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BROADCAST ENGINEERING

The journal of broadcast technology

April 1982 • Volume 24 • No. 4

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BROADCAST ENGINEERING (USPS 338-130) is published monthly by Intertec Publishing Corporation, 9221 Quivira Road, P.O. Box 12901, Overland Park, KS 66212-9981. Postmaster, return form 3579 to the above address.

THE COVER shows some of the equipment and staff members of station WCBU at Bradley University, Peoria, IL. An article by Gary Breed, chief engineer at WCBU, appears in this issue and describes some of the design suggestions followed to achieve superior sound quality at WCBU. (Photos are courtesy of the Bradley University Audio-Visual Services.)

NEXT MONTH:
- Audio time compression and delay
- Teletext update
- TV test equipment roundup

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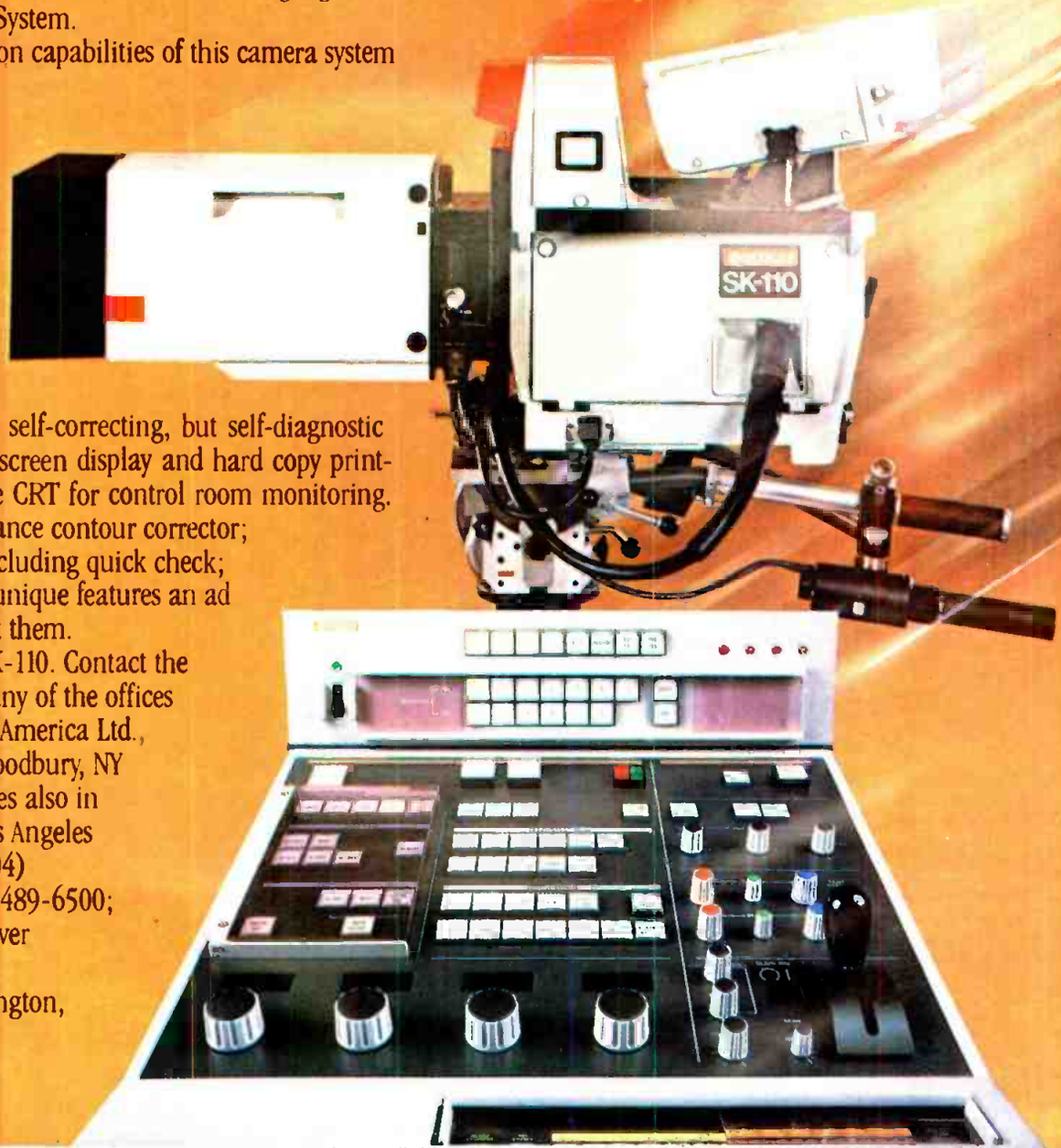

The SK-110 is not only self-correcting, but self-diagnostic as well. It gives both video screen display and hard copy printout; can be hooked into the CRT for control room monitoring.

There's a high-performance contour corrector; 5 automatic setup modes including quick check; 5 data files: so many other unique features an ad can't begin to tell you about them.

The ultimate Hitachi SK-110. Contact the broadcast video division at any of the offices listed below. Hitachi Denshi America Ltd., 175 Crossways Park West, Woodbury, NY 11797 (516) 921-7200. Offices also in Chicago (312)344-4020; Los Angeles (213) 538-4880; Atlanta (404) 451-9453; Cincinnati (513) 489-6500; Dallas (214) 233-7623; Denver (303) 344-3156; Seattle, (206) 575-1690; and Washington, D.C. (301) 459-8262.

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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 also include consulting engineers and dealer/distributors of broadcast equipment

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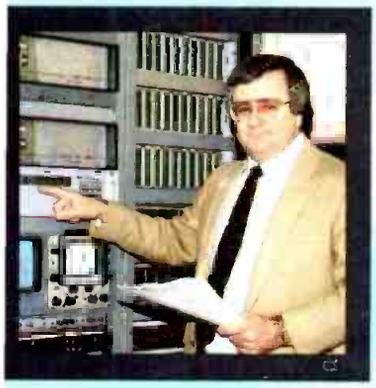
Intertec Publishing Corp.

"I have never been as impressed with a new piece of gear as I am with our programmable SatCom Technologies earth station antenna."

Dave Frasier Technical Operations Manager
WWBT-Richmond, Virginia

WWBT is a technical leader that installs a lot of equipment. According to Dave Frasier, "The technical quality of our new SatCom Technologies' 9.2-meter antenna is excellent, and it has brought new flexibility and a more competitive edge to our programming."



The Model 920C 9.2-meter antenna incorporates high speed drives (2°/sec.) directed by a micro-processor-based programmable controller. The controller can store and access up to 39 satellite positions. WWBT is using the controller's scheduling function to move the antenna automatically from one satellite to another at specific times throughout the day to receive syndicated programming, sports events and feeds from its Washington news bureau.

SatCom Technologies' high-technology antennas are available in sizes ranging from 3-meters to 13-meters. We also offer the exclusive Torus multiple-beam antenna in 4.5-meter and 7-meter equivalent sizes. Each antenna combines the extraordinary high surface accuracy of RSi's AccuShape aluminum reflector with an extremely rigid mount. This means greatly improved sidelobe performance and the ability to upgrade to Ku-band.

Mr. Frasier continues, "We beat our competition, we save ourselves money and headaches. We give our viewers the best service and the best programming, whether it comes from across the state or across the country."

For more information on SatCom Technologies' earth station antennas, call David Speed at (404) 448-2116.

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Photographs courtesy of WWBT Richmond.

FCC update

April 1982

AM stereo authorized

The FCC recently authorized AM stereophonic broadcasting, but will allow broadcasters to use any non-interfering systems they desire. Although adopting a free market approach to AM stereo selection, the FCC did establish minimum technical rules to prevent interference to other spectrum users and ensure acceptable sterephonic performance.

Revised Form 313 available

The August 1981 Edition of FCC Form 313, application for authorization in the Auxiliary Broadcast Radio Services, is now available from FCC District offices or FCC Forms Distribution, Room B-10, Washington, DC, 20554. The revised Form 313, which consists of a 2-page form and instruction booklet, is used to apply for broadcast TV microwave, aural STL and intercity relay, remote pickup and low power auxiliary (wireless mics). The revision conforms to recent changes in the rules, and with the booklet, clarifies items on the application. The August 1981 Edition of Form 313 *must* be used, as previous editions of the 313 will not be accepted for filing.

LPTV service authorized

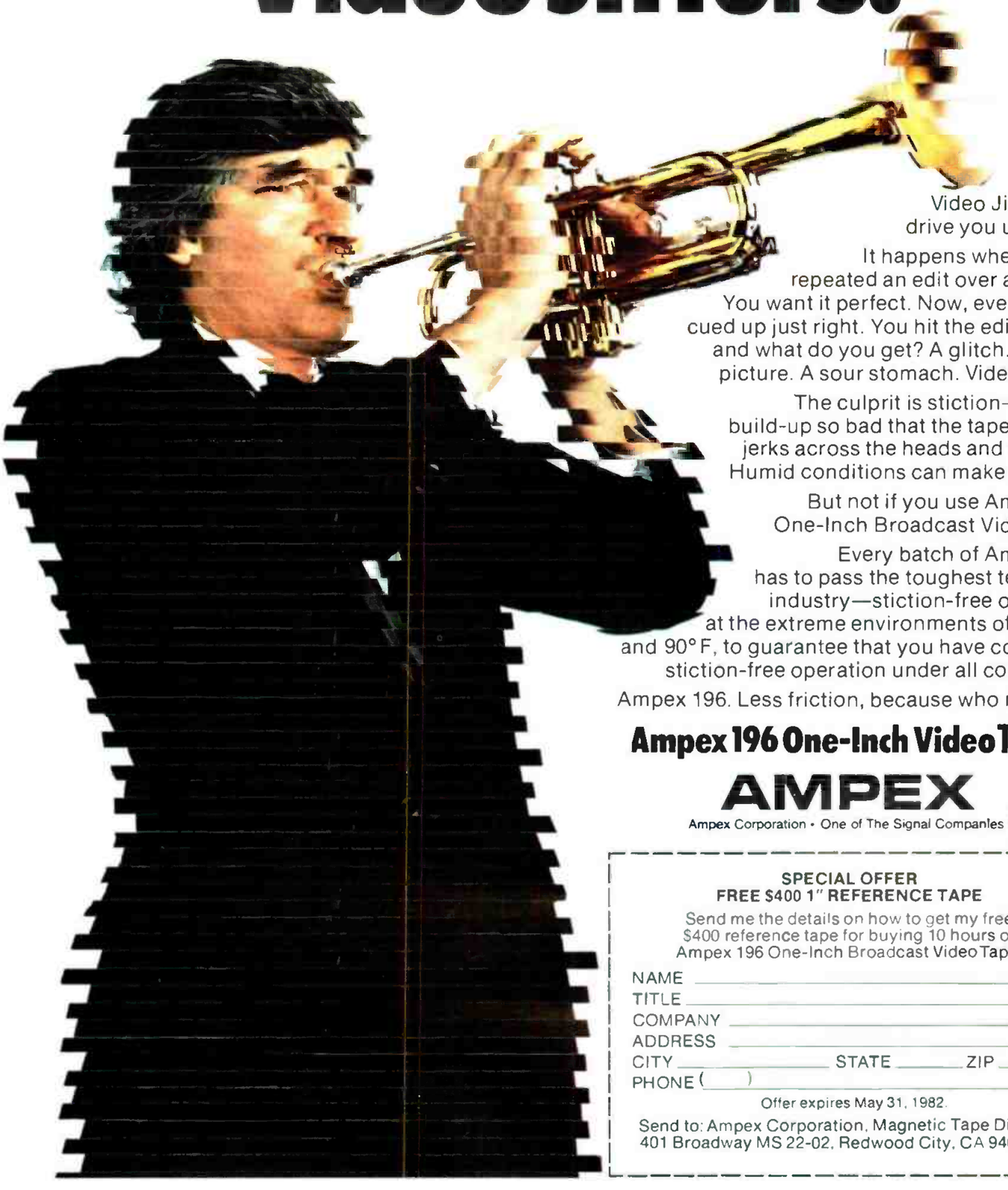
The FCC recently voted to establish a Low Power TV Service to provide new broadcast programming and ownership opportunities. The service will operate on a secondary non-interference basis with full service TV stations.

