000 per installation. It is a cost-effective method for offering interactive applications. Because the broadcast programs already include interactive prompts prior to distribution, the VETS installation operates automatically without the need for an operator. An interactive prompt is a method to relate a video frame to an interactive task. It also indicates an event result, such as an end or beginning of a football play. The prompt data inserts with a TV signal in various ways, such as in the vertical interval or in the active picture portion of the signal.

Downstream to the IHU, the IPS facilities are responsible for the IHU start-up, providing off-line storage, processing batch IHU requests, and providing on-line support to the network. In this role, the IPS is an application-on-demand (AOD) server to the IHU and VETS installations. The IPS collects, merges, secures and maintains all network information.

Many different delivery technologies connect IHUs, IPS facilities and VETS installations to form a hybrid analog and digital network. A coaxial or fiber-optic cable, satellite and direct broadcast are only a few of the methods that an interactive TV architecture needs to support. Each combination of broadcast, cable and telephone communication methods designates a potentially different data and video interface task. Whether the video and data channel arrive on the same channel is not an issue. In either case, there is a requirement that each video frame needs the potential to reference an IHU task. This logical linkage, a unique event ID that synchronizes the video frame with an IHU task and a data channel packet, provides the ability to offer a broad range of interactive TV opportunities.

The InTOUCH TV system

The InTOUCH TV system delivers interactivity to the home on two existing mass communication networks: a TV signal and the standard telephone network. Using a patented signal-processing method, the system economically and reliably encodes and protects interactive prompts with the video. An in-home unit receives and processes the encoded TV signal along with other information previously stored in the unit. A viewer interacts with an application by using a familiar remote-control device. At scheduled times, the encoded prompts instruct an application to become active and to prompt the viewer for responses.

An IPS facility maintains applications, information and transactions as required by individual viewers. When a viewer requests information that is not in the IHU or is not in the TV signal, the IHU automatically connects to an IPS facility. The IPS then transmits the information over a telephone or cable network. The IPS is a scalable, fault-tolerant computer system that provides immediate IHU access and 24-hour, seven-days-a-week availability. In addition to participation with interactive programs, the viewer can request IPS on-demand information. The viewer can review the information on

screen or output the information to a printer. Additional IPS services provide the ability to request on-line services. Both on-demand information and on-line services are accessible to the viewer based on the viewer's profile or previous usage patterns.

The major IPS functional layers are shown in Figure 1. They include a repository for all applications available on the application network; management for end-to-end system tasks and allocation of resources; a repository for all response and transaction data; a repository for features, such as print phrases, display phrases, fonts, symbols and other common information; a database view across all IHUs and VETS systems that connect to the network; and an archive process to move "old" data from on-line storage to off-line storage.

Figure 1 also represents the major VETS functional layers. They include real-time entry that immediately inserts an interactive prompt, a serial digital bitstream, with a video signal; a video signal reference that inserts a prompt file with a video signal; insertion of a prompt file with a video signal from a local schedule; ability to insert reference addresses with a video signal that references an IHU application; and the ability to insert prompts onto a videotape for later broadcast or transmission.

Encoding method

The system's unique signal-processing method involves inserting interactive prompts within a TV signal. The Video Encoded Invisible Light (VEIL) encoder inserts a serial digital bitstream on an analog video signal by a low-level modulation of the luminance portion of a video signal.

The encoder previews incoming video to detect the presence of data. It also stores and delays the video for one field, adds the required level of modulation to the signal and monitors the output signal to assure the accuracy of the process. An entire field or set of scan lines represents a "0" or "1" bit. Because there is a zero net gain (on a field basis) of the luminance level, the result of the modulation is an electronically detectable pattern that is invisible to the human eye and retains the signal integrity.

When compared to vertical interval (VIR) communications, the VEIL signal is a more robust and reliable communication channel. It remains with the program through duplication and retransmission and decodes directly from the signal or optically from the screen image.

The IPS and VETS computers are general-purpose devices with large hard disk with full backup capability. The IHU contains 1MB of memory, tuner, modem, signal decoder, infrared receiver and other special hardware.

The IPS remotely maintains all IHU memory on an intelligent basis. Figure 1 shows the major IHU functional layers. They include memory to store and manage applications; a resource manager for external communications (infrared, telephone, video signal) and internal devices (memory, printer, modem, on-screen graphics, video tuner, IR receiver); and memory storage for common features, such as fonts, symbols, print phrases, display phrases, telephone numbers, credit cards and usage counters.

During the past year, Radio TV Reports, (part of the Competitive Media Reporting [CMR] umbrella, which is the result of a joint venture between Arbitron and VNU) has successfully operated several regional VETS centers for the tracking of broadcast news releases and commercials. Over the last two years, the InTOUCH TV system operators using the VEIL technology have successfully produced interactive TV programs in The Netherlands and in Spain.

The results of these European tests are

a primary input for The Portland Project, a broad-based test of interactive TV services. Broadcasters, cable companies, program producers and advertisers have committed their participation. Operation logistics, system tests and signal field tests are under way. A 1,500-home test will begin late first quarter of 1995. The primary purpose of the test is to compile and analyze viewer participation with interactive TV programs and commercials.

During the analog-to-digital migration, customers will continue to operate seamlessly among the evolving analog and digital components.

Analog-digital migration

The proposed system architecture operates in a hybrid network that includes analog and digital components. While the initial product operates in an analog telephone and TV network, the system conceptually operates with an integrated digital video, voice and data network. Each of these three systems, IHU, IPS and VETS, provide interface layers that act as "fire walls" to ease the impact of technology change. The treatment of separate communication channels for data and video provides a foundation to migrate applications, system modules and common features to new and improved platforms. The TV signal is a broadband multiplex of channels where each video frame has the potential to reference an application residing in an IHU memory or an IPS facility.

This video address method is conceptually the same in an analog and digital delivery system. Although the current implementation is primarily a one-to-many delivery method, there are no technical limitations that restrict a point-to-point delivery method. The data channel is a broadband multiplex of channels where each channel carries applications and information to a designated IHU. The system architecture has the ability to use available and multiple data delivery rates, channel media and delivery carriers. By treating all I/O ports as linkable devices and applications separate from system modules, the migration among analog and digital delivery methods occurs with minimal application impact.

The interactive future is now

During the analog-to-digital migration, customers will continue to operate seamlessly among the evolving analog and digital components. These customers include the advertiser, the broadcaster, the system provider, the cable operator, the producer and most importantly, the TV viewer. When a "live" game travels on fiber optic, coaxial, satellite or other media, the viewer requires the same easy-to-use and friendly user interface to predict plays or scores, request information, print coupons or purchase a product.

The system architecture provides the pathway for applications that support a hybrid analog and digital delivery environment. For the advertiser, broadcaster and program provider, interactive TV migrates programs with the delivery technology rather than against it. With this understanding, interactive TV brings the industry new opportunities for businesses and a vision that is achievable now and in an emerging all-digital world. ■

Editor's note: The InTOUCH TV system and VEIL technology are trademarks of Interactive Systems, Inc., Beaverton, OR.

S-VHS/Hi8 production systems

Analog systems continue to perform admirably in a digital age.

By Curtis Chan

The Bottom Line

Facilities facing reduced budgets and increased competition are turning to these low-cost, high-performance formats in ever-increasing numbers. Although they may not be suited for high-end post work, these small formats work well for many production applications. By carefully tailoring equipment to applications these cost-effective formats are worth considering.

$

At one extreme, the trend in the broadcast industry is toward dazzling new equipment and formats with equally impressive price tags. These new systems offer increased levels of flexibility and performance. D-5, DCT and Digital Betacam are among the equipment that falls into these categories. In the middle are today's workhorse formats – Betacam (SP) and MII. At the other extreme, formats, such as S-VHS and Hi-8mm, offer cost-effective performance and quality, ease of use and a reasonably high degree of reliability and maintainability. This article spotlights the S-VHS and Hi-8mm formats.

S-VHS

Since its inception in 1987, S-VHS has become, in a large sense, a replacement for U-matic. Improvements in picture quality, including greater horizontal resolution and improved S/N ratio, have allowed S-VHS to take on and conquer many of the established U-matic markets. These markets include cable television, small to midsize TV stations, small production facilities, event videographers, schools, hospitals, churches and industrial video users.

Today, S-VHS systems provide quality images for many professional applications including ENG, sports and event videography, computer graphics, and on-air operations for broadcast, cable and corporate television.

Hi8

The Hi8 video format for professional use was introduced in 1989. Since its introduction, it has gained wide acceptance in professional applications. Its compact size and high-quality video images have positioned it as an excellent acquisition tool. Although the format may not be recommended for production and editing, it has gained quite a following.

Since its introduction, it has gained wide acceptance in professional applications.

Specific applications include "undercover" work where the small physical size of camcorders makes them easy to hide. Another application is where camera theft is probable. Because of their low cost, potential theft is easier to accept.

Early on, tape dropout problems limited the number of times a single tape could be played back. This became particularly apparent in editing operations where a single section of tape may be replayed repeatedly. At NAB '94, new tape formulations were introduced to address the problem, greatly improving the format's performance under repeat playback conditions.

A quick look at the specs

S-VHS achieves a luminance resolution of 400 TV lines (TVL), compared with the 240TVL of conventional VHS. This is a margin of 20% over the 330 or so that are typical on today's televisions. The Hi-8mm format also offers 400TVL resolu-

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

tion, and most high-end decks employ digital noise reduction for both the Y and C components.

To avoid NTSC composite artifacts like cross color and cross luminance, many decks allow direct input, recording, playback and output of uncombined luminance (Y) and chrominance (C) components.

sible to work with separate signals throughout production, eliminating the need to combine Y and C into composite NTSC until it is modulated for broadcast.

For audio recording and playback, S-VHS uses both linear tracks and AFM multiplex recording. Each method can record two audio tracks, for a total of four audio channels. Hi8mm, on the other hand, has no linear analog tracks. Four audio channels are recorded on a digital stereo PCM track and two AFM analog stereo tracks.

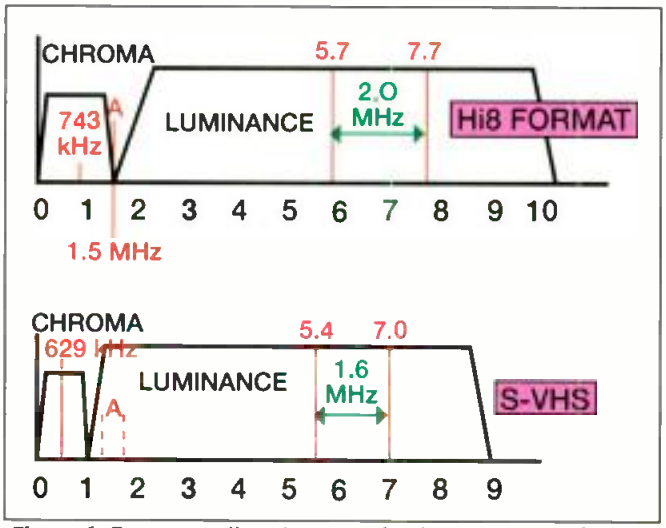
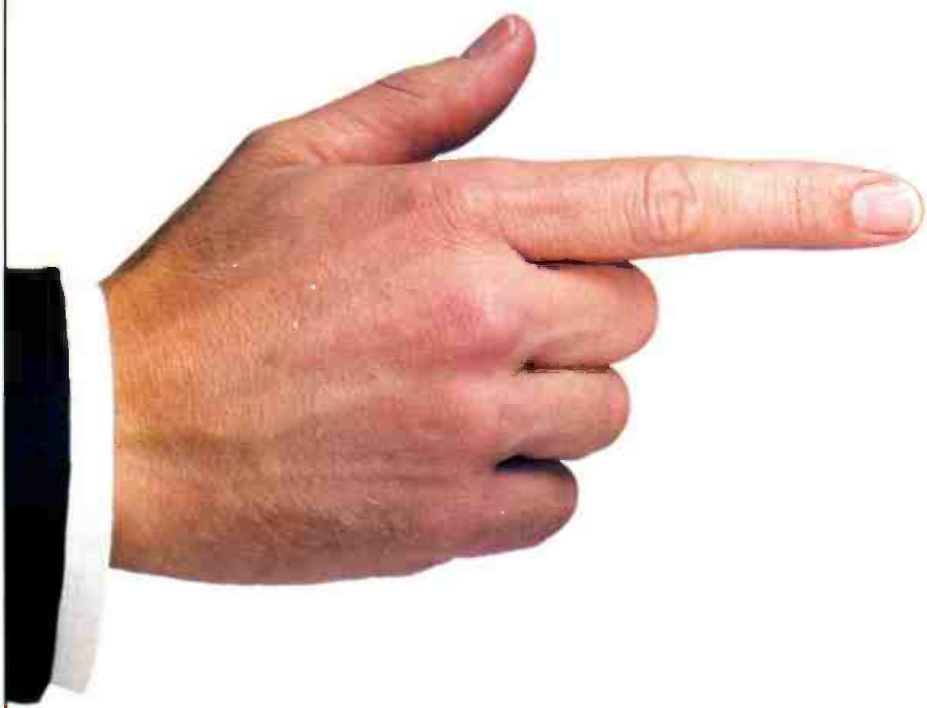


Figure 1. Frequency allocations used for the Hi8 and S-VHS recordings. By increasing the frequency of the FM carriers, manufacturers were able to increase the horizontal resolution of these formats.