This action follows license granted for Bemidji MN in November 1981. Information released to the press in late February 1982 indicated that the commission had approved building of 79 LPTV installations. Contacts with the FCC in March said that only 23 CPs had been issued to date. Of those, five were VHF, with 18 in the VHF service. More information places six UHF channels in Colorado, three in Montana, two in Utah, two in New Mexico and one in Wyoming. The VHF channels are slated for Missouri (two), Tennessee (one), Wisconsin (one) and Wyoming (one).

Freeze lifted on UHF/radio applications

The FCC recently retained the exceptions in its broadcast multiple ownership rules that provide for case-by-case treatment of certain UHF TV applications that would otherwise violate the one-to-a-market and regional concentration rules. It also granted a petition to lift the freeze on processing of applications involving combined ownership of UHF TV and radio stations in the same market or in the same region. □

Ampex Announces the Practical End of Video Jitters.



Video Jitters can drive you up a wall.

It happens when you've repeated an edit over and over. You want it perfect. Now, everything's cued up just right. You hit the edit button, and what do you get? A glitch. A shaky picture. A sour stomach. Video Jitters.

The culprit is stiction—friction build-up so bad that the tape actually jerks across the heads and scanner. Humid conditions can make it worse.

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BE

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MPR purchases digital recording equipment

Minnesota Public Radio has become the first broadcasting operation in the United States to be fully equipped with a multi-track digital recording and editing system. Until now, digital recording has only been installed in commercial recording studios. New standards for the technical quality of programs broadcast nationally via satellite will be set.

The digital system, manufactured by 3M, has been installed in MPR's state-of-the-art 24-track production studio. The equipment will also be used in the production of special remote broadcasts such as performances by the Minnesota Orchestra and Saint Paul Chamber Orchestra.

MPR, referred to as the "flagship of the national system," has already earned a reputation for its quality productions. The network has won three Peabody Awards in the last four years for its programs, and currently produces and distributes more programming for the public radio system than any other station-based entity.

Telidon announces new videotext capabilities

In an address delivered recently at the Online '81 Conference in Dallas, Larry T. Pfister, vice president, Telidon Videotext Systems described powerful new capabilities for Telidon. The following were included in the new capabilities:

- keyword search, associative retrieval and full inverted file access;
- expanded gateway access to third party value-added services; and
- improved portability for Telidon data through Telidon/Basis availability on a wide range of host processors.

Speaking on "The Implications of Videotext to the Online Database Community," Pfister said that Infomart (the Toronto-based parent of TVSI), in conjunction with Battelle Columbus Laboratories, is developing a hybrid database search and videotext display system using Telidon technology and the Battelle Basis data management software to provide comprehensive textual, numeric and graphic information retrieval.

The first target of the project is the cataloging of the Canadian Record Catalog for the recording, retailing and broadcasting industries. The primary information provider is the Canadian Independent Record Production Association. This bilingual database will catalog recordings for cross-reference. It includes information on everything from a record's label, affiliation and distributor to its chart positions. The Telidon/Basis system also provides more than 80 fields of information on each performer and recording, and can also reproduce the album graphics on the subscriber's screen.

Pfister also displayed videotext "pages" created by Infomart, using the Telidon/Basis hybrid, with stunning graphics or record album covers and portraits of recording artists as backgrounds for, or incorporated with, bibliographic catalog information from the Canadian Record Catalog database. He said that the provision of the Telidon/Basis function would accelerate the market penetration of Telidon technology. □

A VERY MOVING STILL STORY.

Editors, Engineers, Animators, Producers, Special Effects Specialists, Station Managers, Training and News Directors, Read This Ad.

In the beginning, all was stillness. A dark and cumbersome, costly and inefficient sort of stillness accentuated by the *kachunka-kachunka* of the slide chain machinery. Then came a company called Echo Science Corporation — us, actually — with a concept called Electronic Frame-Stor.™ And suddenly, all was stillness — and light.

But what excited the engineers at Echo Science wasn't stillness at all, but movement and, yes, re-movement. These were the challenging chapters to be written in the Still Story. How to make all of those electronically stored stills move around in all manner of ways — and do so in a container that was easy to move. For the Still Story, a hero was needed.

Thus was born The Image Maker.®

The Image Maker. A Brief Definition.

Here's what The Image Maker is: A high-band color disc recording system that uses state-of-the-art electronics and an exclusive Discassette® recording medium to perform a versatile number of professional television production tasks from still frame storage to special animated effects. It is a highly reliable, very compact and most cost efficient method of acquiring an impressive package of capabilities.

Loops, Sequences, Special Effects.

The joy of The Image Maker — and the key to its success as a productivity tool — isn't just in its storage of still frames, but also in the manipulation of those stills to serve a variety of needs. In this regard, The Image Maker is a marvel of special effects wizardry, all made possible by a combination of features. Variable speed operation all the way from freeze frame to real time. Random access of as many as 512 frames on line. The ability to preset 64 locations. These features are conveniently laid out on a fingertip touch panel to make it just that much easier for the operator to do animation sequences, generate backgrounds, superimpose effects or pre-program motion loops.

From Cold Fronts To Hot Switches: The Plot Thickens.

More advanced features deliver even more broadcast and production benefits. For instance, because The Image Maker boasts variable speed in both directions, weather motion — or motion analysis of any kind is, well, a breeze. And because it also features two independent heads, the operator can preview upcoming video images, then "hot switch" to the next one without going to black.

Between the cold fronts and the hot switches are a full range of other capabilities. Instant replays. Logo and ID flashes. These are capabilities enhanced by the fact that The Image Maker will conveniently interface with today's modern character generators and titlers.

The Discassette. The Removing Part Of The Story.

Not all of The Image Maker's innovations are located exclusively within the confines of the machine itself. In fact, one of the key innovations — and one unique to Echo Science products — is our Discassette, the removable recording medium that provides both operational and storage convenience. In this day and age, when space is at such a premium and ease of storage and retrievability are very real assets, a library of Discassettes sure beats drawers full of slides or closets stacked with disc packs.

Going Mobile With The Image Maker.

Movable images. Removable media. Both are important parts of The Image Maker story. A third, though, is The Image Maker itself on the move. Because we deal with some mighty tough customers, we build The Image Maker to be a mighty tough television production tool. The combination of the recording technology (one that eliminates the possibility of head crash), Echo Science craftsmanship, and a compact, road-rugged design makes The Image Maker as versatile on remote shoots as it is in the studio.

A Moving Conclusion. Buy One.

Perhaps the most moving part of The Image Maker story is the one you read on the bottom line. Because, ultimately, it's the cost efficiency of The Image Maker that will move you to take a closer look. Clearly, it doesn't make a lot of sense to tie up a 1-inch VTR to do routine or special effects work when the feature-rich but modestly priced Image Maker can do that — and more.

There's a happy ending to our Very Moving Still Story. Call us today and we'll write it together.

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Battison receives award

John H. Battison, director of engineering of the WOSU-AM/FM/TV stations, Columbus, OH, received a special award from the Society of Broadcast Engineers at the annual meeting at NAB-'82/Dallas. The award acknowledges Battison's work in founding the SBE in 1964, serving as chairman of the steering committee, and serving as first president.

Battison founded the SBE following the demise of the Institute of Radio Engineers. He contacted all the broadcast stations in the United States, attempting to arouse interest (he paid his children one cent per name to send out 6000 invitations to form the new society.) At the initial meeting he was named chairman of the steering committee, and the following year was elected the society's first president. He also produced and edited the *Journal of the Society of Broadcast Engineers* for several years.

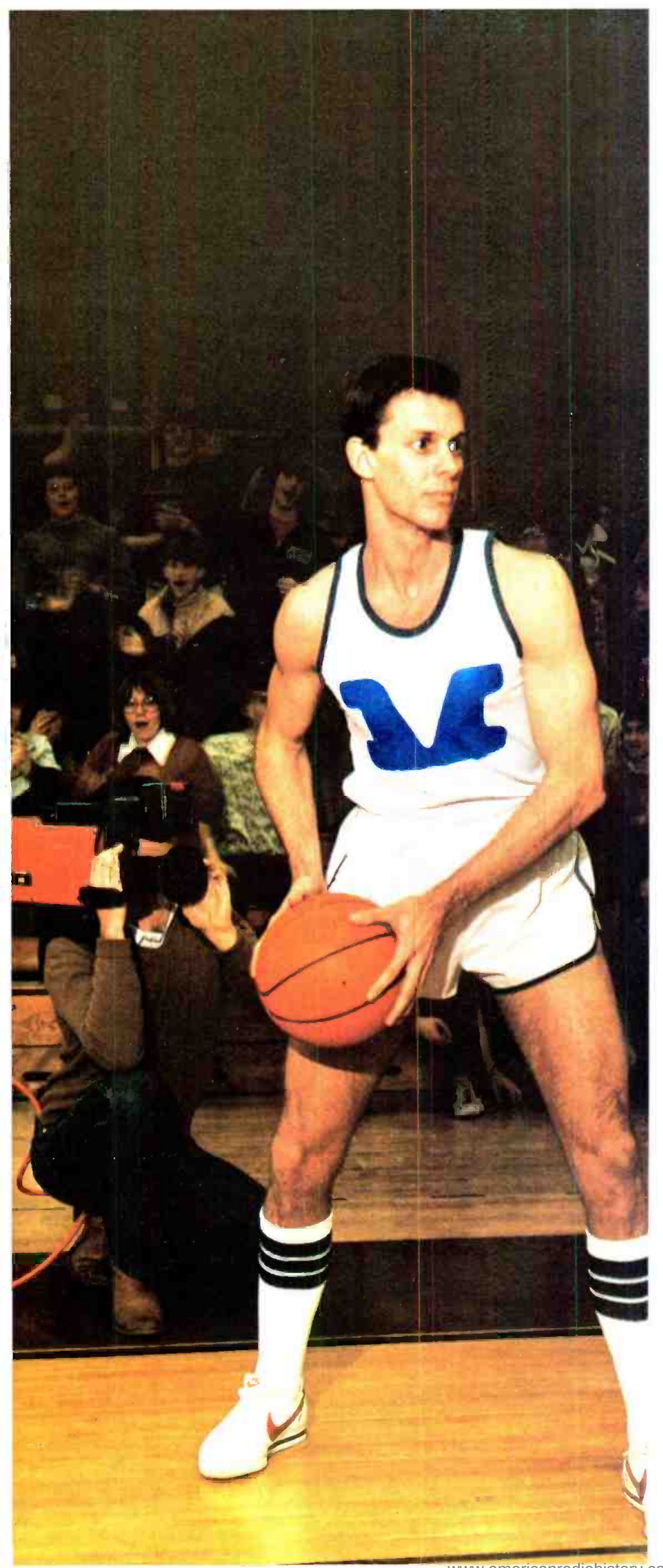
Battison has been director of engineering of the WOSU stations for about four years. Before joining the stations, he was involved in domestic and international broadcasting.

He is a registered professional engineer in Washington, DC, and practiced there for several years. He was also associated with Carl Smith of Cleveland, OH. His long career spans service with ABC in the late '40s, engineering management positions, station ownership and international consulting in the broadcast field.

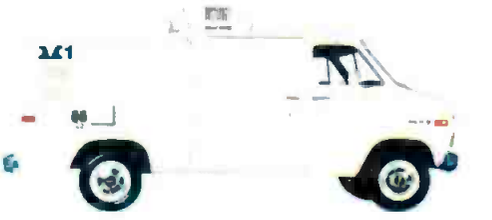
He is well-known as a technical author and is an active operator with the call W8KUC. He was also OD5KX when living in Beirut, Lebanon—his wife was OD5KY. After six years service with the Royal Air Force, in which he fought in the Battle of Britain, Battison came to the United States in 1945 and went to work for KMBC in Kansas City, MO. In 1947 he joined ABC in New York as assistant chief allocation engineer. He has been active in all areas of US broadcasting. He was a member of the US Delegation at the Region II Medium Wave Advisory Committee meetings in Buenos Aires in 1980 and participated in the Radio Advisory Group following this conference.

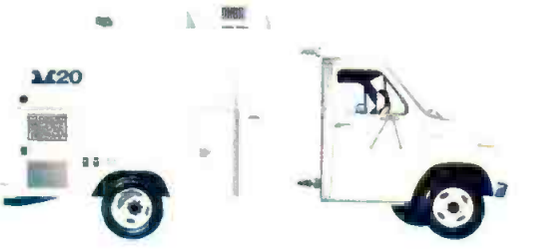
Certification exams scheduled

The SBE will give certification examinations June 18-June 26. All applications for this exam session must be received in the national office by April 26. A copy of the certification program booklet and application may be obtained by writing to the Certification Secretary, SBE, P.O. Box 50844, Indianapolis, IN 46250. □



Midwest and JVC put you where the action is!





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JVC cameras, recorders and editors are famous for their reliability and their ability to take the bumps and jolts of mobile unit installations. That's why they're the choice of so many cable companies.

If you need a mobile unit that can take the punishment that on location productions dish out, you need to talk to Midwest about their complete line of JVC equipped units. Midwest maintains an in-depth stock of the full JVC line.

Let Midwest put you where the action is, with rugged JVC production equipment in an M 1 or an M 20 mobile unit.

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editorial

AM STEREO: TO BE OR NOT TO BE?

Communication is not unilateral. Each month **Broadcast Engineering** strives to bring you the information you want and need. As we assemble an issue, we draw on widely varying backgrounds in the journalism and broadcast spheres. Objectivity is a key to our work, but we do have opinions, and so do you. Beginning with this issue, our editorial page will be our soapbox to air opinions on current issues. Through it, we will offer congratulations and encouragement as well as express disappointment and disapproval on issues in the broadcast industry, as we see them.

But the communication loop will not be complete without your participation. Give us your comments on our opinions as well as your thoughts on other topics. Future editorials will include some of your responses. Through this interaction we will better serve you, perhaps even solve a problem or two with the discussions. Opinions that differ from our own are welcome, and so are confirmations on key issues.

Address comments to: The Editor, Broadcast Engineering, P.O. Box 12901, Overland Park, KS 66212.

The March 4, 1982, action by the FCC allowing a marketplace selection of a national standard for AM stereo is a matter of grave concern, if not dismay. The result could well be industry-wide chaos, extensive delays, wasted efforts and astronomical costs.

The bottom line may be that this decision by the FCC will kill any hope for a successful AM stereo program in this country. But it also leaves the door open for an interested outside company or organization to decide our US broadcasting standards—and that possibility bothers us greatly.

We do not object to universal standards being developed by duly authorized and objective standards committees, such as we see functioning within the jurisdiction of the SMPTE, AES, IEEE and international technical societies. Such dedicated efforts lead to regional and global standards that benefit everyone.

However, AM stereo is facing quite a different situation. Now the major equipment proponents—Belar, Harris, Kahn, Magnavox and Motorola plus, potentially, many others—are left to wage full-scale battle in the marketplace.

Our immediate concern is that the FCC's inability to decide on a single AM stereo system may spell the death knell for the emergence of this technology as an industry. This is disheartening because the AM broadcasters urgently need an edge for survival in a highly competitive marketplace.

Our deeper concern is with the FCC itself. Does this decision mean that the FCC can no longer make the technical decisions that broadcasters need? Have the technical foundations of the commission been so weakened by the lack of adequate engineering support that it can no longer decide what is best for the industry and the public? If this is the case, then we have reached a regrettable state of affairs, and it's time our legislators and the FCC re-examine its structure and functions.

Commissioner Abbott Washburn made his position clear: "It is a proper function of government to lay down the guidelines for a single system that will result in AM stereo in every home at the lowest cost consistent with technical excellence and quality reception. I remain convinced that the commission can choose with confidence a system which will meet the needs of broadcasters, manufacturers and the public. To do so risks making the wrong choice. But with the five systems running a close race in their technical quality, that risk is minimal. And I continue to believe that it is in the public interest for the commission to choose a single system. The risk in selecting a single system pales in comparison to the consequences of compelling multiple systems to fight it out in the marketplace."

The blame for the potentially chaotic state of AM stereo must rest squarely on the shoulders of the FCC commissioners who approved the marketplace decision. The majority of their inputs—from the NAB, NRBA, most of the system proponents and from broadcasters—strongly recommended a single-system selection. They ignored these recommendations.

It has been suggested that the FCC made its marketplace ruling out of fear of industry criticism and possible lawsuits. If true, then the AM stereo decision was made out of weakness, and the present system must be changed. The FCC simply must represent the best interests of broadcasters and consumers if it is to survive and serve a purpose. Anything short of these ideals is inexcusable, especially when it leaves the door open for foreign interests to decide our US broadcast standards.

The industry needs strength in management and engineering as much as perhaps at any time in broadcasting's history. We are facing a digital decade in radio and television, with many associated standards to be considered. We are also facing teletext standards, high definition television standards, stereophonic television and bilingual television. This is no time for the FCC to be weak in its resolves nor to err in its appointed tasks. Anything short of strength and leadership from the FCC leads to waste and chaos—and the FCC might as well close its doors. □

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TELEFRANCE USA, the French cultural and entertainment cable programming system, asked us to design and build their new video production facility in New York City.

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AM stereo?

By Bill Rhodes, editorial director

- March 4, 1982
- FCC authorizes AM stereo
- Marketplace decision
- Commissioners vote 6:1

The FCC decision to allow a free market approach to AM stereophonic has met with mixed reaction—from delight to despair. The FCC has declined to select a single, optimum system for AM stereo, thus throwing the industry into possible chaos—perhaps even killing AM stereo.

The FCC voted 6:1 to allow broadcasters to use any non-interfering system they desire, with only minimum technical guidelines. Commissioner Washburn cast the dissenting vote and spoke eloquently in favor of selecting a single AM stereo system.

Reaction from the industry has been swift, but mixed. Japanese set manufacturers found out about the decision by telegram from representatives just minutes after the decision was made. Of the five proponent systems manufacturers involved, only Leonard Kahn was pleased with the marketplace decision. Others—Belar, Harris, Magnovox and Motorola—expressed displeasure and concern that the FCC did not select a single, best system—a decision that would have virtually assured a future for AM stereo.

The failure of the FCC to decide on a single system, regardless of the technical reasons, may actually kill the future of AM stereo. If set manufacturers refuse to build appropriate sets to receive the AM stereo broadcasts, the industry may not mature. If broadcasters cannot select and install an optimum system, the AM stereo industry may die because of signal imcompatibility throughout the country and the lack of suitable receivers.

On the other hand, the door is open now for the current proponents, plus all others who want to toss their hats into the ring, to do battle in the marketplace. Only time will show who dominates and if AM stereo will survive. The possibility exists now that some foreign source, with strong government backing, could actually decide the AM stereo issue in the United States!

Thus, the FCC's action in the AM stereo matter may

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HARRIS

Circle (14) on Reply Card

have far reaching consequences, and the wake created may last for years. Many view the FCC's decision as an organizational and technical weakness that fragments the industry, and they also consider it a violation of the FCC's charter to serve the best interests of broadcasting.

And, all this is occurring at a time when AM broadcasting truly needs a revitalization. In the face of potential chaos, many AM broadcasters said they still feel that the possibilities of AM stereo give them *something* new to talk about and that it will help them sell air time. But, if AM stereo does not mature, even this small edge will dull in time.

Broadcast Engineering will continue to report progress in AM stereo, as significant trends develop. We began talking to broadcasters and manufacturers immediately after the FCC decision was announced, and the following reflects the general pulse of the industry.