To avoid NTSC composite artifacts like cross color and cross luminance, many decks allow direct input, recording, playback and output of uncombined luminance (Y) and chrominance (C) components. Sophisticated decoders using comb filters are employed on the front end of many decks to decode composite video when required. Today's switching and distribution equipment make it pos-

What's new?

Since their introduction, both formats have evolved considerably. Many of today's S-VHS editing decks feature frame-accurate assemble and insert editing, built-in TBCs, built-in LTC and VITC generator/readers, 4-channel audio recording (two Hi-Fi AFM channels and two longitudinal channels) with built-in Dolby B noise reduction, RS-422 serial interface, digital noise reduction, and digital dropout compensation. Digital framing servos have replaced the analog servo systems in many decks and provide faster, more precise synchronization. Something to watch for in some of the S-VHS TBCs is adjustable Y/C delay. In some of the lower-priced units, manufacturers saved some money by eliminating a delay line in the output section. The result was a 1-line



difference in the chrominance and luminance signals. For single-pass operations, this was no problem. However, after multiple passes, the results can become quite objectionable.

CTL track time code is an innovation that allows time code to be recorded with the control track, rather than on a longitudinal audio track.

CTL track time code is an innovation that allows time code to be recorded with the control track, rather than on a longitudinal audio track. This leaves both longitudinal audio tracks open for use as needed. Some decks also offer the ability to post-stripe tapes. For instance, if the field deck is not time-code capable, tapes can be post-striped, eliminating the need to buy a new field deck or add a generation to have the benefits of time code.

On Hi8 machines, time code is recorded between the video and PCM audio tracks in a separate and dedicated location. As a result, Hi8 tapes can be post-striped as well. Note that Hi8 time code cannot be distributed as audio. Time code on these decks is part of a digital word encoded onto the tape and is output on the RS-422 serial port as part of the control information.

Many S-VHS decks offer slow motion with some offering up to -2 to +3 times normal speed. Newer additions feature digital slow motion, R-Y/B-Y outputs and an internal 3-dimensional digital TBC. Digital processing helps maintain uniform picture quality during editing. A large-capacity memory enables clear, noise-free, high-quality slow playback. Playback speed, including digital still, is selectable in steps on built-in systems or an optional slow-motion controller allows variable speed control.

For Hi8, sophisticated decks are available for high quality, no-frills playback. The idea being that footage is acquired on Hi8 then bumped to another format for post work. None of the current Hi8 offerings include variable play. To some extent, this reinforces the positioning of Hi8 as an acquisition format. For audio, high-end units employ a digital memory buffer for jogging and cuing. Unlike older designs, the new units also tout advanced servo systems for precise frame-accurate editing. This allows for impressive features including instantaneous starts and high-speed picture search from -17 to 17 times normal speed.

Last, high-end decks of both formats

tout on-screen menu systems for easy setup and trouble-free operation. Mode selection and initialization are all possible via the menu display. Even functions normally requiring DIP switches can be switched directly via the menu display. Through these menus, numerous items are selectable including frame servo, TBC mode, Dolby NR, Hi-Fi recording, audio limiter and pre-roll times.

Mass storage applications and other applications

One of the more interesting notes is how the S-VHS and 8mm formats are used in data storage applications. Current 8mm systems are capable of storing up to 7GB of data on an 8mm cassette, with transfer rates of up to 500kB/s sustained and 4MB/s peak. This is accomplished by employing read and write head pairs, coupled with a 1MB speed-matching buffer. Sophisticated error correction and error recovery routines can now guarantee a BER of 10^{-17}. Using compression, a single tape cartridge can store up to 25GB with proportional increases in transfer rate up to 2.5MB/s and high-speed search of 187.5MB/s. The forecast is for a doubling of capacity every two years; from the present 7GB to 20GB, 40GB and 80GB by the end of the decade with transfer rates of 6MB/s.

Other applications for these formats have been found in the audio industry. S-VHS and Hi8 transports have been adapted for use in multichannel digital audio decks. These decks offer eight digital audio channels and use standard tapes (running at elevated speeds). Multiple units can be "stacked" for up to 128 synchronized digital audio channels. Because of their increased popularity, new tape formulations have been developed and optimized for audio uses.

These formats have come a long way. Both have survived the test of time, and new uses continue to be developed. As technology marches forward, and signal-handling techniques are refined, look for further improvements in these small, cost-effective formats. The video and broadcast industries are changing and Hi8 and S-VHS have earned a place in the new world that emerges.

Acknowledgment: The author would like to thank Neil Neubert, engineering manager of JVC, in addition to Sony, Panasonic and Exabyte Corporation for their help with this article. ■

➡ *For more information on S-VHS and Hi8 equipment, circle (300) on Reply Card. See also the video products section pages 58-66 of the BE Buyers Guide.*

Radio in transition

Building for duopoly

A successful station merger requires careful planning and good communication.

By Kirk Harnack

The Bottom Line

If you're not already engineering for a duopoly or LMA situation right now, the chances that you soon will be continue to increase. The number of duopolies and LMAs has doubled since the beginning of 1994, and there are even some hints that multiple-ownership regulations will be further relaxed soon. What changes can you expect when your station buys another — or another station buys yours?

It's been a year and a half since the FCC instituted its new duopoly rules. These regulatory changes liberalized many previous restrictions on same-service ownership of stations in a given market. Several hundred station owners are expanding their market influence by buying or lease-managing other stations in the same area. The common "AM/FM" designation is being replaced with FM/FM, AM/FM/FM, and even AM/AM/FM/FM. While keeping sign painters, moving companies and stationery printers busy, these new multistation operations also are testing station engineers' skills and creativity.

When radio stations merge facilities and combine staffs, broadcast engineers must construct new studios, new STLs, new remote-control systems, and train operators to monitor several transmitters. How are engineers anticipating these changes? What pitfalls are there to look out for? How can an engineer be best prepared when it's time to put three or four stations where one or two once were?

The process of consolidating radio stations can be divided into two areas of concern: facilities and staff. Engineers concern themselves with facilities. Owners and general managers tend to worry about staff matters. It's important, however, for engineers and managers to discuss both areas prior to a consolidation.

Technical concerns

When considering a merger of two or more stations, proper planning for the technical and space requirements is critical, so that neither the existing station(s) nor the newcomer is hampered in its operation and, hence, its profit potential. Both engineering and management must agree on the primary aspects of the consolidation. A good starting point is considering how the new station will fit into the existing operation.

The engineering department should take the lead in working out a plan for consolidating facilities.

A prudent engineer will seek out the needs and desires of the management and programming staffs so the new station's facilities and stature will smoothly merge into the existing station framework. It's vital that engineering staff be a part of planning the consolidation from the beginning. This can avoid the pitfalls of surprise when management and programming are told their plans can't work or will be more costly than had been planned.

A common scenario for a duopoly might have WAAA in Bigtown purchasing WBBB in Suburbia. WBBB's studios were already in Bigtown, but WAAA would like to combine the offices and studios into its existing facility. WAAA employs a full-time chief engineer while WBBB uses a contract engineer.

When plans are announced to com-

Continued on page 50

Harnack is president of Harnack Engineering, a broadcast contract engineering firm in Memphis, TN. Respond via the *BE* FAXback line at 913-967-1905.

If you've been quietly suppressing a monumental *urge* to smash the living *HECK* out of every single noisy, clumsy **CARTRIDGE** that's been jamming up your carts for the last *umpteen* years, NOW would be an *extremely opportune* time to *VENT* all that pent-up Rage!

Take out that old NAB cart and plug in Otari's new MiniDisc! It's as easy as that! And you get fast random access editing, auto-programming for commercial sequences, digital I/O, and high quality digital sound for transparent copies. For flexibility, Otari's MiniDisc recorder/player delivers a next-play function and auto cue, plus optional RS-422. In short, Otari's MiniDisc is the perfect cart replacement. And at the same time, you get Otari's legendary "workhorse" reliability for on-air dependability. Call your local Otari dealer for information about how the powerful, yet easy-to-use Otari MiniDisc cost-effectively meets your on-air and production requirements.

OTARI

Otari Corporation
U S A
Phone (415) 341 5900
Fax (415) 341 7200
N Y Sales. (212) 297-6109
L.A Sales (818) 972 3687

Otari Inc.
Japan
Phone (81) 4-2481-8626
Fax. (81) 4-2481-8633

Otari Deutschland GmbH
Germany
Phone 49) 2159-50861/62/63
Fax: (49) 2159-1778

Otari Singapore Pte.. Ltd
Singapore
Phone (65) 284 7211
Fax (65) 284-4727

THE FACT THAT OUR COMPETITORS ARE SUDDENLY PUSHING S-VHS IS A SURPRISE TO EVERYONE,

BUT US.

JVC PROFESSIONAL

At JVC, we figured it would only be a matter of time. And now that other video manufacturers have jumped on the bandwagon by making an even bigger commitment to S-VHS, they've confirmed that S-VHS is truly "the format of choice."

But as all videographers know, a duplication is never as good as the original. That's why so many of them have turned to JVC's S-VHS. As the originator of S-VHS, JVC has invested all of its energies into just this one format. Year after year, this intense product commitment has enabled us to offer exactly what was needed: a broad spectrum of innovative acquisition and editing products, incredible flexibility for easy upgrading, superior workmanship for excellent picture quality and utmost reliability, and tremendous forethought to affordability. It's for these reasons that we've managed to consistently increase our loyal customer base, which is the reason that our biggest competitor has even gone S-VHS. Our customers know who built the "wagon," and those who are merely going along for a ride. But from all of us at JVC, we'd still like to thank our competitors for their support.

For additional information on JVC PROFESSIONAL PRODUCTS, or for the name of your nearest JVC dealer, please call 1-800-JVC-5825.

A CHRONOLOGICAL HISTORY OF JVC's DEDICATION TO S-VHS.

1987 – Developed and introduced the revolutionary S-VHS format.

1988 – The 10 Series, our first professional S-VHS editing and acquisition.

1989 – The 11 Series, a professional S-VHS system with refined and upgraded editing and acquisition capabilities.

1991 – The first S-VHS-C 3-CCD camcorder, the GY-X1.

1992 – The 22 Series, JVC's most sophisticated professional S-VHS editing.

1993 – The first full-size S-VHS 3-CCD camcorder, the GY-X2.
– The BR-S422, the lightest docking portable recorder.
– The world's first and only variable tracking S-VHS player, the BR-S525.
– Advanced DNR with motion compensation.

1994 – "The Edit-Desk System," the most affordable S-VHS system with time code.

1995 – The world will just have to wait.

JVC S-VHS. The Original, The Best.

Continued from page 46

bine the stations' offices and studios, the chief and contract engineers should be discussing a strategy to move WBBB. The plan should include addressing the following issues:

- Equipment and layout requirements for programming
- New studio space and equipment
- Production room facilities
- Integration with existing in-house wiring plan
- STL for new station
- Remote-control system and operator responsibilities
- Moving phone lines and updating phone system
- The contract engineer's role in moving the facilities
- The contract engineer's role in ongoing maintenance
- What other skilled labor might be required

Strategies derived from this meeting should be presented to management as early as possible so that budgeting and logistical preparations can begin.

Sometimes overlooked by management is the full impact of moving another radio station into the same facility with an existing station. Even if some employee cuts are made in the course of a merger, there will be a big increase in activity at the combined location. Also important to consider are the logistics of moving the newly acquired station while keeping it on the air. The engineering department should take the lead in working out a plan for consolidating facilities, then present that plan to management. Naturally, the plan should be flexible enough to accommodate management's budget and time considerations, but should be firm and explicit in areas of prime importance to getting the project done successfully.

Many full-time engineers are finding themselves with too much work and responsibility after stations merge.

Staff concerns

Duopolies and LMAs can create tension and uncertainty among employees of both or all stations involved. For example, what will happen to WBBB's engineer after consolidation?

Because a primary incentive for creating duopolies and LMAs is reduction of duplicate staffing, chances are strong that management will feel two full-time engineers are unnecessary — and perhaps they are. Unfortunately, too many full-time engineers are finding themselves with too much work and responsibility after stations merge. This leads to a decline in the level of maintenance, efficiency, and reliability in the engineering department. Eventually, such a decline will impinge noticeably on each station's viability.

Some duopoly stations have found that employing one full-time engineer and a part-time engineer or contract engineer is a good solution.

Addressing staff changes and concerns early in the duopoly/LMA scenario will be beneficial to both engineering and management. The engineer should realistically evaluate the stations' engineering needs both during and after a consolidation. This evaluation should be discussed thoroughly with management, in order to come to a good understanding of what engineering needs are required to maintain and improve the stations' market positions.

One common problem in planning a consolidation is the

Duopoly problems and solutions

Some stations have entered into duopoly agreements and made plans for moving without regard for FCC main studio rules. This causes real problems when the station's chief or consulting engineer points out that the studios cannot be combined without provision for a legal main studio.

Problems also have come up when engineers discover that no 950MHz STL frequencies are available from the combined studio location to service the newly acquired station.