Belar

Arno Meyer, president, Belar Electronics Laboratory, said he does not think too highly of the FCC's inability to settle on a single system for AM stereo. He even suggests that the FCC may have reneged on its charter to the NAMSRC (National AM Stereophonic Radio Committee) program wherein three of the proponent systems were evaluated.

In an exclusive interview with **BE**, Meyer pointed out some of the pitfalls in this monumental FCC decision, including the possibility that aggressive companies or countries might shape the future of the industry by inserting early equipment into the market without regard to what may be best for the broadcaster and the public.

The official position of Belar is readiness to have monitoring equipment available for the Magnavox system, mainly because of the amount of background work in getting receiver manufacturers prepared for this system. And, Belar is ready to help broadcasters to the best of its ability.

In short, Belar is definitely in the AM stereo race.

Harris

The Harris Corporation issued the following formal statement concerning its position on AM stereo:

"Harris Corporation will begin selling its AM stereo broadcasting system (immediately) to the nation's 4650 AM radio stations and will license manufacturers of home radios to use its stereo receiving technology. The company expects to begin delivering equipment in July and estimates that AM stations will eventually invest $100 million in stereo transmission.

"The Federal Communications Commission voted to allow AM stations to broadcast in stereo for the first time:

Continued on page 93

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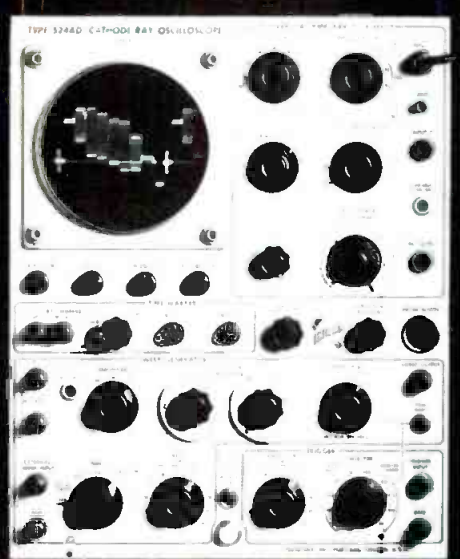

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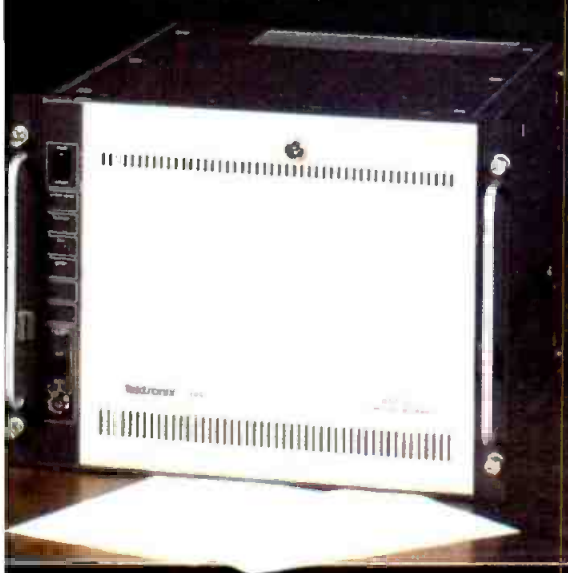

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The Odyssey of Homer

"Close your eyes and give your mind a listen."

By Richard Fairbanks, staff engineer, Universal Recording Corporation, Chicago, IL.

"I don't care if I *am* an 'up and coming' engineer! Why do I have to do this?" I screamed at my best friend over cold coffee. "I want to do music!" It seemed more like a prison sentence than a recording project. Homer's *Odyssey*, a 2300-year-old book with a 1-eyed giant who eats people, a witch who turns men into pigs, a hero who shoots 100 suitors with a bow and arrows, all in verse. A prehistoric *Starwars* in 1-hour episodes. I questioned my sanity.

Then I met Yuri Rasovsky, producer-director for the National Radio Theatre. He seemed harmless enough. Before it was over, I would watch him stalk the control room like a trapped animal, tug fiercely at his beard and alternately praise and curse the actors. He would command concentration so intense that a phone ringing caused near rigor mortis. A fear would hover over the control room that lightning might strike should a snicker or a sneeze occur. Yet, through it all, the perfectionist attitude that drove Rasovsky and myself produced what would finally be a series of eight 60-minute-long episodes.

Rasovsky operates the non-profit organization called the National Radio Theatre of Chicago. Several grants had been received toward a project of adapting the *Odyssey* into a serialized radio play. The original plan included 12 episodes, each to include a concluding discussion of some aspect of the times of Homer. At first the 2½-inch thick script caused me intense trepidation. Having trouble balancing a checkbook, I wondered how I would ever keep everything straight. I decided to write everything on the script and take the chance that all the mistakes would somehow cancel themselves out.

Recording

About two weeks after I met Rasovsky, 15 actors, Rasovsky with two assistants and I, with one assistant, crowded into Chicago's Universal Recording Corporation's Studio C. One corner of the small control room was quickly filled with limiters, outboard Dolby equipment and cases of tape. The others spread out into the remaining space. In the studio area, Rasovsky requested all voices close-microphoned to minimize room sounds. I chose Shure SM-5s as primary microphones, because their response and directional patterns work well for voices within two feet. They almost never pop and are relatively forgiving of bobbing and weaving actors. Four such mics were set at right angles to one another, facing out. In one corner of the room was a Sennheiser MD 421 microphone, baffled from the others, for the poet or story narrator, the voice of Homer, if you will, portrayed by veteran actor Sheppard Strudwick.

The five microphones were recorded to 4-track, ½-inch Ampex 406 tape set for standard operating level. All tracks were Dolby'd to control audible noise and reduce possible print-through. Four non-ganged limiters kept program levels away from saturation and eased coping with the inevitable surprises. The 406 tape was chosen as a high quality, relatively print-free tape that allowed plenty of headroom at standard operating level. The 4-track format was the minimum to allow separation between voices that we would need later.

During rehearsals of each scene, actors practiced weaving in and out of assigned microphone positions, giving me a chance to prepare for problems. Good acting demands a wide dynamic range. An actor might whisper one line, scream the next. I had to anticipate delivery to keep levels artistically consistent. We worked through the script. Notes beside each line indicated which track would contain it. Future mixing would require quick references when re-recorded lines were to be cut in. Normally we assigned each actor's mic to its respective track.

Yuri Rasovsky, producer-director, (right) checks notes on the script as engineer Richard Fairbanks sets the Lexicon reverberation system. *Photo: Murray Allan*

The author, Richard Fairbanks, adjusts the Eventide Clockworks harmonizer for double voicing of goddess Athena in disguise. *Photo: Murray Allen*

Odyssey

The poet's mic was combined with mic two. Sometimes, however, narration would have its own track and others were combined. When there were two or more mics on a single channel, no more than one at a time was open in order to keep out extraneous noises.

As we recorded, each take was slated with a different number to indicate episode, page and line. A typical slate "153-9-7-6" meant *take 153, episode nine, page seven, beginning on line six.* "Keepers" were noted in the script for later editing references.

Occasionally an actor forgot his mic position and popped into someone else's assignment, displacing that person, similar to a case of five cats and four bowls! We madly scrambled to reassign mics, to keep important material separated. With two or three actors on each mic, that presented quite a challenge. Nimble button-punching between lines usually did the trick.

Rasovsky believed in actors really "acting." Sometimes they sat at tables. Sometimes they could move around the mics. We occasionally longed for a boom man. One love

Sheppard Strudwick is the voice of Homer.

Megan McTavish plays Odysseus' faithful wife, Penelope. *Photo: Ed Sacks*

Irene Worth, known throughout the United States and Europe, portrays Athena.

Odyssey

scene involved the happy couple tenderly embracing each other on the studio floor, smooching their hearts out for an X/Y pair of KM84s. Kinky, perhaps, but it achieved the desired effect.

Things were going well. We were actually ahead of schedule until one day an ear-splitting rhythm session next door leaked through enough to keep us from recording a quiet scene. One actor quipped that it might "pass for the music of the gods."

Rasovsky was enraged, and we tried to schedule rehearsals or lunch periods during rhythm dates next door. Then the air conditioner blower hearing began to fail. It became so noisy that we had to shut it off during takes. Despite such problems and many tedious hours, the actors remained friendly and professional. Finally everything was recorded, including many crowd effects—ohs, ahs, cheers—with some overdubbed as many as four times.

Editing voice tracks

We began to edit. Within two weeks we made two complete passes through everything; deleting, rearranging,

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John Glover is cast as Telemachus, son of Odysseus. *Photo: Ed Sacks*

The production staff for the *Odyssey* included Peter Green, University of Texas, Austin; Albert Lord, Harvard; James Redfield, University of Chicago; Kerry Frumkin, documentary producer; Yuri Rasovsky, director-producer; D. Nicholas Rudall, University of Chicago; Peter Arnott, Tufts University; and Jarl Dyrud, University of Chicago. (left to right) *Photo: Ed Sacks*

Odyssey

improving timing. Editing ½-inch tape became so natural that ¼-inch tape felt strange. Then, finally, the day came to lay it onto 24-track tape in Universal's new "Back Room" studio. The multi-track recorder was set up with 406 tape at 3dB elevated level, recording at 15 inches per second through Dolby units. We planned to use the MCI 628 console automation for mixdown. Tracks 1 and 24 were left open for data channels. To keep the all-important voice tracks away from possible edge damage and to simplify notekeeping, the 4-track, Track 1 was transferred to Track 11, two to 12, etc. The poet, always appearing completely dry and centered in the final stereo

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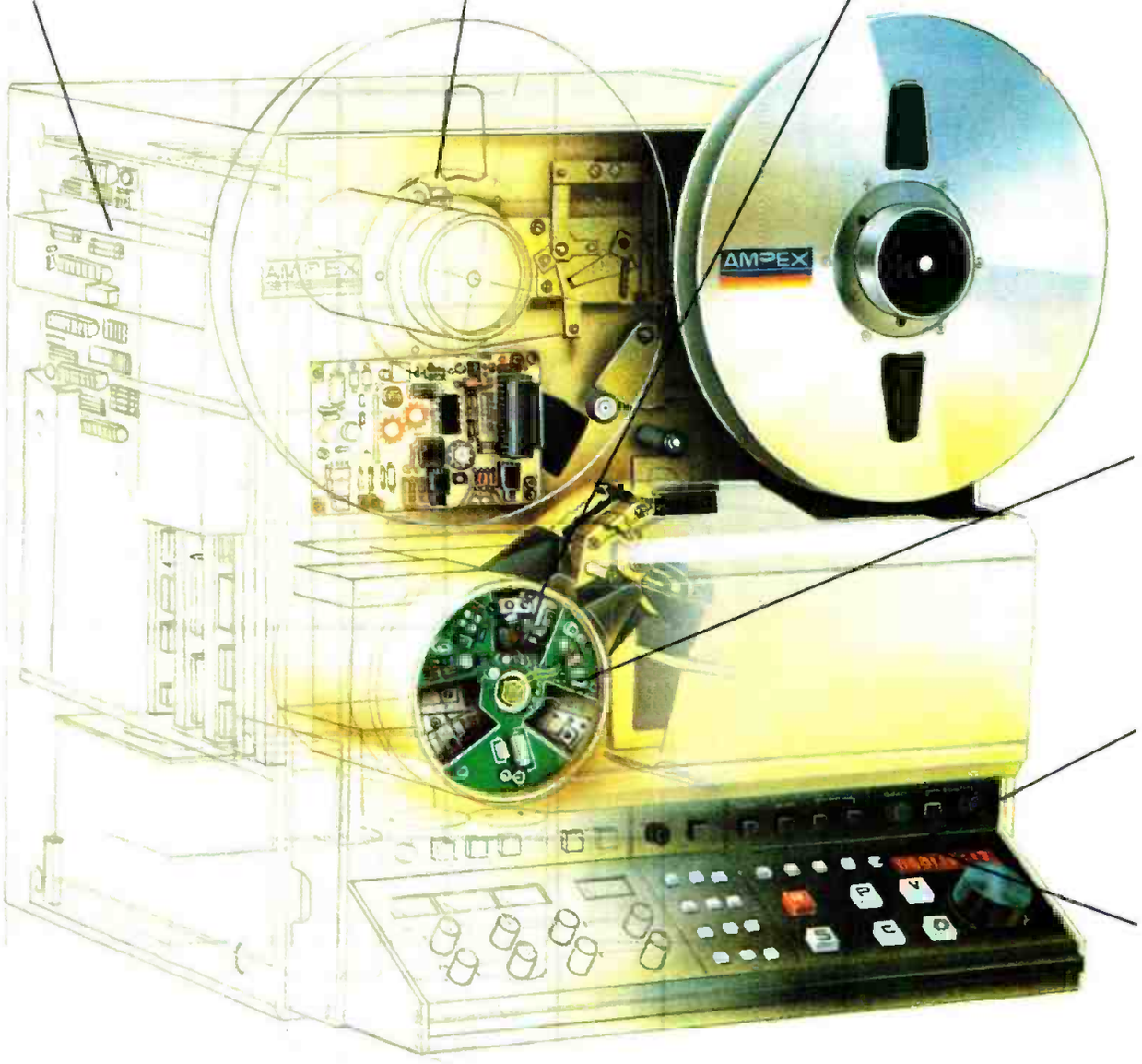

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TOOLS FOR TOMORROW

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Radio changing top-tune image

By Carl Bentz, technical editor

Promotional announcements led me to sit back on a mid-October evening to listen to a radio program titled *The Odyssey of Homer* on KXTR-FM, the classical music station in Kansas City, MO. With outdated 4-channel headphones and an FM receiver set for SQ decoding, I closed my eyes to begin an aural adventure. Carefully controlled blatant use of audio effects created an experience not possible with AM radio or TV broadcasts in the United States today. Although the *Odyssey* series ran only eight weeks, the National Radio Theatre program it is a part of includes other dramatic offerings filling a 26-week run before repeats begin during the week of April 18, 1982.

Radio, as an entertainment medium beyond news/talk and top-tune formats, is not dead. Several organizations have expressed a belief in radio as a distributor of high quality, creative entertainment by means of their funding efforts. The major supporters of the National Radio Theatre projects include the National Endowment for the Arts, the John and Mary R. Markle Foundation, the Satellite Program Development Fund of the Corporation for Public Broadcasting, the Andrew M. Mellon Foundation, the Illinois Humanities Council, and a company called TRW. "Close your eyes and give your mind a listen," is TRW's suggestion for listeners.

What response might be expected for classical music format station by such a diversion from Bach, Bartok, Beethoven, Borodin and Brahms? Byl Strother, KXTR-FM program director, offered an answer. About 50 calls had been received at the station.

"One or two complained of a change from the regular format," Strother said. "The others favored the program enthusiastically with some suggestions that the airing time be changed from 10:00 p.m. to something earlier." A newcomer in radio program direction, Strother had been concerned about the possible response to theater on a classical music station. "I decided I'd rock the boat on a bet. I'm glad that I did," he said.

Kate Busch, of the Chicago-based National Radio Theatre operation, provided similar comments regarding the nationwide response. Distribution is by satellite and other vehicles to more than 239 radio stations and additional cable systems throughout the United States. NRT announced a toll-free number, 1-800-621-2373, for information for listeners. Busch indicated that more than 13,000 calls were received. Most were interested in a special publication, *Audiobill*, which provides background on the *Odyssey* project. All expressed interest and pleasure with the production.

"When a ratings service factor is applied to the calls received," Busch said, "to determine an estimated cum listenership for *The Odyssey*, the numbers are astounding – possibly as high as 5 to 8 million. We have been quite pleased."

Several dramatic series are currently broadcast by radio. All show capable creative artistry in the radio medium. Of them, however, the NRT/Universal Recording Studio production with Rasovsky and Fairbanks takes the greatest command of the imaginative powers of the human mind. Preparation and perseverance in direction and engineering; the artistry of performers Irene Worth, Shepperd Strudwick, Barry Morse, John Glover and many others; introductory hosting by Edward Asner; extensive production research into the life and times of Homer by Kerry Frumkin; and original music by Eric Salzman, all worked together.

Odyssey

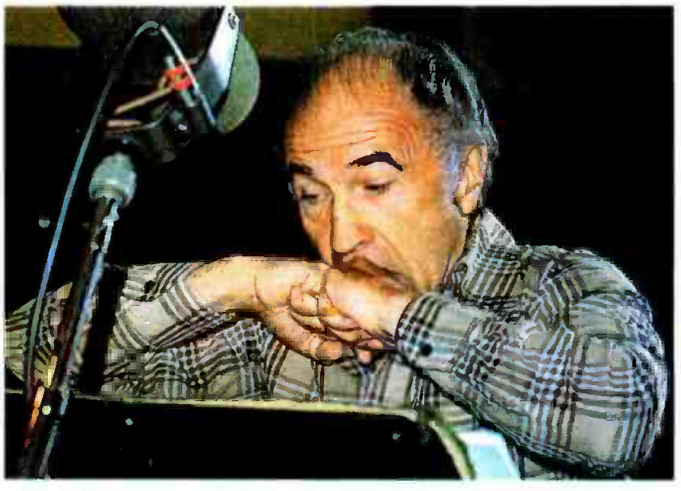
mix, was given his own track. We evened levels and made certain other voices were wisely assigned to tracks. If a character narrated over the story (dry and centered), as well as appeared in the scene, that narration was placed on a separate track.

In an attempt to simplify the final mix as we dubbed to the multi-track, any desired equalization and all effects were committed to tape, even reverberation, on separate tracks. That practice later eased cutting inserts into a previously mixed master. The voices, recorded flat to start, now were treated with general equalization curves: added warmth for indoor scenes, brightened midrange for outdoor portions, flat for narration.

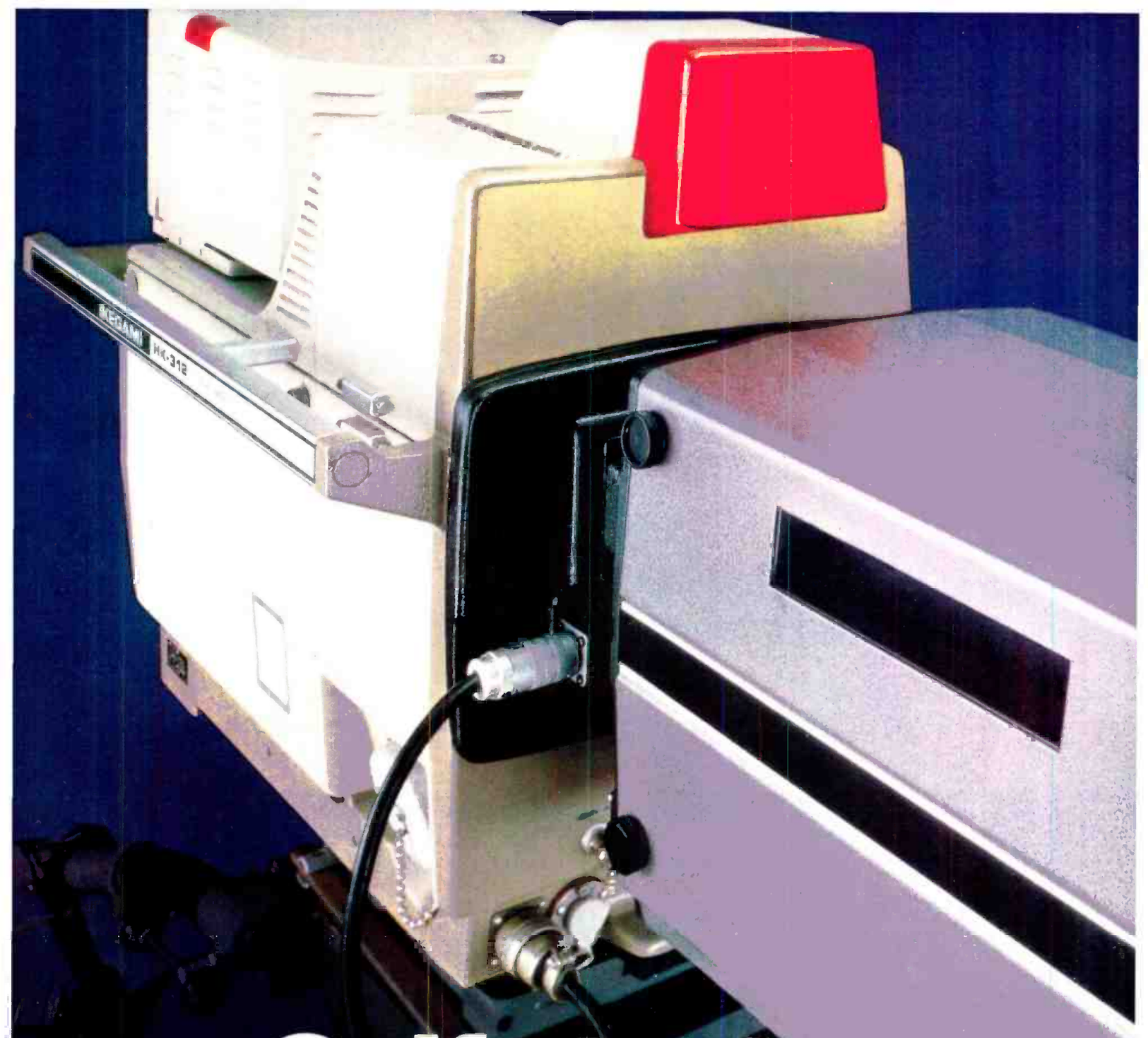
The voices of gods always needed to be distinct from mortals. Special reverb and delay effects were applied with an Eventide Clockworks Harmonizer and a Lexicon 224 Digital Reverberator. The effects were mixed with the dry voice directly to the god's voice track. Some special consideration was given to the goddess Athena, played by Irene Worth, who transformed herself into various disguised characters throughout the work. When she transmogrified herself, we faded the reverb and gradually harmonized the dry voice up and down as needed, combining the effect with the original voice, placing the combination on a single track. The method was preferred to an alternate means – two actors reading the same lines side by side – synchronized. The technique of combining it to one track allowed easy panning of her voice around the final mix with level changes made equally simple.