Be sure to check well in advance and advise management of potential problems early.

And just because the existing station's STL path is clear to its transmitter site doesn't mean the new acquisition's STL path to transmitter site will be good from the same studio location. Be sure to check well in advance and advise management of potential problems early. Be prepared to give alternatives.

A few other helpful tips for smoothing the transition:

- Using new wired digital audio technology with multiple ISDN and Switched-56 lines can free up a station's 950MHz STL equipment for a few days. This can help a station stay on the air during a studio move.
- Check out a new dial-up remote-control system to take the place of traditional wired or subcarrier-based remote controls.
- Remember to meet with your telephone service provider. Services, such as Call Forwarding, Centrex, T1 and DID (Direct Inward Dial) trunks can make a station consolidation much easier to cope with by your advertisers and listeners who contact you by phone. ❑

continuing maintenance on the existing facility while moving the new station in. Day-to-day problems and occasional emergencies won't disappear just because the engineers are busy with a studio move. It's common for an engineer to want to impress management by trying to handle a consolidation while also keeping up with regular duties. Experience has shown that this thinking can prove disastrous to both the existing and new stations. That's why it's vital to plan for enough qualified engineering help before, during and after the move to address the problems and emergencies that are likely to occur.

The process of consolidating radio stations can be divided into two areas of concern: facilities and staff.

The period during a station move and the first few weeks thereafter can put the engineering/management relationship to the test. Problems are bound to crop up during and after consolidation. It's important that engineers meet often with managers to discuss progress and problems. Having potential and actual problems brought up and worked out early is far better than waiting for operations, programming and sales personnel to raise such issues with management.

Summary

There are more than 1,400 stations in duopoly and LMA situations today. Many if not most of these have consolidated their operations for reasons of cost efficiency. If your station is about to engage in a consolidation, talk to your counterparts at stations that have already combined.

Work on improving the relationship between management, programming and engineering departments. Show that the engineering department can be not only a necessary, but a desirable and helpful, part of the company's strategy in acquiring and operating other stations in your market. The job you save could be your own. ■

Re: Radio

RF shielding

By John Battison, P.E.

The other day, a young engineer asked me what a Faraday Shield was. Apparently he had come across a peculiar RF device with a vertical metal grid placed between two coils. Someone had told him it was a Faraday Shield, but didn't tell him how it worked. Our subsequent discussion ranged into the topics of skin effect, RF radiation and RF shielding, and it is summarized in this month's column.

Skin effect produces some strange results at times and always should be considered when working with RF — especially high-power RF. Two fields are involved in RF transmission: the E field (electrical lines of force) and the H field (magnetic lines of force surrounding a flowing current). Whenever electrical energy moves, these fields are produced and, together, they are known as *electromotive energy*. The *E* and *H* lines of force are always at right angles to each other, and the electrical energy always moves at right angles to both fields.

You might be inclined to say "So what?" Actually, these two fields have a great affect on our RF operations. The basic result of skin effect is power loss due to heating of an RF-carrying conductor. It is helpful to understand how these losses occur: We think of E lines of force as being perpendicular to the axis of the conductor. In fact, they turn out to be not quite so, but might be considered as "dragging their feet" or "leaning forward," like the wave front from a vertical antenna, which becomes tilted as ground losses cause the "bottom" of the wave front to drag behind the "top."

Because of the tilt, the radially moving E field that surrounds the conductor actually enters it — the conducting material "short circuits" the electric lines of force. As always, when an electric field moves a charge through a conductor, a current (and therefore an I^2R loss) is generated. This energy is deducted from the total power applied to the conductive path, and thus, the power loss is explained. This current also produces a magnetic field in opposition to the H field and, thereby, tends to reduce it.

Skin effect produces some strange results, and always should be considered when working with RF.

This shows that skin effect can be measured in physical units. The current density in the conductor follows the same attenuation law as the change in voltage or current along the line. Such an exponential decrease enables us to determine the effective skin thickness, which is used to calculate the resistance of paths at radio frequencies.

At 100Hz, the effective skin thickness of copper is 0.260 inches, while at 1kHz it is 0.0826 inches and at 1MHz it is 0.00260 inches — indicating that the lower the frequency, the more current flows through the center of the conductor. As frequency increases, more current moves to the outer surface of the conductor, and eventually, almost no current flows in the center of the conductor. At 1MHz, a solid copper cylinder has the same RF resistance as a half-inch copper pipe. So we use silver-plated copper tubing in RF systems and save a lot of money and weight.

Too close for comfort

Another strange peculiarity of RF in conductors is the *proximity effect*. When conductors are close together, this phenomenon results from a distortion of the surrounding fields and the concentration of current at these points. The smaller the separation, and the larger the conductors, the greater the proximity effect. As you might expect, this effect is extremely strong inside inductors. The current in an inductor tries to follow the path of least inductance, which exists at the smallest (i.e., innermost) diameter of coil. An interesting result is that the coil's RF resistance is about three times that of the same conductor if it were straightened.

When I was introduced to the wonders of radio in the early 1920s, medium- and long-wave stations were all that existed (apart from a few hams). Regard for the proximity effect caused most makers of broadcast radio coils to use *Litzendraht wire*. It consisted of a number of extremely fine (small gauge), individually insulated wires, woven or cabled together to form a single strand. It was necessary to remove the silk insulation from each individual wire before soldering to a lug. The theory of operation is that the total RF resistance will be less than the equivalent-sized solid wire, because the current is distributed equally among the individual wires. You don't see much "Litz" wire these days, except in a few chokes and other special devices, or in some audiophile speaker cables.

As the electron turns

Have you ever wondered why flat straps are used instead of braided wire for connections to antenna-circuit inductors? It's because of the possibility of appreciable RF resistance at radio frequencies and a greater inductive effect from "round" wire.

On the other hand, if you pass an RF current-carrying conductor through a metal ring, the same amount of current that's in the conductor will flow through the ring. The current is said to be flowing around the ring in a *toroidal* direction — or like a doughnut. It is at right angles to the plane of the conductor.

This principle is applied when ferrite beads are placed around equipment leads to keep out unwanted RF voltages. Sometimes when equipment is repaired, these little beads are lost or not put back. (Perhaps the person doing the work didn't know their purpose.) It is surprising how much difference this omission can make in operation. ■

Battison, *BE*'s consultant on antennas and radiation, owns John H. Battison and Associates, a consulting engineering company in Loudonville, OH. Respond via the *BE* FAXback line at 913-967-1905.

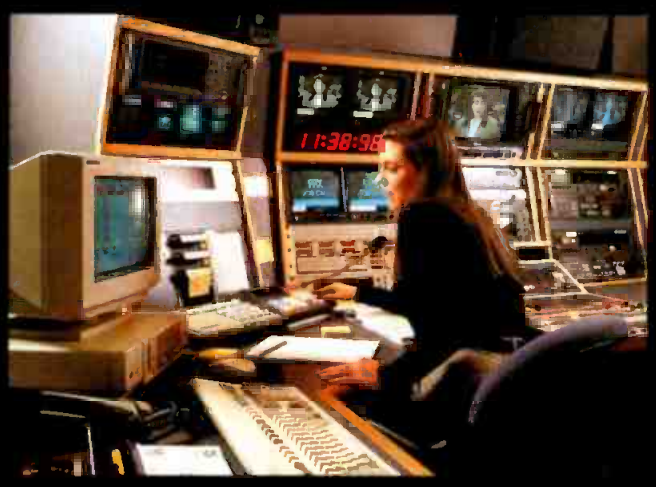
Dana McDaniel can tell you anything you want to know about broadcast automation. But make it quick, ok?

As they say at ChicagoLand TV News, you've got five seconds. Four. Three. Two. Welcome to news when it happens, not when you expect it, or have the staff to handle it. It's broadcast on double espresso. Where any second a producer can override your play list and scream "Let's go live!"

So how *does* an Operations Supervisor keep her sanity at 24 hour news station? Meditation? Primal screaming? Sanka? Try total station automation, by Louth. From the moment it hit the airwaves on January 1, 1993, the entire station has been running on Louth: ADC-100 automation, Autoscreen media management, and the Traffic Interface Manager to tie it all together. All of which gives Dana and her staff absolute flexibility and control under any conditions. From merely frantic to those last second edits to 10,000-event playlists.

If you're considering broadcast automation, talk to the people who use Louth—like Dana. And don't be afraid to get right to the point. After all, air time is money. And she doesn't have a moment to waste.

DON'T WASTE HER TIME



LOUTH
AUTOMATION

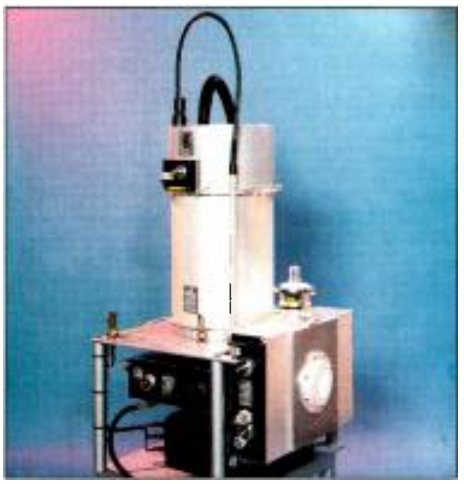
545 Middlefield Road, Menlo Park, California 94025
(415) 329-9498 Fax: (415) 329-9530

Circle (28) on Reply Card

The transition to HDTV transmission systems

Now's the time to start thinking about it

By Don Markley



Now that the HDTV field tests are complete, the day looms even closer when stations will want to start the conversion to HDTV. More articles have been appearing about the anticipated performance of ATV systems and about the massive conversion of studio facilities and transmitters. It appears that planning is currently under way at many stations to implement HDTV in a reasonable, scheduled manner. Those plans should include the consideration of some important real-world problems.

Antennas

Many manufacturers are looking at smaller antennas for HDTV. Some manufacturers are offering antennas that have low windload and weight for side-mounting on existing structures; others offer broadbanded panels, which will accommodate multiple stations diplexed into one antenna. Multiple antennas will be available from well-established manufacturers and virtually all should be capable of meeting the needs of HDTV stations. However, there are performance requirements that will be somewhat different than for NTSC systems.

Commonly, NTSC antennas have been tuned to optimize the VSWR around those frequencies that have the greatest power levels. Primarily, these are the visual carrier ±0.5MHz, aural carrier and the color subcarrier. Although the rest of the band was of concern, the most stringent requirements were at those three areas. A fairly common requirement was a VSWR of 1.05:1 around the visual carrier, 1.07:1 around the other two frequencies and under 1.1:1 over the rest of the 6MHz. band. This was done for two reasons. First, some transmitters simply perform better when looking into a low VSWR load. Second, and more important, ghosting can become visible in the station's signal at higher VSWR levels.

With HDTV, transmitter power will be more uniformly distributed across the channel. That means no single frequency or part of the band will have greater importance than the rest. Depending on who is making the prediction, the actual VSWR that can be tolerated varies slightly, but some numbers seem to be uniformly acceptable. A return loss of 30dB, corresponding to a VSWR of 1.065:1 would seem to be a good working value for HDTV antennas. That seems to be a reasonable limit over the channel with greater values of return loss at other points in the channel being acceptable.

One manufacturer has stated that a 10dB variation between 30dB and 40dB of return loss will be quite acceptable for HDTV. Variation in the opposite direction, from 30dB up to 20dB, may cause unacceptable problems. The good part is that all of the major manufacturers feel they can meet the 30dB goal. The technology is well developed and has been demonstrated in the field.

The general consensus is that single-channel HDTV antennas will not be a significant problem in the conversion process. The same holds true for multichannel antennas, primarily of the panel variety, as long as the 30dB criteria is maintained over each of the channels in use. Again, that technology exists and has been field proven.

Among the possible HDTV antenna types is this dual-mode panel from Jampro. These units can be used in any application where aperture and/or windload are critical factors.

Transmission line

Transmission line technology for HDTV does not differ from current types, and it seems there are no problems lurking in the dark to destroy the chief engineers' day. Based on power-handling requirements, 3-inch cable can be expected to be quite popular for HDTV systems. The semi-flexible cables will be adequate for many stations. However, there will be users who elect to stay with rigid line. The relative benefits of both types of line have been covered in the literature and should be familiar to all.

In some cases, especially with taller towers, larger cables will be selected to obtain greater efficiency, up to and including 6$^1/_8$-inch rigid line and waveguide. Remember that a 2,000-foot run of 6$^1/_8$-inch can have an efficiency of less than 50% at the higher channels. The old rules of economics will still apply concerning whether it is better to pay more for the line or pay more every month for power and transmitter costs. This is a new problem for the VHF operators but one that is familiar to UHF stations.

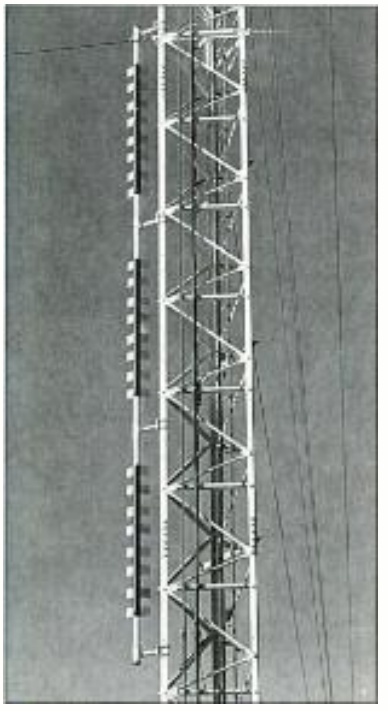
Real-world problems

The real problems in the conversion would appear to lie, not in the area of antennas and lines, but in the practical change in facilities. First, the tower must be considered. Many existing towers will have difficulty accommodating another antenna and line. There are many towers in use that were built 30 years ago or more under less demanding standards than are currently in effect. The original RS-222 standard required only both sides of one sheet of paper. The new ANSI/EIA 222E is a tidy

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

little book that contains requirements not even considered 30 years ago.

The first check for any station is to have its tower studied by a reputable structural firm or manufacturer. The new antenna itself will probably not be the problem, because it will only constitute a small load at an isolated location. The greater problem will be the transmission line. On even a 500-foot tower, an additional 3-inch coaxial cable presents a new load of 125 square feet, which is distributed along the length of the tower. The antenna load may be handled, in some cases, by some minor structural changes or the change of one or two sets of guy cables. The transmission line load may require modification of a large portion of the tower or tower replacement.



One of several possible HDTV antennas is this unit from Andrew, which is lightweight and presents a low windload to the tower.

This is where the first of the real world problems will start to rear its ugly head. With particular regard to the taller towers, there is a limited number of companies capable of building such structures. The readers are free to do their own guessing, but a number around 10 is realistic. If you are considering the 2,000-foot monsters with multiple antennas, the number gets closer to four or five. Now consider the number of stations that will be changing facilities. Currently there are approximately 1,500 stations operating in the United States. If only 10% of those need new towers, the obvious conclusion is a need for 150 new towers, some being extremely tall. That simply cannot happen over a period of two to three years.

Let's assume only 20 of those 150 new towers are 1,500 feet, or greater. Towers of that size are only built by a few crews, limited by experience and the size of the equipment needed for construction. Those 20 towers would occupy the time of several crews for a couple of years. The rest of the tall tower crews, probably less than 20, would have 130 towers to erect.

The simple arithmetic is overwhelming. In addition to the new construction, approximately 1,350 antennas and transmission lines must be installed, many with some tower modifications. It has been estimated that about one month per installation would be a reasonable average number when it is realized that some jobs will require much longer due to structural work. Even if that average were as low as three weeks, including necessary items, such as travel between sites, a little time off and weather delays, at least 25 more experienced and equipped tower crews must be found somewhere if the work is to be accomplished within three years. The total is now up to approximately 45 tower crews with the ability to install TV antenna systems. Remember, there is still tower work going on in the rest of the industry including cellular, PCS, microwave, AM, FM and 2-way radio.

The conclusion is obvious. There simply aren't enough capable crews and manufacturers. Simply put, the transition will take longer than three years no matter how well planned and executed.

The problems will be enlarged by the need for field tuning of all of the antennas. There are less than 10 groups currently in the field who are experienced and equipped to field tune TV antenna systems. The conclusions are again obvious. It must be remembered that buying some test equipment doesn't provide the experience necessary for antenna field work any more than buying a winch makes a rigger. It isn't simply a matter of hardware. If it were, the problems would be simple and readily solvable. The problem is people with experience in the field with antennas, towers and the construction of transmission systems.

The solution

Start now. Get your tower analysis work done as soon as possible. Then get the work scheduled with reputable manufacturers and crews. It isn't possible to order an antenna until the channel is known, but the tower work could be completed or at least scheduled to minimize the time needed to make the transition. In addition talk with transmitter and antenna manufacturers and consider placing an order for needed items, or more accurately, production slots. The alternative is attempting to get on the list when everyone else is trying to do the same. The early bird won't necessarily get any worms in this case — but at least it will be on the field before the arrival of the whole flock. ■

Industry Briefs

BUSINESS SCENE

Abekas Video Systems, Redwood City, CA, has commenced shipment of its ASWR8100 component digital switcher with delivery of systems to CNN and Video Wisconsin.

Advanced Audio Visual Systems (AAVS), Sioux Falls, SD, has sold six digital video analyzers to Pacific Bell in California. Also, Editel, New York; The DI Group, Boston; and Modern Videofilm, Burbank, CA, have purchased S310 digital video analyzers. AAVS digital video analyzing equipment has been installed at Texas Instruments, Silicon Graphics, PBS and ESPN.

Arrakis Systems, Fort Collins, CO, and Wegener Communications, Duluth, GA, have formed a strategic alliance to create an integrated digital satellite-controlled workstation. The Arrakis Gemini and Digilink workstations will be combined with Wegener's patented Addressable Network Control System and DR96 series MPEG-2 digital audio receivers to create DISC (Digitally Integrated Satellite Control).

Silicon Graphics, Mountain View, CA, has collaborated with CBS News and Post Perfect Productions to create IRIS OnAir, a development tool that enables a production group to create the broadcast design with real-time, 3-D video and graphics.

Prime Image, Saratoga, CA, has sold video standards converters to the Swaminarayan Temple, Bombay, India.

Quantel, Darien, CT, has installed a full-service post-production facility for Henninger Capitol, Washington.

A fifth Quantel Paintbox has been delivered to Pittard Sullivan Fitzgerald, Hollywood, CA.

Utah Scientific, Salt Lake City, has installed a video signal routing system for the Upjohn Company.

Russ Berger Design Group, Dallas, has expanded to a new location. The new address is 4006 Beltline Rd., Suite 160, Dallas, TX 75244; phone 214-661-5222; fax 214-934-3935.

Digital Audio Research, Surrey, England, has delivered a fifth DAR Delta audio workstation to Twickenham Sound Station.

Otari, Foster City, CA, has sold Premiere consoles to Universal Studios, Los Angeles; Saul Zaentz Company Film Center, Berkeley, CA; and Four Media Company (4MC), Burbank, CA.

Xymox Systems, Van Nuys, CA, has sold Myriad Facility Manager software systems to Pacific Title Digital, Los Angeles; Advanced Digital Services, North Hollywood, CA; IVL, Minneapolis; Warner Brothers, Hollywood, CA; West End Post, Dallas; Video Post and Transfer, Dallas; Motivation Media, (Chicago and Glenview sites); and Gastown Post and Transfer, Vancouver.

PolyPhaser, Minden, NV, marks its 15th year in the business of providing lightning/electromagnetic pulse and grounding solutions.

Avid Technology, Tewksbury, MA, has sold the NewsCutter disk-based editing and AirPlay playback systems to the Canadian Broadcasting Corporation, Windsor, Ontario.

AudioVision systems have been installed at Paramount Pictures, Hollywood, CA; Screen Music, Studio City, CA; and Skywalker Sound, Marin County, CA.

NVision, Nevada City, CA, has received orders from 525 Post, Los Angeles; CBS, Los Angeles; Industrial Light and Magic, San Rafael, CA; and Digital Cable Radio.

Memex Software, Vancouver, BC, has developed and implemented computerized TV management systems for DirecTV, a unit of GM Hughes Electronics.

Acrodyne, Blue Bell, PA, has built, delivered, and commissioned the first tetrode-equipped 30kW UHF TV transmitter in use in the People's Republic of China.

ITS, McMurray, PA, has been awarded a Ben Franklin Partnership Challenge Grant to conduct research in adaptive equalization of terrestrial digital TV transmission in a joint effort with Carnegie Mellon University.

Rorke Data, Eden Prairie, MN, has begun shipping the latest Seagate and Micropolis AV high-capacity disk drives.

Solid State Logic, New York, has sold a second SSL ScreenSound digital audio editor to Kampo Audio/Video, New York.

NFL Films, Mount Laurel, NY, has purchased an SL 8048 G Plus console with Ultimation and Total Recall, and ESPN, Bristol, CT, has installed a 48-channel SL 5000 G series console with Total Recall.

NTL, Hampshire, England, has collaborated with News Datacom and Comstream to develop the VSC MPEG-2 video compression system. Star TV has selected the digital compression system for DigiStar, a new multichannel digital TV service that will be launched in 1995.

Keystone Communications, Washington, has contracted with the Associated Press to provide a full-time, digital, fiber-optic video circuit from New York to Washington.

CBS and Keystone Communications have renewed a contract to provide a weekly transmission of *Wall Street Journal Television* to the Pacific Rim.

Audio Video Corporation, Burbank, CA, has sold Virtual Recorder systems to KOTA, (ABC) Rapid City, SD; KINT (IND), El Paso, TX; KRON (NBC), San Francisco; KCTF (PBS), Waco, TX; KMIR (NBC), Palm Desert, CA; KPBI (FOX), Fort Smith, AR; WBIR (NBC), Knoxville, TN; WYED (IND), Clayton, NC; WOLF (FOX), Scranton, PA; and WOWL (NBC), Florence, KY.

NXT Generation, Greendell, NJ, has relocated its primary service facility to Florida. The new address is 6759 Plantation Manor Loop, Fort Myers, FL 33912; phone 813-561-4191; fax 813-561-4194.

Alpha Image, Salt Lake City, has sold an Alpha 500 component digital switcher to Dome Productions for the SkyDome, home of the Toronto Blue Jays and the Toronto Argonauts.

PEOPLE

David Oren has been appointed professional products sales manager for Alesis, Los Angeles.

James Sinclair will head NTL's new office in Hong Kong. Sinclair specializes in digital and satellite communications.

Virginia Lee Williams has joined International Datacasting, Atlanta, as director of sales and marketing.

Mark C. Gray has been appointed chairman of the board of directors and chief executive officer for Chyron, Melville, NY.

Warren Weinberg has been appointed director/product services for Alesis, Los Angeles. ■

PORTADAT

PERFECT PORTABLE DAT

Quite a claim, we know. But then these are no ordinary DAT recorders. Designed in consultation with representatives from all areas of professional audio recording by HHB, the World's leading independent suppliers of DAT technology, the PORTADAT range has every detail covered. Compact, light and sonically superb, the PDR1000 features a rugged direct drive transport with 4 heads for confidence monitoring, 2 hour rechargeable battery life, 48v phantom powering, balanced analogue inputs, 44.1/48/32KHz sample rates, digital I/Os and a full range of indexing facilities. In addition, the PDR1000TC is equipped to record, generate and reference to time code in all international standards. But perhaps the most remarkable feature about the PORTADAT range is that for once, perfection doesn't cost the earth. For a free, 8 page color brochure on the PORTADAT, the future of portable DAT recording, call Independent Audio or mail the coupon today.

Circle (29) on Reply Card

Independent Audio · 295 Forest Avenue, Suite 121, Portland, Maine 04101-2000, USA
Tel: 207 773 2424 · Fax: 207 773 2422

Studer Revox Canada Ltd · 1947, Leslie Street, Toronto, Ontario M3B 2M3, Canada
Tel: 416 510 1347 · Fax: 416 510 1294

HHB Communications Ltd · 73-75 Scrubs Lane, London NW10 6QU, UK
Tel: 0181 960 2144 · Fax: 0181 960 1160

HHB

For full details of the PORTADAT range of portable DAT recorders, please mail this coupon to Independent Audio

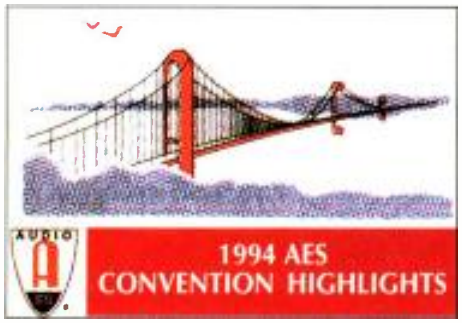
Name _____

Address _____

Zip Code _____ Tel _____

DAT Digital Audio Tape

New Products



Stereo real-time de-hisser
HHB Communications

• **DH-1:** from Cedar Audio, removes hiss and broadband noise in real-time without any need for a spectral fingerprint; features a twin 32-bit floating point internal processor, 24-bit AES/EBU and 16-bit SP-DIF digital I/O, balanced analog I/O with 18-bit/>103dB ADCs and 18-bit/>93dB DACs; based on SERIES 2 CEDAR hardware; standard 2U 19-inch rack-mountable design.

Circle (350) on Reply Card

Audio-For-Video equipment line
Sony Electronics

• **MXP-700:** TV production console series offers three frame sizes (16, 28 and 44 channel) and 30 different modules; provides a variety of functions tailored to TV on-air and production applications, featuring mix-minus outputs and clean-feed buses; ideal for remote broadcasting from OB vehicles; available in February 1995.

Circle (390) on Reply Card

Fully integrated codec
CCS Audio Products

• **Prima:** "thinking" codec allows user to customize Prima for each application; supports MPEG-1 at 32- and 48kHz sampling; uses 18-bit D-to-A and A-to-D technology to increase signal-to-noise ratio and guarantee sonic purity; features include built-in ISDN terminal adapters, standard H.221 (J.52) multiline inverse multiplexing, AES/EBU digital interfaces with automatic rate adaption, in-band birectional RS-232 data communications and MUSICAM compression algorithm with encoder enhancements; 19-inch rack-mountable unit, equipped with international power supply and I/O connectors.