The multi-track variable speed capabilities helped us create little monsters, big monsters, man-eating children, and certainly sped the pace. Spaces were included for anticipated sound effects. A few of the pauses were intended for music cues, which as fate would have it, were not completed yet. And then the voice transfers were finished, so it was back to the top to add sound effects.

Most background presences were recorded in true stereo. Some actually came from Greece. When Universal's large collection of sound effects was not enough, Universal's Charlie Deardorff came to the rescue. On our own version of a Foley stage he built a "carriage machine," a large contraption with wheels that roll on a dirt surface for a chariot with stereo movement. Also, there was an ancient ship, a thunder sheet and a Trojan horse. By the time we finished, Deardorff had devised numerous gadgets that squeaked, creaked, clanked, snapped, scraped and a few more that just simply broke. Wet sponges (footsteps in mud), scrap metal, ripped-open soft-drink cans, pencils (at quarter speed made fine roll-



Barry Morse, once known as Inspector Girard on "The Fugitive," plays the ever resourceful Odysseus. *Photo: Ed Sacks*



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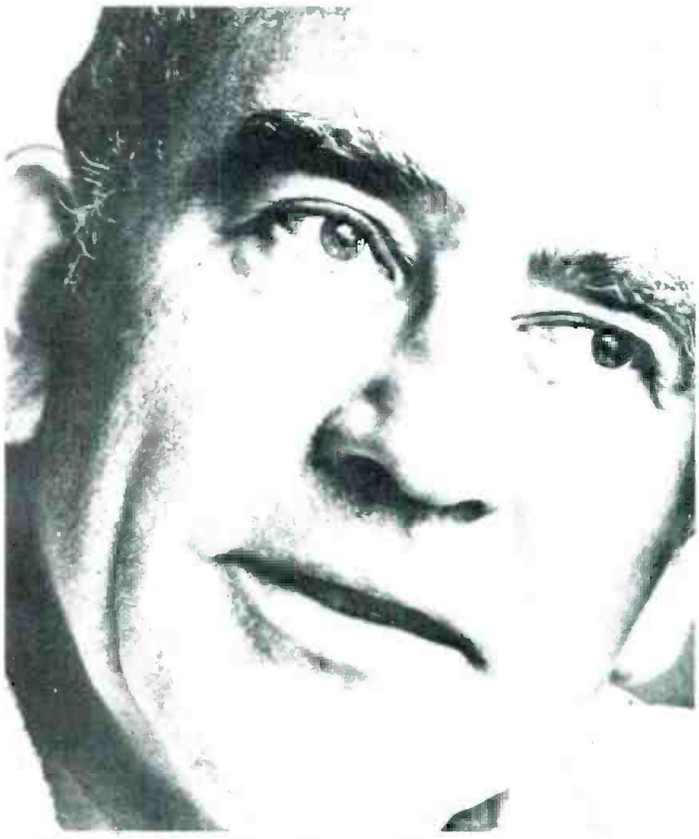
Circle (23) on Reply Card

ing logs, army boots, buckets, mic cables, and even a 100-pound slab of polished marble for footsteps came into play. A half-speeded avalanche, lightly mixed with an ominous rumble and a few groans, magically provided a Cyclops tearing off a mountain peak. Slowing down a thundersheet made a terrific explosion. Speeding up a plucked piano string caused a taut bow string "twang." A little twist of the knob worked wonders.

In addition to the vari-speed tricks, we added room sound to indoor scenes by playing the program through studio speakers, while mixing in a microphone placed in the middle of the studio. We flanged reverb returns, harmonized their sends. The warm, tight, "woody" room sound of a small hut came from the stereo output of the Eventide Instant Flanger with the seep oscillator disabled. The Lexicon 224 allowed creation of many different atmospheres, from a palace to the huge Cyclops' cavern. Carefully misadjusted and taped backward, it even helped to raise the dead when Barry Morse, as Odysseus, visited Hades. We noted on the script where every effect began and ended and on which track it appeared. The most complicated effects were premixed in stereo onto a couple of spare tracks while they were fresh in our minds. Others were saved for later.

After three weeks work, the effects were laid in. With music still not available, we returned to the top of the show to premix. Even though our final product would be stereo, we were concerned with the mono mix. A large portion of the listening audience would undoubtedly hear the show only in mono. We therefore monitored entirely in mono, until the final mix sessions. Mixing began with



Edward Asner hosts *The Odyssey of Homer* series.

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Total Error Corrector

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Specifications

Digital Sampling	Luma: 8 bits at 14.3MHz Chroma: 8 bits at 7.2MHz (R-Y at 3.58MHz and B-Y at 3.58MHz)
Window of Correction	32 Horizontal Lines
Signal to Noise Ratio	57dB Encoded Mode (Combs Off) 60dB Dub Mode (Combs Off)
Differential Phase (Residual Error)	Dub In/Dub Out (Y-688) 0.5° Encoded In/Encoded Out 1.5°
Differential Gain (Residual Error)	Dub In/Dub Out (Y-688) 0.5% Encoded In/Encoded Out 1.5%
Bandwidth	5.0MHz (-3dB)
K Factor (2T)	Dub (Y-688) 1.5% Direct 1.5% Heterodyne 3%
White Clip	110 IRE Nominal (Internally Adjustable)
Power	87-130VAC or 200-260VAC, 50 or 60Hz, 235W
Ambient Temperature	10°C to 40°C (50°F to 104°F)
Ambient Humidity	10% to 90%
Weight	18.2kg (40 lbs.)
Dimensions	48.3cm (19") W 8.9cm (3.5") H 60.3cm (23.75") D 54.6cm (21.5") D into rack

Inputs

Dub In
Video In (Encoded)
DOC RF
Genlock/Sync (Loop)
Subcarrier (Loop)

Outputs

Dub Out
Video 1 (Encoded)
Video 2 (Encoded)
VTR Advanced Sync
VTR Subcarrier
Blackburst
Y
R-Y
B-Y
Sync
Subcarrier
Blanking
7.2MHz Color Video

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™Record 1 is a trademark of Faroudja Laboratories, Inc.
All specifications are subject to change without notice.

Controls and Indicators

Power	2 position switch (on or off)
Program Out	2 position switch bypasses unit circuitry in program video path, monitor video path is always activated.
Input Mode	2 position switch selects Y-688 (dub) video input signal or encoded video input signal.
Image Processing	2 position switch turns the image processing and enhancement portion of the Y-688 32 Total Error Corrector on or off.
Video Gain	± 3dB
Chroma Gain	± 3dB
Setup	± 20 IRE
Hue	± 30°
Video Position	± 1 usec (with respect to sync)
Horizontal Phase	± 4 usec
Chroma Phase	360°
Vertical Image	0-100% Boost of vertical detail
Horizontal Image	0-100% Boost of horizontal detail
Noise Reduction	0-6dB compression in auto position and adjusts the level of coring in the manual mode.
Auto Position	Allows automatic boost compensation when Faroudja Laboratories Record 1™ pilot tone is present in input video signal.
Power On	Green LED
Image Pilot	Amber LED (indicates Record 1™ pilot tone present in input video)
Genlock	Green LED
Video	Green LED (indicates input video present)

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Norcross, Georgia 30092-9990
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the automation system, recording the data on one of the two empty tracks (1 or 24). The MCI 600 series automation system was ideal for the work. We often found it helpful to subgroup crowd effects, incidental effects and voice tracks. A mere flick of a switch here and there provided instant subgroups. Although much of the program was simple enough to balance on the first pass, some more complicated sections required several updates. We began such sections with voices only, adding effects, then subgrouping and rebalancing.

Punch-ins on the automation data tracks were unavoidable, but the MCI system coped with them easily and inaudibly. Updates and rewrites with the system are done easily and quickly. In short, the automation system handled every requirement and saved a great deal of time and aggravation. It also held consistent levels while we cut remixed segments into our master 2-track tape. Levels conveniently matched every time.

Adding music

At last Eric Salzman arrived with the music he had composed. He had taped and premixed the music in New York with different versions of each piece. We returned to the beginning and began placing the music cues. Some of the music, written and performed to precise lengths, refused to fit. Fortunately the variable speed machines again proved their worth by letting us tailor the music a few seconds longer or shorter to drop in perfectly. Salzman's knowledge of the tonality of each segment, along with variable speed calibrated in musical half-steps, helped to make "impossible" crossfades work nicely. We could produce a particular key, tempo or timbre to fit the dramatic mood. So, still monitoring in mono, we updated the automated mix to include the music, readjusting voices and effects as needed. The extra pass also gave Rasovsky and Salzman a chance to re-evaluate the music and finalize appropriate changes.

On the final mix-down, we added the opening and closing music along with hosting remarks of Ed Asner. Because automation took care of levels, Rasovsky and I could concentrate on panning and equalization. Rasovsky used headphones. I listened to the monitors. Together we hovered over the board, twiddling controls and punching equalization in and out. He handled voices and related effects movements. I kept an eye on everything else. The script contained our track assignments and all other instructions concerning compression, automated volume and equalization changes, as we had noted them during premix sessions, so we frequently found ourselves with noses buried in the pages, fighting over pan-pots, and yelling at each other to double check assignments. The final playbacks and addition of the documentary discussions produced by interviewer Kerry Frumkin finished the project of 12 1-hour episodes. A subsequent re-editing resulted in a shorter 8-episode version to be used by the many subscribing stations.

From a technical standpoint this project proved at least as challenging as any I have ever done. Most important and most surprising, *it was* fun. What better way to spend three months, two weeks, four days, and six and a quarter hours? Plus or minus a few minutes. Yet, for me it's back to the "real world" of 32-track digital. I am told that Rasovsky is barricaded in his office, his beard growing back nicely. □

← Circle (25) on Reply Card

Looking from the on-air operating position, these five racks contain reel-to-reel tapes for on-air use, the transmitter control and monitoring equipment, and the tape room for recording and playback of network and Radio Reading Service programming.