Circle (351) on Reply Card

Time code analyzer
Brainstorm Electronics

• **SR-15+Distripalyzer:** identifies the format, stability and frame rate of incoming codes, monitors its synchronization with video (phase and color field alignment) and reports time code errors; analyzer features include 24, 25 or 25 FPS code, drop frame or non/drop, reference-to-video rate 29.97 or 30 FPS; distributor/reshaper offers five buffered and balanced outputs with individual level controls; extracts pilot tone (50 or 60Hz) from time code, video or AC.

Circle (352) on Reply Card

On-air console
Soundcraft

• ***RM100:*** available in a range of frame sizes to provide 8, 12 or 20 inputs, which are selectable from mono, stereo and Telco modules and Script Tray; used as stand-alone or installed into studio furniture; features program and audition stereo outputs, VCA faders on all inputs, comprehensive monitoring facilities, standard or deluxe meter bridge and remote start/stop controls.

Circle (353) on Reply Card

Digital cassettes
3M

• **AHD Audio Hi8:** designed with ultrafine metal particles, which raise audio signal-to-noise ratios for true-to-life sound; provides 113 minutes of recording time; features an advanced binder system and a stabilized polyester backing to assure fewer data errors and durability during the editing process.

• **ASD digital audio tape**: designed for digital audio multitrack applications; provides up to 42 minutes of recording time at the 48kHz sampling rate; offers quality performance for tracking, mastering, editing or playback; features an advanced binder system and a stabilized polyester backing to assure fewer data errors and durability during the editing process.

Circle (354) on Reply Card

Total studio system
Solid State Logic

• **SI 9000 J series:** audio circuitry includes the main LCRS mix bus, four additional stereo mix busses and access to 48-track tape machines; features include six mono and one stereo aux sends per channel and an equalizer switchable between E and G series EQ characteristics; provides automation of up to 240 faders and 1,320 switches; frame sizes up to 120 channels; integrated digital audio and video storage/editing options.

Circle (355) on Reply Card

Audio/Video Rack series
Rorke Data

• **AVR 35:** 14-inch deep x 4RU high; one switching 65W P/S; 2 SCSI ID PB and AC power switch access from front; holds two 3½ or 5¼-inch HH disk, tape, MO optical or CD-ROM.

• **AVR 05:** 14-inch deep x 4RU high; one switching 65W P/S; 2 SCSI ID PB and AC power switch access from front; holds two 3½ or 5¼-inch HH or one 5¼-inch FH disk, tape, MO optical or CD-ROM or DAT stacker.

• **AVR 05:** 17-inch deep x 4RU high; one switching 300W P/S; 4 SCSI ID PB and AC power switch access from front; holds four 3½ or 5¼-inch HH or two FH or combinations of each; uses disk, tape, MO optical or CD-ROM or DAT stacker.

• **AVR 410:** 21-inch deep x 4RU high; one or two switching 300W P/S; 8 SCSI ID PB and AC power switch access from front; holds eight 3½ or 5¼-inch HH or four FH or combinations of each; uses disk, tape, MO optical or CD-ROM or DAT stacker.

• **AVR PC:** 26-inch deep x 4RU high; one switching 300W P/S; 8-, 12-, 16-slot EISA, keyboard, turbo, reset, lock and indicators accessed from front; up to six internal drive bays.

AVR series options include RAID levels from disk stripping & mirroring to high-end fault-tolerant RAID 3 & 4; up to eight additional SCSI I/Os are available for some high-end audio/video digital workstations.

Circle (356) on Reply Card

The biggest thing to happen in broadcasting since . . .

Pro MiniDisc cart recorder and player

Sony Electronics

• **MDS-B3 recorder/player and MDS-B4 player:** features direct digital interfaces for complete digital system integration for use on the air or in production suites; include an RS-232C port for computer interface control, a headphone jack with volume level, and timer/play control with automatic recuing function; also offer illuminated controls with the "press-and-play" functionality of standard analog NAB cart machines; units are EIA rack mountable in a 3-across configuration; MDS-B3 comes with a separate keyboard/remote control for use in track editing or entering text.

Circle (357) on Reply Card

ISDN manager and digital reporter terminal

Audio Processing Technology

• **PRO-LINK:** integral 6-channel terminal adapter allows direct connection to ISDN; 6-channel synchronizer and inverse multiplexer can manage up to three seconds differential time delay; fail-safe operation with automatic bandwidth allocation; user-friendly control of all functions from front panel or remotely via RS-232 port and Hayes AT commands; I/O via composite X.21, RS-449 and dedicated DSM 100 port or six 56/64Kb/s X.21 ports.

• **DRT 128:** digital reporter terminal, designed for outside broadcast and limited bandwidth applications; offers simultaneous transmission and reception of professional-quality audio over ISDN; features 32kHz and 16KHz sampling frequencies, apt-X digital audio data compression, full compatibility with ALL apt-X-based codecs, integral two B channel TA with full Telecom approval in 52 countries and 2-channel synchronizer and inverse multiplexer capable of compensating for up to three seconds differential delay; balanced analog accessible via XLRs on rear panel.

Circle (358) on Reply Card

Continued on page 64

. . . the autumn of 1921 . . .

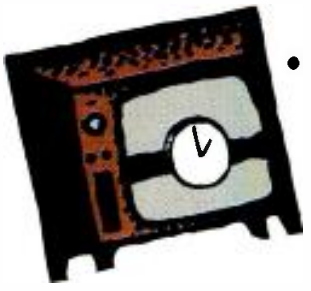
. . . when Graham McNamee of WJZ in New Jersey broadcast the first description of baseball play-by-play action in the New York Yankees vs. the New York Giants World Series . . .

. . . Philo's phenomenon in 1933 . . .

. . . when Philo Taylor Farnsworth developed the electronic television set, forever changing the way America spends Saturday night . . .

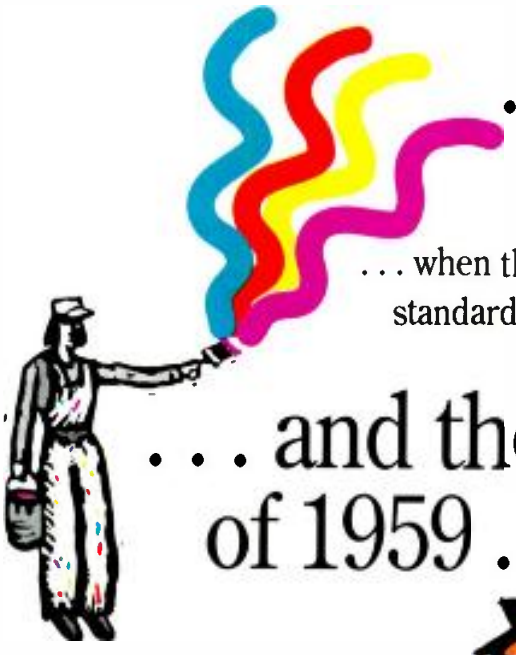
. . . a scary eve in 1938 . . .

. . . when Orson Welles and his Mercury Theater troupe aired the H.G. Wells classic, "War of the Worlds," and threw a nation of gullible listeners into panic on Halloween eve . . .



. . . one milestone minute in July 1941 . . .

. . . when the Bulova watch company paid $9.00 for the first minute of commercial television advertising . . .



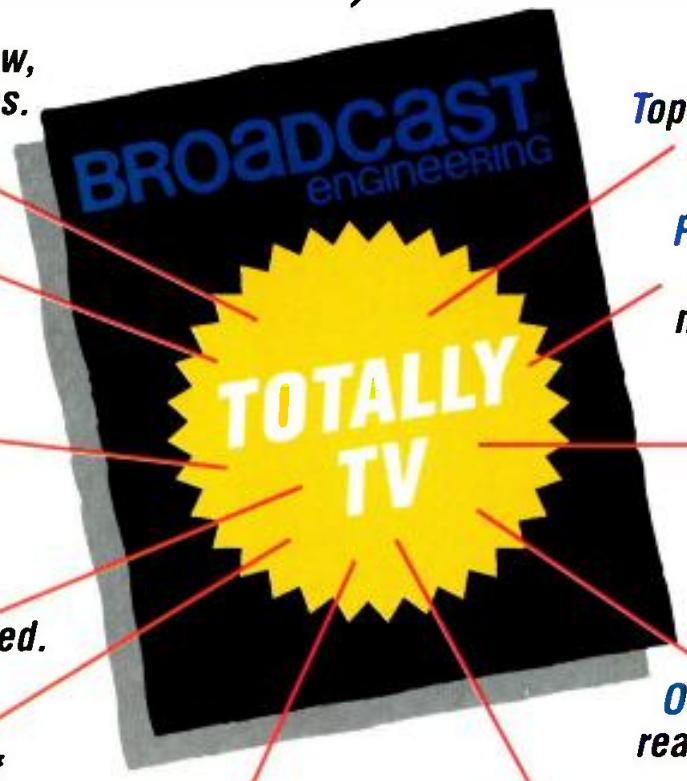
. . . a brilliant move in 1953 . . .

. . . when the FCC adopted the NTSC color television standard that's still in use today . . .

. . . and the landmark year of 1959 . . .

. . . when Broadcast Engineering was launched, setting the standard of excellence in radio and television industry publishing for the next 35 years.

In January 1995, we'll set a new, totally-television and a new, stand-alone



In-depth coverage of new, converging technologies.

Expanded coverage of audio for video.

Hard-hitting, solutions-oriented features written by industry experts.

Re-vamped and re-designed.

First with the finest coverage of changes and trends in the industry.

More news, reviews and points of view.

More of the best contributing writers in the industry.

On-line services for reader/staff dialogues.

New columns on ATV, digital and interactive technologies.

Packed with a multitude of multi-focused articles.

Topical, leading-edge cover stories.

Totally television. Totally focused on the converging markets creating the new media for the 21st century.

Television • Cable/Telco • Production • Post Production
Business TV • Satellite • Interactive • Advanced TV

Thirty-five years ago, technology was the driving force in the broadcast industry. And we were there with a vision. To be the consistent, reliable and authoritative source of information for the television and radio professional. To help you stay in step with these exciting, expanding industries and profit from the knowledge. To be the leader.

Since then, evolving technologies and the digital revolution have caused the proliferation of new options and new products, changing what you need in a magazine. We'll answer this need with continued reliability, authority and the vision it takes to help guide you through the unlimited possibilities of the future.

BROADCAST engineering
The Pulse of the Industry

The standard again with Broadcast Engineering BE Radio magazine!

New columns on contract engineering, technology management and RF engineering.

More pages filled with solutions-oriented features and columns.

Expanded digital coverage.

Addresses both management and engineering concerns.

More "how-tos" for consultants.

More contract engineering and RF articles.

Technology in a non-technical environment.

More about small markets and the issues that affect them.

Timely coverage of news, new products and new technologies.

The high-powered, information-packed magazine exclusively for the professional.

Radio Stations • Combination Radio/TV Stations
Contract Engineers • Recording Studios • Consultants

The look and quality of Broadcast Engineering in a stand-alone magazine dedicated to the radio industry. The all new BE Radio is exactly what you asked for. Focused on the specific issues affecting radio today and tomorrow. Colorful, graphically dynamic and highly readable. A reliable source of the information you need to help you make critical decisions in an increasingly competitive marketplace.

The new BE Radio will come your way every other month with 52+ information-packed pages in every issue. Plus a special bonus seventh issue, the Product Showcase tabloid displaying the latest introductions in full color with brief descriptions and inquiry service numbers. Don't miss a single, exciting issue of the new BE Radio. Subscribe today!

BE Radio
From the Editors of Broadcast Engineering

New Products

1994 AES CONVENTION HIGHLIGHTS

PCMCIA interface and translator
Audio Precision

• **PCM-DOS:** interface card for System One audio test, fits in standard PCMCIA card slots provided on most notebook and sub-notebook computers, eliminating the need for an ISA bus slot on the host computer or a "docking station;" available in mid-February 1995 as a stand-alone or interface upgrade when ordered with a new System One.

GAT-1: GPIB-to-APIB translator allows users to operate their System One either via their existing interface or from an IEEE-488 GPIB controller; operates independently of the audio analyzer, thus specialized industrial systems for DC measurements or switching alone may be configured; available January 1995.

Circle (359) on Reply Card

Professional power amplifiers
QSC Audio Products Inc.

• **PowerLight Series:** designed for use in mobile sound applications; weighs 18 pounds and is two rack spaces high; features three different models, providing 2W power points of 500W, 700W and 900W per channel, respectively; custom high-efficiency heatsink allows long-term performance into low impedances; also features detented calibrated gain controls, Neutrik "combo" connectors for XLR and 1/4-inch inputs, LED meters that indicate signal level and amplifier status and stereo/parallel/bridge switch; rear contact allows remote control, AC power control when amps are in stand-by mode to reduce in-rush current demands.

Circle (360) on Reply Card

Dual-channel low-profile shielded pairs
GEPCO International Inc.

• **24-gage stranded conductors:** shielded bonded to jacket so both can be stripped in one operation; 1987 National Electrical Code Compliance; passes UL 1581 Vertical Tray Flame Test; conductor: 24 AWG (7x32 AWG) TC, 24W/M feet; pair shield constructed of 100% aluminum/vinyl tape; overall jacket is black, right channel is marked with red stripe.