Frank Thomas, station manager, in the WCBU production room. Note that turntables, tape decks, and auxiliary equipment are arranged in a convenient circle around the operating position.

Laura Garfinkel, WCBU operations manager, on the air during her afternoon "intermezzo" program.

The WCBU tape room contains four tape decks, satellite demodulators, cassette tape, AM-FM tuner, routing and distribution equipment. Recording and playback functions of this equipment, including audio routing and demod selection, is controlled by an Apple II computer.

Audio processing equipment available in the production room includes compressor/limiters and noise reduction units. Together with equalization available on the M-90 console, nearly all processing needs can be met.

Case study: WCBU

By Gary A. Breed, chief engineer, WCBU-FM/WTVP-TV, Peoria, IL

Getting the most out of your studio means putting the most into it, through planning and design. Electronic function, physical layout and operator interaction with the equipment must all be well thought out and carefully tailored to the individual needs of the particular studio in order to create the most efficient possible combination of space and function.

Before looking at the design processes used recently to upgrade the WCBU facility, a basic plan can be laid out to follow in designing any new studio. Every station and every studio has individual requirements in terms of performance, budget, and so on, but there are some general principles that we all need to follow.

Fixed parameters

First, determine your *fixed parameters*, things not subject to change or compromise. Included in this category are available space and its location, budget requirements, and necessary features of the studio's function. At the earliest stages, you need to establish the most basic design factors that you have little or no ability to change: where the studio is to be located, how much you have to spend, and a general idea of the features that studio will need to have. For example, is the studio a small production-oriented facility without many fancy gadgets, or is it a major on-air control room with space for a number of guests, racks of auxiliary equipment, etc.? Match the available space, the budget and the basic requirements for operating features into a workable beginning for the final configuration of the studio.

Performance and operational goals

After establishing the basic guidelines, determine performance and operational goals. Start on the details of planning and designing the studio. Create a "wish list" of everything you would possibly like to see included in the studio. Start with the basic functions desired and the minimum number of units and type of equipment required to carry out the studio's basic task. Audio console capacity, number of turntables, cart machines, reel-to-reel tape decks, and other general types of equipment start the process. Expand on the list with desired additional equipment for operational convenience or flexibility. Define the optimum features with respect to human factors. Storage of carts, records and tapes; locations of windows, doors and traffic areas are the biggest items. Also list the details of ideal placement of equipment for convenient access, remote controls, telephone, music or copy files and other items necessary for your ideal studio.

After these first steps, you should have a complete analysis of what you want to do, plus the limiting factors you will have to deal with. With this information, you can begin working

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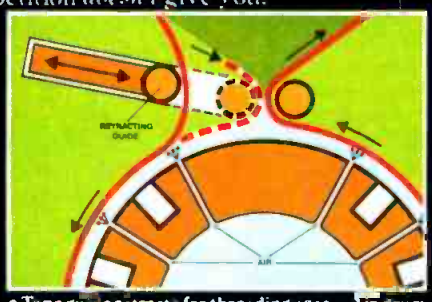

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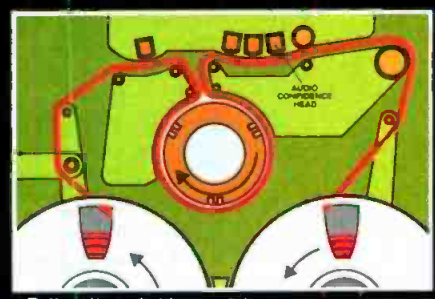

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toward the realization of your studio design.

Final design

It is not possible to give complete "how-to" instructions for the process of arriving at the final design of your studio. There are too many variable factors in priorities and compromises that have to be made as the process proceeds. Most engineers will begin with a physical layout, planning the placement of equipment, furniture and accessories for efficient operation and good use of space. Starting there also gives the staff a feeling for the reality of the project, as they begin to visualize what the studio will look like. It probably is the best starting point for most designs. Major changes are not likely to be needed as the design progresses, because equipment sizes do not vary greatly between different models. Some accommodation for a much larger or smaller audio console would be the most likely thing to alter plans of the studio layout.

Selecting equipment for the studio is necessarily a cooperative venture between engineering, programming, production and management personnel. Everyone's process of decision is different, but there are a number of things to keep in mind. For example, keep the audio quality goals in mind at all times. If your goals are for the ultimate in quality, then be sure *all* equipment is of top quality. Audio is definitely limited by the weak link in the system. If the goal of quality is tempered by budget constraints, then do not be tempted to get equipment that is far better than its companions in the audio chain. Unless there is another reason, such as reliability, to have exceptional equipment among average types, then the money is better spent elsewhere.

Flexibility is the next watchword. Whatever the level of quality in your studio plans, get the most out of your equipment by allowing maximum flexibility. It costs very little to add a patch panel or two, or to get a little more ambitious about a master interconnection panel. The result will be flexibility of interconnections beyond the normal configuration of equipment. The use of accessories and production aids such as compressors, equalizers, noise reduction or special-effect equipment requires a flexible interconnection system.

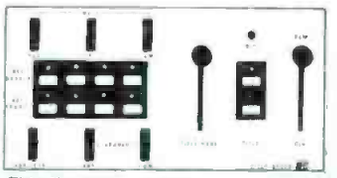
Finally, keep *operator convenience* in the foremost of your thoughts at all times. Let the people who will actually use the studio every day be the ones to help you determine the human engineering principles used in placing equipment and their controls. Traffic patterns, storage areas, lighting and small convenience accessories all are part of the operators' environment as they work in the studio.

The key to good studio design is good planning, starting with your goals in mind and making the necessary mid-course corrections with attention to original goals.

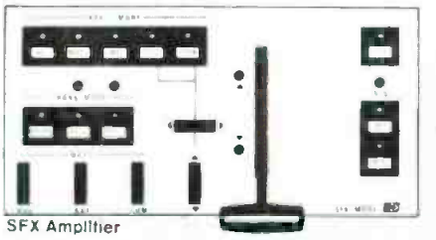
WCBU's experience

About three years ago, WCBU began planning a major renovation of studio facilities to coincide with similar upgrading of its transmitting plant. WTVP-TV, a co-located TV station was also planning improvements, including a new tower, to put that station on a par with other local TV stations.

The opportunity for WCBU to participate in that project, as far as sharing tower and transmitter building facilities, took care of improving the power, coverage area and quality of the transmitted signal, but its studios needed reconstruction to do justice to the improved signal strength. Fortunately, both WTVP and WCBU were able to successfully raise local funding and secure grants from NTIA for their facility improvements. The following

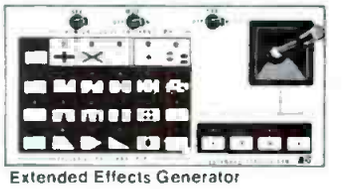


Title Keyer

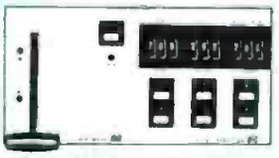


SFX Amplifier

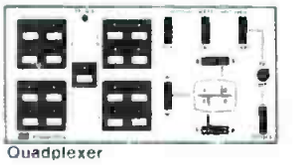
Chroma Keyers...RGB and Encoded



Extended Effects Generator



Master Mix & Auto Transitions



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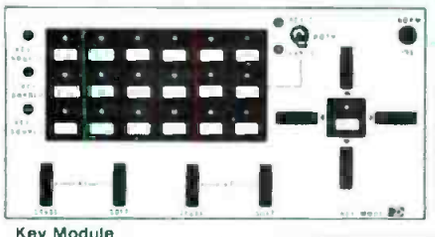
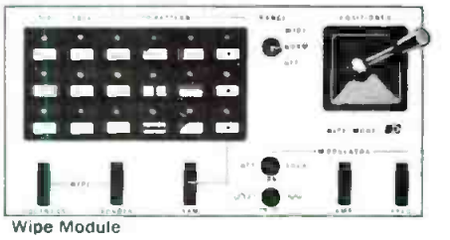
CD 480 SFX



Key Module



Wipe Module

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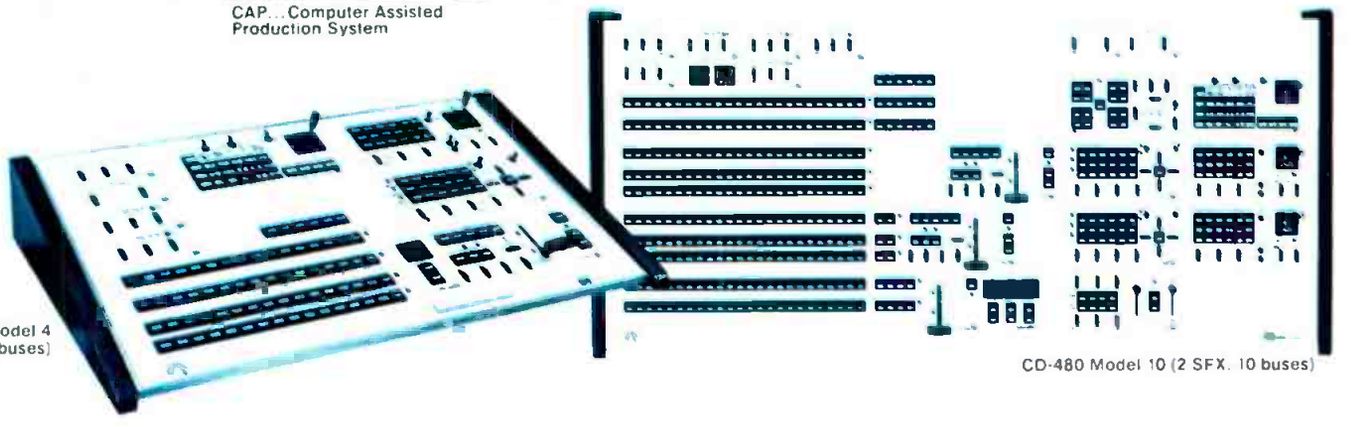

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is a summary of the process by which the WCBU studios were designed by Keith Turcot, engineer, working with Frank Thomas, station manager, and the staff of WCBU.

Fixed parameters

First, fixed parameters were established by an estimate of the money available and the maximum operational and performance standards that could possibly be achieved. Although there was no excess of available space, it was judged at this early stage to be sufficient. Because of the grant process, the money portion had to be done again once NTIA awarded WCBU its allocation of funds. In summary, the fixed parameters were money and a no-compromise attention to the quality of the program audio chain.