Circle (361) on Reply Card

Portable mixer
Shure Brothers Inc.

• **M367:** offers the reliability and durability of the M267; features six inputs, internal DC/DC converter, 48V phantom power, 87dB of gain and mechanical VU meter; also features input peak LEDs, detachable power cord, two XLR outputs, power-on LED, headphone monitor circuit and output peak/limiter LED; powered by two 9V batteries.

Circle (362) on Reply Card

Pro series power conditioners
Furman Sound

PM-PRO, PS-PRO, PL-PRO: provide complete and comprehensive protection from power line-related transient voltages, noise and wiring faults available; features 20 amp rate (2,400W), precision-magnetic circuit breaker and Extreme Voltage Shutdown, which guards against destructive wiring faults; multiple levels of protection components can safely absorb large spikes and provide effective RF filtering.

Circle (363) on Reply Card

Audio/data networking system
BEC Technologies Inc.

•**Σnet Series:** AD2 20-bit stereo analog input module inserts a stereo pair on 64 network channels; features 108dB dynamic range and 0.001% THD+noise, +24dBu maximum input level; available with digital AES/EBU input.

DA2 20-bit stereo analog output module reads any stereo pair from the 64 network channels; features 108dB dynamic range, 0.001% THD+noise and +24dBu maximum output level.

Circle (384) on Reply Card

Digital audio workstation
Fairlight

•**Mini:** portable version of MFX-3 system; a full 24-track system that may be supplied in 4- or 8-channel configurations; U.S. pricing begins at less than $28,000.

Circle (385) on Reply Card

Wireless microphone/transmitter
Sony

• **WRT-867A:** operates in the 800MHz UHF band range; can access up to 94 channels of operating frequencies with a PLL (phase locked loop) synthesized control system; based on the same high-quality microphone capsule of the F-780; ensures low noise, wide dynamic range of stable signal transmission by the adoption of the compander (compressor/expander) system.

Circle (386) on Reply Card

Edit controller
Timeline Vista Inc.

•**Timeline Studioframe edit controller:** offers users a high-resolution scrub/jog wheel for precise machine control and editing functions, as well as dedicated track access keys to all tracks; features a set of software-configurable control keys that can be mapped to a floating toolbar in the application menu; user can assign menu functions to the keys, making software functions hardware ones.

Timeline has announced the introduction of a 24-track upgrade for its Studioframe workstations. The upgrade extends recording configuration capability to include 8, 16 or 24 tracks and integrates with the entire Studioframe system, including the on-board mixer.

Circle (387) on Reply Card

Digital production system
Solid State Logic

• **Axion:** fully digital, fully automated mixing console; features frame sizes from 48 to 96 channels, systemwide or selective reset and hard disk audio storage/editing (up to 95 channels of concurrent access hard disk audio storage); resource management system allows for shared access to comprehensive analogue and digital I/O and hard disk resources.

Circle (388) on Reply Card

UHF wireless system
AKG Acoustics

• **SR800:** features two separate reception circuits with silent switching, dbx noise reduction for extended dynamic range and receiving frequency selectable from 12 subchannels of one UHF TV channel; also features continuously adjustable user squelch via front panel control, front or rear antenna mounting, transformer balanced XLR audio outputs, 11-segment LED bar to indicate audio or RF levels and independent level controls fro headphone and main outputs.

Circle (389) on Reply Card

New Products

PC plug-in board
Applied Concepts

• **SCSI BOOSTER:** compatible for ISA and EISA SCSI bus systems; increases file server and workstation system performance by regenerating and conditioning internal SCSI bus signals; provides SCSI termination to all devices via onboard high-performance active terminators; supports narrow and wide FAST SCSI devices; no additional software is required.

Circle (364) on Reply Card

TV monitoring receiver
Philips TV test equipment

• **PM 5696:** designed for off-air reception and monitoring of TV signals; selective front-end allows instrument to receive and demodulate RF signals between 40MHz and 960MHz at 100μV and 1000mV, as well as receive signals in any environment, even when high RF fields are present; features automatic and manual gain control, and envelope and synchronous detection for descrambling signals; supports a frequency entry (vision carrier frequency) via the keyboard.

Circle (365) on Reply Card

Battery analyzer
Cadex Electronics

• **Cadex C4000:** services NiCd, NiMH and SLA batteries; more than 700 battery adapters available for portable radios, cellular phones, laptops and cameras; battery parameters stored in adapters, eliminating the need to set the analyzer to a specific battery; optional printer interface.

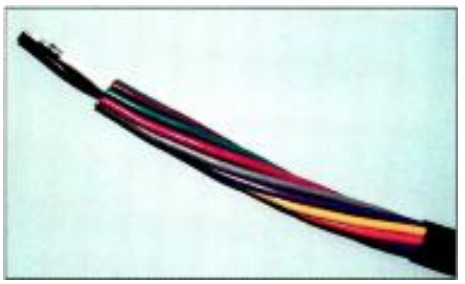
Circle (366) on Reply Card

Compact TV measurements
Rohde & Schwarz

• **Video measurement system VSA:** combines functions of a video analyzer, vectorscope, oscilloscope, monitor and process controller in a single unit; capable of performing up to five complete measurement cycles per second; uses a built-in multiprocessor system, which provides fully digital signal processing with high measurement accuracy and controls all system interfaces; stores measurement results and graphics on built-in hard disk; video and FFT analyzer calculates up to 150 different signal parameters from the input signal applied and provides automatic limit monitoring with the aid of two independent sets of limit values.

Circle (367) on Reply Card

Video cable
GEPCO International



• **Model VS102000:** video snake cable offers increased versatility and convenience for remote use and fixed installations; includes 10 full-sized 75Ω low-loss video coaxials (RG59), cabled together in an extra-flexible, all-weather jacket; each coax has a 100% aluminum/polyester shield with a 96% tinned-copper braid; ideal for applications that require multiple video cables in the field or in the studio.

• **Model LVT61859S:** 75Ω triax video cable for use in remote applications; 21 AWG (19x34 AWG) stranded copper center conductor; insulation constructed of high-density cellular foam polyethylene for crush resistance and low capacitance; two shields are constructed of 95% coverage-braided copper; all-weather jacket enhances the cable's flexibility; currently available as a stock item.

Circle (368) on Reply Card

Digital videocassettes
Fuji Photo Film

• **ADC001:** 19mm digital component videocassette, designed for use with the new Ampex DCT digital recording system; uses super-fine Metallix magnetic particles and Fuji's advanced surface treatment techniques, which provide a smooth tape surface for optimum tape-to-head contact with minimal head wear; also offers a proprietary binder formulation to keep error rate down; available in 35M, 60M, 90M and 120L lengths.

• **D321:** digital metal videocassette for Digital Betacam VTR systems; features improved durability and tape transport stability for ENG/EFP field work and high-speed shuttle operation during editing; prevents tape shrinkage during long-term storage, reducing off-track errors caused by changes in track-pattern dimensions; will be available in 1995 in 6-, 12-, 22-, 32- and 40-minute lengths in the small shell size, and in 34, 64, 94 and 124 minutes in the large shell size.

Circle (369) on Reply Card

Digital video disc system
By Pioneer

• **WORM (Write Once Read Many):** MPEG-2 based system for video archival and video server applications; conforms with General Instruments' DigiCipher II and other video compression formats; dye-polymer recording process facilitates up to 20GB of data on a single disc.

Circle (370) on Reply Card

Continued from page 34

In addition to the basic computer platform requirements, large hard-disk storage space is required, usually starting at 120MB for smaller, simple systems, and extending beyond 400MB as the system grows. Audio data eats up computer storage space quickly. It is also a good idea to have a standard backup procedure for the hard drive(s), because they will be reading and writing a significant amount of data.

Specific hardware requirements can change depending on the particular IPS software needs. Some of the system suppliers can provide hardware as well as software, but it is usually more cost-effective to work with the software developer to determine system requirements, and then obtain the hardware through computer suppliers.

The success of an IPS is influenced by its audio quality. If the system sounds like a low-fidelity answering machine, time spent on line by callers is likely to be minimal. The phone line itself limits frequency response to about 300Hz to 3,000Hz, so any audio feeding the lines should exceed that. The IPS's voice cards will determine the system's audio quality.

The software

Choose a software package that can fit your needs and expectations. The more flexible the software, the more diverse it can become in the future as you decide to add more features.

The caller interface should welcome callers, and make them want to call again. System features should be established for optimum caller effectiveness. The system administrator's interface should allow ease in the maintenance, information retrieval and updating of the system.

The database management system (DBMS) needs to be fast and flexible enough to provide reports that can be used as needed. Ideally, the IPS and DBMS should live on the same system, allowing callers to update their own information, and see their own account statistics.

Applications

Some of the more common features and uses of an IPS are as follows:

•*The registration area*: This is where the caller's identifying information is recorded. To avoid scaring off first-time callers, it is best to keep this brief — probably just asking for name, address, phone/fax numbers and birthday. First-time callers may be calling out of curiosity, and a long series of questions may only turn them away. More detailed information can be gathered on successive calls. The system could be set up to allow new callers to bypass this area, but then only have limited access to the IPS and the benefits of club membership. Previously registered callers will always skip this area once they enter their registration number.

•*Audiotext information*: Basic information announcements are presented in this area, such as concert listings, ski conditions, music ratings and station events. Many stations already offer these services with answering machines or auto-answer carts.

Prompts callers through registration questionnaire
Assigns callers PINs
Opens bonus point accounts for frequent users
Identifies repeat callers by PIN
Alters the branching of call based on caller's previous record
Allows for redemption of points at advertisers' premises
Provides automated merchandise ordering capability
Allows personalized responses to callers' messages
Conducts music surveys and other research projects
Allows fax response, fax broadcast and other fax services
Conducts automated contests
Stores caller profiles and notifies them about their preferences (Favorite artists coming to town, etc.)
Supports outbound dialing for research and ratings campaigns
Connects callers with station staff or advertisers
Tracks activity in on-line database
Provides quick, programmable reports
Removes duplicate names from database

Table 1. *A typical list of features available in the most advanced interactive phone systems.*

•*Call transfer service*: This allows a caller to be transferred to another destination, as a service to a particular sponsor. For example, during the playback of theater listings, a caller can press a key that will automatically transfer the call to the telephone ticket sales office for the show being described at that point in the listings.

•*Fax response*: Operating like a fax-on-demand service, this service can include helpful printed information like a map to the concert hall or the menu of a restaurant.

•*Contests*: A station can encourage listeners to call its IPS to enter the contest, and then expose them to all it has to offer. When an IPS is first started, this is a great way to get listeners into it. The contest entry could be accessed through a line set up for the main contest sponsor or prize supplier.

•*Interactive feedback*: Callers can leave messages for a specific station personality. The personality then can leave a response (either personalized or to a group of callers) that will be heard by the caller(s) on their next visit.

Selecting an IPS

Determining the needs for your IPS is dependent on the station's goals. First decide how complex the IPS will be — whether it is simple audiotext, or a fully loaded, fully interactive system. Will the system be owned or leased? Will it live in the station's offices, or elsewhere? If the IPS is being leased as a service from another company, what are the procedures for updating information, and getting reports back? There are also hardware considerations. How many phone lines will it handle? What is the storage capacity? What is the fax capability? One important question is can it be expanded? If so, how and at what cost?

Some basic system requirements depend on market size and ratings. If your station cume is 500,000 or more, 16 ports (16 calls at once) is a good starting point. As cumes approach one million, 24 ports are more appropriate.

Hard-disk space also depends on applications, but for straight audiotext, 120MB is good. If you are going to be using memberships, plan on 300MB for the incoming information. If you are going to add surveys, interactive feedback and data tracking, plan on 500MB or more.

The computer must be able to house all the option cards, and operate fast enough for the system to run properly. A 486DX33 or better is recommended. For larger systems, a LAN may be necessary to accommodate all the line ports, and to keep the system functioning quickly.

Radio stations today are more than just a jukebox with some advertisers. The more profitable stations are actually mini-marketing firms, and an IPS can help complete this arrangement. Reacting to your market's needs can be achieved almost instantaneously. An IPS may be the solution to reviving your station, or propelling it even further in the market. ■

Editor's note: Thanks to Ted Strauss for information from his book, "Interactive Phone Systems for Your Radio Station."

New Products

Comprehensive display evaluation system
MTL Systems Inc.

• **CODES**: handheld, lightweight testing device designed to provide an easy check for electronic display degradation of an installed system in its working environment; operator can complete a performance evaluation of an electronic display and make spot decisions on a CRT in just a few minutes.

Circle (371) on Reply Card

Free electronics catalog
B&B Electronics Manufacturing Company

• **Serial Communications Interface and Control Equipment**: 18th edition; features 26 pages of affordable solutions to connectivity problems, including RS-232, 422, 423, 475, 530 and Current Loop interface converters; B&B also manufactures stand-alone converters, PC cards, smart switches, control products and software.

Circle (372) on Reply Card

Obstruction lamp alarm relay
SSAC Inc.

• **SCR490D**: senses lamp failure on radio/TV towers and other tall structures; one unit can be adjusted to meet most obstruction lighting requirements and monitor up to nine 116W lamps; current flow in the lamps' wiring is monitored with the toroidal transformer; operates on 120VAC 50/60Hz; circuitry is fully encapsulated in a 2½x3½x¾-inch surface-mount enclosure.

Circle (373) on Reply Card

Remanufacture program
Varian Associates

• Recently launched remanufacture program can double the life of existing power grid tubes for less than half the cost of a new tube; most commonly used Eimac-brand broadcast power grid tubes are eligible; ship aging tube to Varian Power Grid Tube Products manufacturing headquarters in San Carlos for a free evaluation; technicians rebuild tube to meet new-tube specifications; process takes 30 days.

Circle (374) on Reply Card

Circle (33) on Reply Card ➜

New Products

Recordable MiniDisc
Sony Broadcast

• **PRMD-74**: ideal for use with Sony's MDS-B1/MDS-B2P on-air MiniDisc recorder/player and all other recording MD hardware; stores 74 minutes of digital audio on a 64mm disc; features a block-error rate (BLER) of 10^{-4} — a magnitude improvement over standard MiniDiscs; provides undegraded audio performance typically extending to one million read/write cycles; recordings are protected in a CD-style storage case.

Circle (375) on Reply Card

Multichannel audio processor
Panasonic Broadcast & Television Systems

• **MAP**: increases the AES/EBU digital audio channel pairs of Panasonic D-3 composite and D-5 component digital VTRs; allows user to record or playback multiple language version of programs simultaneously from the same cassette; applications include broadcast of multilanguage programming, international cassette distribution or single cassette protection archiving; functions as a standalone A/D and D/A converter as well as a 4:1 bit-rate reduction device for audio applications.

Circle (376) on Reply Card

Time-code monitor with VITC capability
Summertone Ltd.

• **Timecode Monitor**: used for fault-finding, confidence reporting and unattended monitoring of SMPTE/EBU longitudinal time code; can simultaneously monitor, analyze and report errors in vertical interval time code (VITC).

Circle (377) on Reply Card

Standards converter
By Thomson Broadcast

• **TTV 7810**: allows standards conversions from 625 lines (PAL, SECAM and digital) to 525 lines (NTSC and digital) and vice versa; features digital processing with four digital CCIR 601 inputs and four digital CCIR 601 outputs.

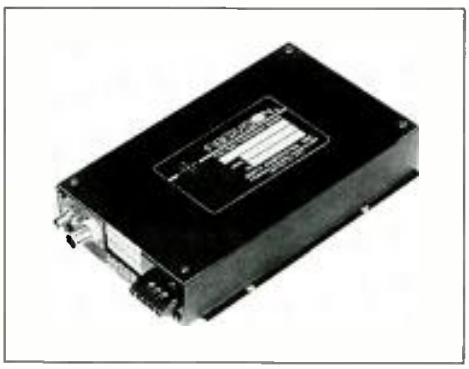
Circle (378) on Reply Card

Continued on page 72

Continued from page 68

New Products

Fiber-optic transmission systems
Math Associates



• **FX/FR-5800-7, 5805-7, 5820-7, 5821-7, 58231-7:** designed to send video and PTZ control signals over a single optical fiber over distances of more than 40km; FX/FR-5800-7 transmits video, 2-way audio and PZT control signals; FX/FR-5805-7 transmits video and 2-way PZT control systems operate at a single optical wavelength of 1,300nm; video channels are fully compatible with NTSC, PAL and SECAM standard and all units (except FX-FR-58231-7) may be configured for RS-232, RS-422 and TTL as well as Burle, American Dynamics, Pelco and Vicon PTZ controllers; FX/FR-5821 may be operated with Pelco and Vicon "Up-the-Coax" systems and will extend the operating range of these beyond their normal copper-wire limits; operating power is 12V to 18V AC or DC; dimensions are 4.5x7.3x1.4 inches.

Circle (379) on Reply Card

Indestructible amplifiers
DB Elettronica

• **KN series (KN 500/1000/2000):** solid-state power amplifiers are fully compatible with new digital products of TD/16, RD/16, DGB and DGP series; "ALC" global protection system and control logic units protect equipment from damage during destructive events — short circuits, partial or total stop of cooling system, main spikes and overvoltages and climatic conditions.

Circle (380) on Reply Card

TV modulator
Standard Communications Corporation

• **ICM470:** adjacent-channel, VSB AM modulator, designed for use in all PAL video systems; employs extensive use of integrated circuit technology, ensuring state-of-the-art performance and reliability; microprocessor PLL-controlled RF output is frequency agile from 50MHz to 470MHz.

Circle (381) on Reply Card

Audio transmitter and receiver
RF Industries

• **Neulink DCL series:** provide a reliable and low-cost method for transmission and reception of IFB audio to ENG trucks; housed in a steel enclosure and compensated for use over full temperature range (-30°C to +60°C); available in VHF, UHF and 900MHz.

Circle (382) on Reply Card

Machine controllers
BCD Associates

• **BCD-2000A:** mixes parallel control with RS-232 and RS-422; provides a cost-effective single-board solution by including full control with SMPTE and EBU read/write; uses BCD's industry-accepted 4-character command protocol; circuit-board controllers are compatible with PC-based and Amiga platforms.

Circle (383) on Reply Card

Professional Services

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

NETCOM
STATE-OF-THE-ART ENGINEERING FOR AUDIO & VIDEO
TURN-KEY SYSTEMS
DESIGN & DOCUMENTATION
EQUIPMENT SALES
CAD SERVICES
1465 PALISADE AVE., TEANECK, NJ 07666 / (201) 837-8424

East Coast Video Systems
ON LINE IN TIME
A full service Company providing..
- Consultation
- Engineering & Design
- Installations
- Training

Serving..
- Cable Systems
- Corporate Facilities
- Broadcast Facilities
- Teleproduction Facilities

52 Ralph Street, Belleville, NJ 07109 (201) 751-5655

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

D.L. MARKLEY
& Associates, Inc.
CONSULTING ENGINEERS
2104 West Moss Ave.
Peoria, Illinois 61604
(309) 673-7511
FAX (309) 673-8128
Member AFCCE

For Classified Advertising or Professional Services information Call Renée Hambleton at (913) 967-1732 FAX (913) 967-1735

Classified Display: $119 per column inch, per insertion, with frequency discounts available. 1 inch minimum, 10 inches maximum per ad. Blind ads $40 additional. Reader Service number $50 additional or free to 4" or larger ads. Spot color available for $95 (color determined by publisher).

By-The-Word: $1.75 per word, per insertion. Initials and abbreviations count as full words. Blind ads $40 additional. Minimum charge $40 per insertion. No agency discounts allowed for classified ads.

PATCHPRINTS® VIDEO TIE LINES In 1 2 3 4 Aux
Custom Patch Bay Labeling
By
PATCH BAY DESIGNATION COMPANY
Div. of Glendale Rubber Stamp & Printing Co., Inc.
P.O. Box 250278, Glendale, CA 91225
4743 San Fernando Road
Glendale, CA 91204
Telephone
(818) 241-5585
FAX (818) 507-5050

BIGGER HALF MEDIA SYSTEMS INC.
CORPORATE AND COMMERCIAL
VIDEO AND MULTI-MEDIA ENVIRONMENTS
DESIGN - INSTALLATION - CONSULTATION
TEL. (919) 489-5580 JOEL APPELBAUM
PRESIDENT

Classified

FOR SALE

HAVE CABLES
ASSEMBLED • BULK • CUSTOM
HAVE INC.
THE SIGN OF QUALITY
DEALER INQUIRIES WELCOMED
HAVE PROFLEX™
BELDEN
CANARE
WEST PENN WIRE
MOGAMI
FREE CATALOG of Audio/Video Tape, Cable, Equipment, Acessories, Supplies
518/828-2000
309 POWER AVE, HUDSON, NEW YORK 12534

STOCK ANSWERS.
For video duplication, demos, audition reels, work tapes, our recycled tapes are technically up to any task and downright bargains. All formats, fully guaranteed.
To order call:
(800)238-4300 CARPEL VIDEO

World's Largest Supply Transmitters & Parts
Buy/Sell Broadcast Items – Prices Negotiable

RCA UHF 50 kw transmitter	$91,000
RCA VHF 50 kw transmitter	$14,900
PIE UHF 55 kw transmitter	$74,500
VA 890 low hours	$7,900
Grass 300	$29,000
MEC XQ 3427 RGB & New HL 791	$6,995
Anton Bauer/Cine 60s, rebuilt	$165

Wanted – High/Low Power Transmitters & Parts – Call
CALL JIM COMELLA, BT&T – 708-204-5637

• STUDIO EXCHANGE • BURBANK
(818) 840-1351 • FAX (818) 840-1354
NEW & USED VIDEO EQUIPMENT
BUY, SELL, CONSIGN; 25 YRS EXP

KurlyTie™
Spring Coil Cable Wraps
FREE SAMPLE!
DIAL 1-800-587-5984
Every so often the evolution of useful things takes a quantum leap. KurlyTies are it!
A simple concept.
An elegant design.
NEW!
A patent pending solution for tying portable cables.
Find out why everyone's dumping Velcro for KurlyTies!
Call now for a FREE KurlyTie and KurlyTie Catalog!
The KurlyTie Company, 3382 Border Dr., Stone Mtn, GA 30087
a div. of SuperVid Also: Pocket Tool converts VHS tapes to SVHS

TEST EQUIPMENT
Reconditioned Wavetek, HP, Tektronix and more Signal Level Meters, Sweep Systems TDR's, Power Meters Spectrum Analyzers, Frequency Counters and Fiber Test Equipment Guaranteed to meet/exceed manufacturers specs 90 day warranty standard
SATELLITE ANTENNAS
Used Scientific Atlanta, Andrews, Vertex, RSI and others 7 meter & up
PTL Cable Service, Inc., USA
Phone (407) 747-3647 Fax (407) 575-4635
BUY — SELL

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

PANASONIC-SHARP-EIKI-MAXELL-RAMSA-TASCAM-TECHNICS-BOGEN: Professional/Industrial/Security Video & Audio Equipment. Wholesale Prices! Factory New Warranty! Sales = 800-233-2430. Support = 607-687-0545.

FOR SALE: G.E. Industrial Voltage Regulator. Model GEK-26035. In excellent condition. Recently overhauled by G.E. $3,500.00 plus shipping. Call Vic (818) 440-1147. Fax (310) 676-1033.

SENCOR VIDEO TEST EQUIPMENT FOR SALE: SC-61 Waveform Analyzer, VA-62 Universal Video Analyzer, VC-63 VCR Test Accessory, NT-64 NTSC Pattern Generator. All for $4,000. Call (609) 646-4114.

MCMICHAEL ACE STANDARDS CONVERTER complete with NTSC, PAL, SECAM coders. Not presently working. Ideal for parts. Please call Frank Bruno (416) 260-3622 or fax (416) 260-3622.

SONY • AMPEX • BTS • DUBNER
GRASSVALLEY • PANASONIC
If You're Looking For the Best in Used Equipment
and You Want the **BEST: • DEAL • VALUE • SERVICE**
CALL MIDWEST: (708) 251-0001 • FAX: (708) 251-0045
midwest AUDIO/VIDEO EXCHANGE, INC.
1131 Central Ave. Wilmette, Illinois 60091
International Brokers and Appraisers Serving the Audio / Video Industry

Circle (150) on Reply Card

Classified

FOR SALE

SERVICES

HELP WANTED

ENGINEERS! Radio Computing Services is looking for talented people to support and install our MASTER CONTROL digital audio system at various sites around the USA and the world. We have exciting opportunities for bright radio pros who are familiar with radio programming, music scheduling and/or radio engineering. Knowledge of computers, enthusiasm and strong people skills are a must. Continue your radio career at RCS, the world's largest radio software company. We offer a competitive salary, excellent benefits and pretty good coffee. Send or fax your resume to: Kenny Lee, Client Services Manager, Radio Computing Services, Inc. Two Overhill Road, Suite 100, Scarsdale, NY 10583. Phone (914) 723-8567 Fax (914) 723-6651.

POST PRODUCTION EDITOR/PHOTOGRAPHER needed for CBS station in the West's fastest growing market. Must have postroom computer editor and commercial shooting experience. Strong lighting skills a must. Responsible for heavy commercial and station production load. Send resume and tape to: Jeff Chesser, KLAS-TV, 3228 Channel 8 Drive, Las Vegas, NV 89109. NO PHONE CALLS PLEASE. EOE.

MANAGING ENGINEER
(BETTER KNOWN AS A ONE MAN BAND)

ACTUALLY YOU WILL BE RESPONSIBLE FOR AN EQUIPMENT MAINTENANCE BUDGET OF APPROXIMATELY $300,000. BUT REMEMBER YOUR SALARY WILL COME OUT OF THIS TOO. YOU TELL US HOW TO SPEND THE BUDGET AND KEEP THE PLACE RUNNING AND OUR CLIENTS AND STOCKHOLDERS HAPPY AND THE REST IS YOURS...
(WELL, MAYBE!)

YOU WILL PROBABLY NEED 3 TO 5 YEARS OF HANDS ON AND MANAGEMENT EXPERIENCE IN A TELEVISION BROADCAST/PRODUCTION ENVIRONMENT TO CONVINCE US YOU CAN WORK WITH A HIGHLY CREATIVE, ALTHOUGH SOMETIMES BRAIN DEAD STAFF. IN ORDER TO GET THIS JOB. GOOD LUCK! (YOU'LL NEED IT.)

Send resume and salary history to:
HUMAN RESOURCES DIRECTOR, P.O. BOX 22643, LOUISVILLE, KY 40252-0643. An Equal Opportunity Employer.

ENGINEERING OPPORTUNITIES

Continental Electronics Corporation has established itself as world leader in the design, development and production of high power radio frequency transmitters for communications, radio broadcast, radar and scientific research applications.

Continental is looking for MSEE(s) or equivalent with at least five years experience in designing solid state RF amplifiers. Primary responsibilities will be design and development of high power solid state RF amplifiers (1000 watts and higher) for application in AM and FM radio transmitters capable of producing 50 kW of output power. Must be familiar with PSPICE transient analysis and TOUCHSTONE RF analysis software programs.

CONTINENTAL PROMOTES PROFESSIONAL SATISFACTION THROUGH CHALLENGING WORK, COMPETITIVE SALARIES, AND A COMPREHENSIVE EMPLOYEE BENEFITS PACKAGE.

TO APPLY, SEND RESUME WITH SALARY HISTORY TO: **PROFESSIONAL RECRUITER-KSAM001, CONTINENTAL ELECTRONICS CORPORATION, P.O. BOX 270879, DALLAS, TEXAS 75227. PRINCIPALS ONLY PLEASE.** WE ARE AN EQUAL OPPORTUNITY EMPLOYER.

Classified

HELP WANTED

DISTRICT SALES MANAGER

Continental Electronics Corporation, Dallas, Texas, a leading manufacturer of broadcast and communications equipment, is currently seeking an individual with thorough knowledge of equipment needs of radio stations, to sell in the south central USA. Territory includes the following six states: Texas, Arkansas, Oklahoma, Louisiana, New Mexico, and Colorado.

The successful applicant will be involved with assisting customers in planning new projects, upgrading, compiling equipment lists, closing orders, and attending trade shows and other meetings to present and explain products.

Typically requires a BS degree in engineering, or equivalent plus four years of related experience, or BS in business administration or equivalent plus six years of technical sales experience. Background as radio station engineer a plus.

CONTINENTAL PROMOTES PROFESSIONAL SATISFACTION THROUGH CHALLENGING WORK, COMPETITIVE SALARIES, AND A COMPREHENSIVE EMPLOYEE BENEFITS PACKAGE.

To apply, send resume with salary history to: **PROFESSIONAL RECRUITER-NDS001, CONTINENTAL ELECTRONICS CORPORATION, P.O. BOX 270879, DALLAS, TEXAS 75227.** PRINCIPALS ONLY PLEASE. We are an Equal Opportunity Employer.

EXPERIENCED MOBILE TRUCK ENGINEERS

Full Time and Freelance positions available. Company is Dallas based. New 48ft Expando Sports Truck 10 BTS Cameras, GVG 3000/3 Digital Switcher, Chyron Infinit!, A53, A42 etc. Please fax complete resume, availability and salary requirements to: **SOLJAY PRODUCTIONS INC.,** 3333 Earhart Dr., #380, Carrollton, TX 75006. Call (214)-458-8388. Fax (214) 458-9741.

MAINTENANCE ENGINEER Must have at least 5 years experience with all video tape formats, strong broadcast television systems and electronic background, plus knowledge of modern post production practices. Must be familiar with all troubleshooting procedures. Qualified candidates should send or fax resume to: E.I.F. T.V., P.O. Box 90000, Los Angeles, CA 90009. Attention: Noel Miranda. Fax: (213) 758-7991.

MASTER CONTROL OPERATOR NBC affiliate in Southeastern Coastal Region is seeking an experienced Master Control Operator. Pay is low but quality of life is high. M.A.R.C. & MII experience a plus. Apply to: Chief Engineer, WECT-TV, PO Box 4029, Wilmington, NC 28412, (910)791-8070. EOE.

UHF BROADCAST ENGINEER Religious television network in Mobile, AL. Transmitter maintenance, microwave, translator, trouble shooting and repair master control, video tape and audio production systems. FCC or SBE certifications preferred. Travel required. Only resumes with salary requirements considered. Chief of Staff, P.O. Box 81521, Mobile, Alabama 36689. Equal Opportunity Employer.

WE PLACE

(Technical Engineers-Post Production Editors-Colorists)

•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
Pittston, PA 18640

Fax 717-654-5765 • Phone 717-655-7143

ASST. TV ENGINEERING MGR in top 100 market. Familiar with scheduling, installation, maintenance, and operations of all types of studio and RF equipment, including Betacam, computers and transmitter. Must be a self starter and possess strong management skills and good interpersonal relations. Will assist in capital budgeting. General Class license required, SBE Certification desired. EOE. No phone calls. Send salary and resume requirements to Engineering Manager, WKBN TV, P.O. Box 59, Youngstown, OH 44501.

MAINTENANCE TECHNICIAN Immediate opening for experience technician at an ABC affiliate. Must have a minimum of 5 years experience in TV broadcast maintenance, including systems troubleshooting and repair of studio video and audio equipment, digital equipment, computer systems, Electronic News Gathering equipment, video and audio recording equipment. FCC General Class License or SBE Certification desirable. Send resume to Human Resource Department, KOMO TV, 100 Fourth Ave N, Seattle WA 98109. No phone calls please. KOMO is an EOE. Women and minorities are encouraged to apply.

MAINTENANCE ENGINEER Dynamic, fast-growing subsidiary of VIACOM INTERNATIONAL is currently looking for a Maintenance Engineer to assist in the maintenance of our tape duplication department. Qualified candidates must have at least 2 years experience working with broadcast tape systems. Must be capable of troubleshooting to component level. Degrees welcomed but not necessary to qualified individual. Resumes to: Joseph E. Ashton, Engineering Manager, VIACOM/MGS SERVICES INC. 619 West 54th Street, New York, NY 10019.

ENGINEER

EDEFX Group in Miami is expanding and is now looking for an Engineer with experience in C Format and D1.

Please respond to:
EDEFX Group
Chief Engineer
7355 NW 41st St.
Miami, FL 33166
(305) 593.6911

EDEFX GROUP

Field Service Engineers

Harris, a $3.3 billion Fortune 200 Corporation, has opportunities available in TV and Radio Field Service Engineering at its Broadcast Division Headquarters, a worldwide supplier of radio and TV broadcast equipment and integrated systems, in Quincy, IL.

To our customers around the world, the Broadcast Division Field Service Engineers ARE the Broadcast Division, and provide world-class technical support by delivering the highest quality on site installation, troubleshooting, and field engineering services.

These positions require a technical associates degree, augmented by a solid background in high power RF broadcast transmission systems, and site installation and troubleshooting skills. Experience with broadcast antenna towers is a plus. Candidates must be prepared for field deployment periods of 3 months or more.

We currently have products in over 150 countries throughout the world and growing, and we are plotting the course for advanced TV technology and Digital Radio Broadcasting in the U.S.

Harris Corporation offers a competitive starting salary including applicable overseas assignment premiums, with a comprehensive benefits package and opportunities for growth and advancement.

If you have the utmost technical competence in broadcast transmission systems at high power levels, are bent on customer service, and ready to travel the globe for extended assignments, send your resume with salary history/requirements in confidence to: W.G. Kellner, Supervisor, Human Resources, Harris Corporation, Broadcast Division, Dept. FS, P. O. Box 4290, Quincy, IL 62305-4290. OR Internet, wkellner@harris.com

Harris Corporation is an equal opportunity employer, and we encourage women and minorities to apply. M/F/D/V.

HARRIS

EQUIPMENT WANTED

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.

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.

Ad Index

	Page Number	Reader Service Number	Advertiser Hotline
AAVS/Div. of Sencore	3	5	800-769-AAVS
Alamar Electronics USA, Inc.	60	30	408-866-9373
Aphex Systems Ltd.	35	37	818-767-2929
Belar Electronics Laboratory	43	20	610-687-5550
B&H Photo - Video	69-71	34	800-947-9928
Broadcast Video Systems Ltd.	72	35	905-764-1584
BTS Broadcast TV Systems	15	7	800-962-4BTS
Canon USA Broadcast Lens	5	11	201-816-2900
Clear-Com Intercom Systems	IFC	1	510-527-6666
DB Elettronica Telecomunicazioni	67	33	049-870-0588
Duracell USA	38-39	22	800-548-5489
Dynatech Video Group	55	27	800-453-8782
EEV, Inc.	33	17	800-DIAL-EEV
Electronic Design	48 AB	96	818-843-6199
ESE	51	31	310-322-2136
Garner Industries	74	151	800-228-0275
Grass Valley Group	29-31	10	800-343-1300
Grass Valley Group	44-45	18	800-343-1300
Harris Allied	7	12	606-282-4800
Henry Engineering	40	24	818-355-3656
HHB Communications Limited	57	29	081-960-2144
Intertec Info Age Books	43		913-967-1856
Jampro Antennas, Inc.	50	32	916-383-1177
JVC Professional Products Co.	48-49		800-JVC-5825
Leitch	BC	3	800-231-9673
Lightwave Systems, Inc.	37	21	214-741-5142
Louth Automation	53	28	415-329-9498
Matrox Electronic Systems	9	13	800-361-4903
Maxell Corp. of America	11	14	800-533-2836
Midwest Audio/Video Exchange	73	150	708-251-0001
Opamp Labs, Inc.	72	36	213-934-3566
Otari Corp.	47	19	415-341-5900
Panasonic Broadcast & TV	23		800-524-0864
Pirod, Inc.	IBC	2	219-936-4221
Rane Corporation	41	25	206-355-6000
Shure Brothers, Inc.	13	6	800-25-SHURE
Tektronix, Inc.	24-25	16	800-TEK-WIDE
Telex Communications, Inc.	1	4	800-392-3497
Ultimatte	17	8	818-993-8007
Utah Scientific/Dynatech Video Group	55	27	800-453-8782
The Winsted Corporation	40	23	800-447-2257
3M Pro Audio/Video Products	19	9	612-733-1959

Advertising sales offices

NEW YORK, NEW YORK
Gordon & Associate
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 Corp.
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, CALIFORNIA
Duane Hefner
5236 Colodny Ave., Suite 108
Agoura Hills, CA 91301
Telephone: (818) 707-6476
FAX: (818) 707-2313

SANTA MONICA, CALIFORNIA
MC² Magazine Communications Marketing Corp.
Jason Perlman
Telephone: (310) 458-9987
FAX: (310) 393-2381

CHICAGO, ILLINOIS
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, KANSAS
Renée Hambleton
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

WHEN THE ICE CAME,

OUR PIROD TOWER DIDN'T EVEN SHIVER.

Dave Turner
WMCC TV, Channel 23
Indianapolis, Indiana

"With more than two feet of ice at the antenna of our 1,000-foot PiRod tower, and guy wire ice eight inches in diameter, our tower bent like a banana. I recall my engineer saying that the tower wouldn't last five more minutes. But our solid rod PiRod tower stood there and straightened as the ice melted. No damage. No stress fractures. No problems. I guess that's when the quality of a solid rod PiRod tower comes through."

Solid Rod, Solid Service, Solid Value

Solid rod, free-standing or guyed towers custom designed to your specifications.

For a free guide to tower selection and fast, courteous response to your requests for quotation, contact:

PiROD INC.
P.O. Box 128
Plymouth, Indiana 46563-0128
Telephone (219) 936-4221

Circle (2) on Reply Card

Pick A Card...

A CARD LIKE OUR UTILITY VIDEO DA.

We've put it in our economical MIX BOX to give you the best value per output offered in a self-powered DA, with looping inputs and 8 outputs of broadcast video.

Excellent VALUE highlights all MIX BOX DAs. These same LEITCH 8 OUTPUT DAs populate our 19" rack-mount frames and exceed all broadcast industry standards.

Video DAs include utility video distribution, equalization, clipping, delay, and clamping.

Audio DAs have balanced high impedance inputs and a choice of 8 mono or 4 stereo balanced outputs.

Don't gamble with Quality over Economy; Get both...

LEITCH DAs STAND ALONE

in a self-powered MIX BOX!

PICK A LEITCH DA CARD IN A MIX BOX.

LEITCH

FOR IMMEDIATE RESPONSE, FAX THIS PAGE TO (804) 548-4210.
To receive information by mail, call (800) 231-9673.

NAME _____ *FAX NUMBER* _____

Leitch Incorporated, 920 Corporate Lane, Chesapeake, VA 23320 - Tel: (804) 548-2300 or (800) 231-9673 Fax: (804) 548-4088
Leitch Video International Inc., 220 Duncan Mill Road, Suite 301, Don Mills, Ontario, Canada M3B 3J5 - Tel: (416) 445-9640 or (800) 387-0233 Fax: (416) 445-0595
Leitch Europe Limited, 24 Campbell Court, Bramley, Basingstoke, Hants, U.K. RG26 5EG - Tel: +44 (0) 880088 Fax: +44 (0) 256 880428

Circle (3) on Reply Card