Performance and operational goals

Second, performance and operational goals were established once the firm guidelines of money and ultimate performance were set. Because performance was assumed to be the best possible, that left only operational features to be decided upon. The following were major items on the station's list:

- Basic on-air equipment simple enough for operation by inexperienced student or part-time help was needed.
- A future move to a new studio location was in discussion. The network satellite feed recording equipment was to be electrically and physically separate, because it could end up in a different room from its neighboring equipment in the control room.
- Production room facilities had to be flexible enough to handle diverse media: ¼-inch, ½- and ¼-track reel-to-reel; ½-inch, 4-track tape; cartridges; cassette; and disc recordings.
- An interview studio, located between the control room and production room, had to be usable for either on-air or production tasks.
- The "tape room," three racks in the control room, had to be able to record from any of six satellite demodulators. Playback might be into an SCA reading service feed or be used for later broadcast.

Nothing remarkable was in the plans, just a straightforward, but highly flexible operation with specific features for operation and recording capabilities.

Final design

The results of the planning process at WCBU, room by room, are as follows.

First, let's look at the on-air studio. Of the high quality consoles available at the time of design, the Ward-Beck R-1200 had the performance desired in a straightforward layout and was chosen as the heart of the operation. With most programming played from disc, Technics SP-10 turntables, Audio Technica arms, Stanton 681SE cartridges and Stanton preamps, were selected for the turntable system. An ITC 3-D cartridge reproducer provides cart playback, and three MCI JH-110 tape decks are used for playback of taped programming.

Microphones used are the E-V RE-16s. which were used before the redesign. Although other microphones have been considered, background noise from air handling equipment in the building is the limiting factor in microphone quality. In this same area, vibrations are also present. To minimize vibration-induced rumble, the turntables are mounted on isolated bases (a commercial model with rubber isolators), and the pedestal bases have approximately 400 pounds of sandbags in each.

An outside consultant provided additional help in minimizing the

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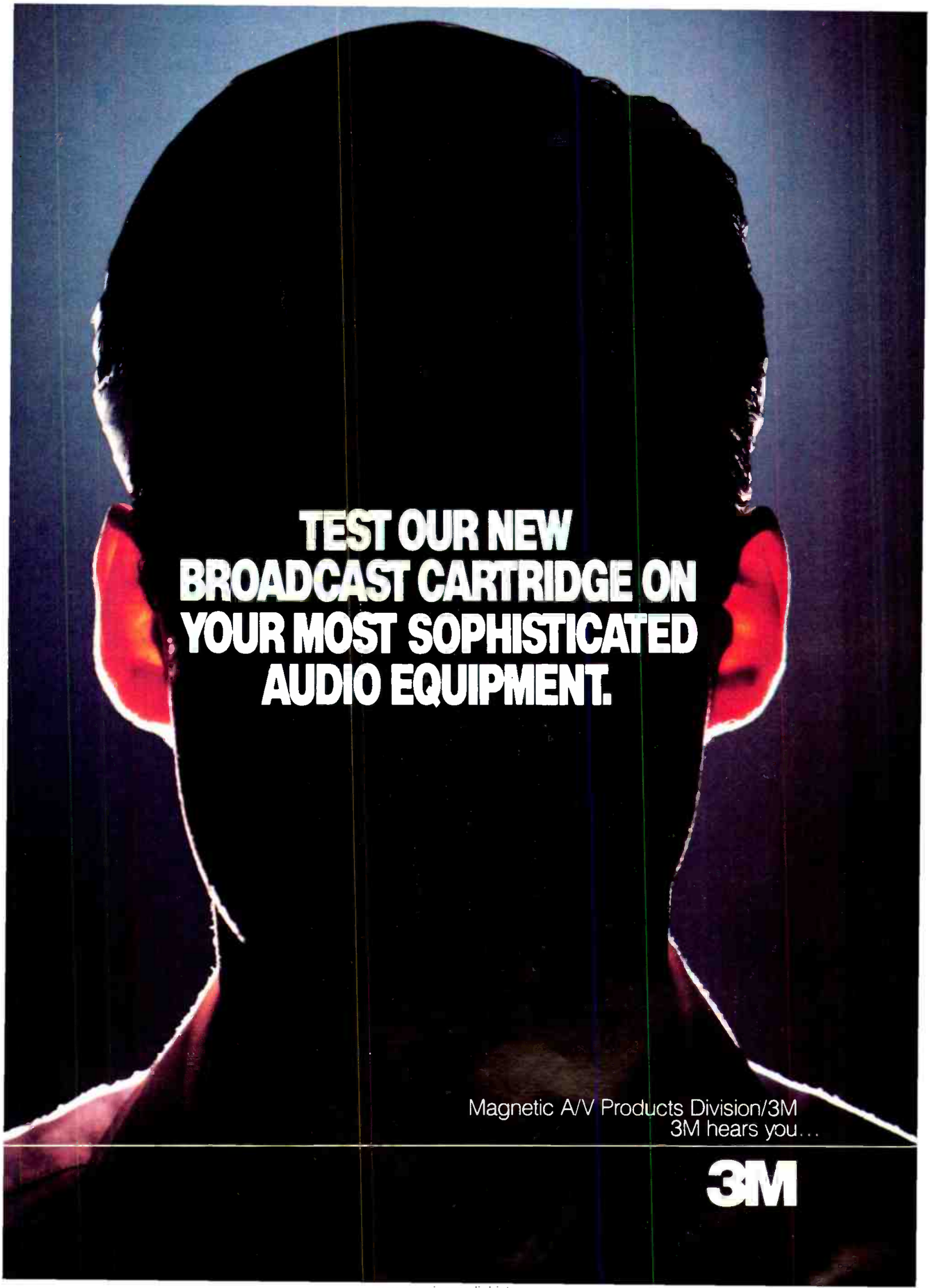


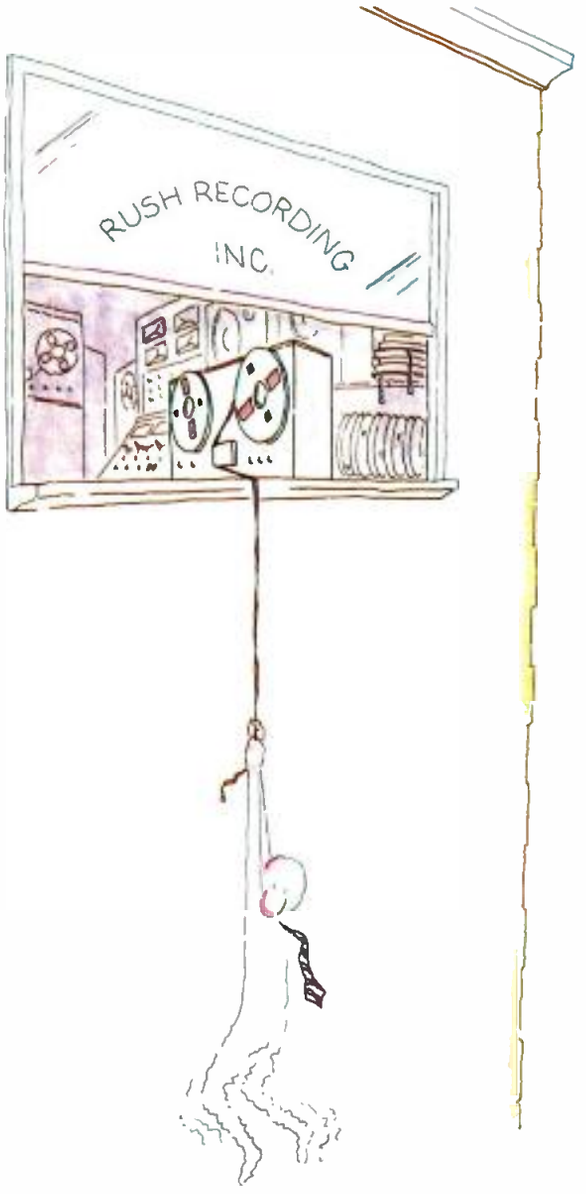
Another view of the production room, showing the equipment arrangement. The wide-angle camera lens makes it look more crowded than it really is. Although it is a compact studio, it is not cramped.

From the back of the main control room, we see the spatial relationship between the equipment racks and the on-air operating position. Turntables, carts and remote controls for the tape decks are close at hand for maximum operating convenience.

WCBU

acoustical problems, although the expense of implementing some of his suggestions was beyond budget capacity. Sound-absorbent wallboard and a high absorbency ceiling tile were used with relative success. Unfortunately, ductwork for heating and air conditioning of the entire classroom building in which the studio facilities are located passes overhead, and the air handling unit is in the same end of the building. The subtle, but audible, rumble of machines is always around. With the treatment of walls, ceiling and turntables, the only noticeable evidence of this to listeners occurs when the announcer chooses not to talk closely into the microphone.

Audio processing is provided by an Orban Optimod 8100A. Processing is probably not the appropriate term to describe the use of the Optimod, but rather overmodulation protection. The threshold of operation on the gain reduction functions of the unit are set rather high to avoid significant reduction in the dynamic range of the broadcast signal. There is an ongoing struggle, however, to determine just where the threshold should be set,



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because minimal processing requires close attention by the operators, and inexperienced help is often used. The studio-transmitter-link is a Moseley PCL-505C composite STL, which contributes no degradation of the audio quality. In the interest of operational ease, a QEI automatic transmitter system is used to eliminate the need for a transmitter operating log.

For the production room, use of another Ward-Beck console had been planned, but when final design considerations had to compromise with the budget, a Harris M-90 (by Auditronics) was selected for the main console. Turntable systems identical to the on-air studio were used in production as well. Two MCI JH-110 ½-track tape decks, and an MCI ½-inch, 4-track deck are the primary production tape equipment. A Revox B-77 provides ¼-track capability, and a Teac A-3X cassette unit is also installed. ITC cartridge recorders and reproducers, and an older ITC 850 reel-to-reel machine are also available. For audio processing functions, the console has equalizers on each channel, dbx 142 3-channel noise reduction units can be patched into use, and on-hand Spectrasonics Complimeters were installed to provide compression/limiting functions, if necessary. In all, very high quality and versatile production needs can be met in the well-equipped and flexible studio.

The "tape room" consists of three racks located in the same room with on-air operation. Six demodulators capture NPR network feeds. Revox A-77 and ITC 770 tape decks handle the recording and playback functions. A Ramko routing switcher is used, primarily for its remote control functions. Also located in this area is a Teac A-550RX cassette deck, providing access to material recorded in this medium. The tape room provides two operational functions: to record network programming for later broadcast; and to provide audio for the Radio Reading Service, which uses the WCBU SCA. Reading service programming comes from NPR as well as other material.

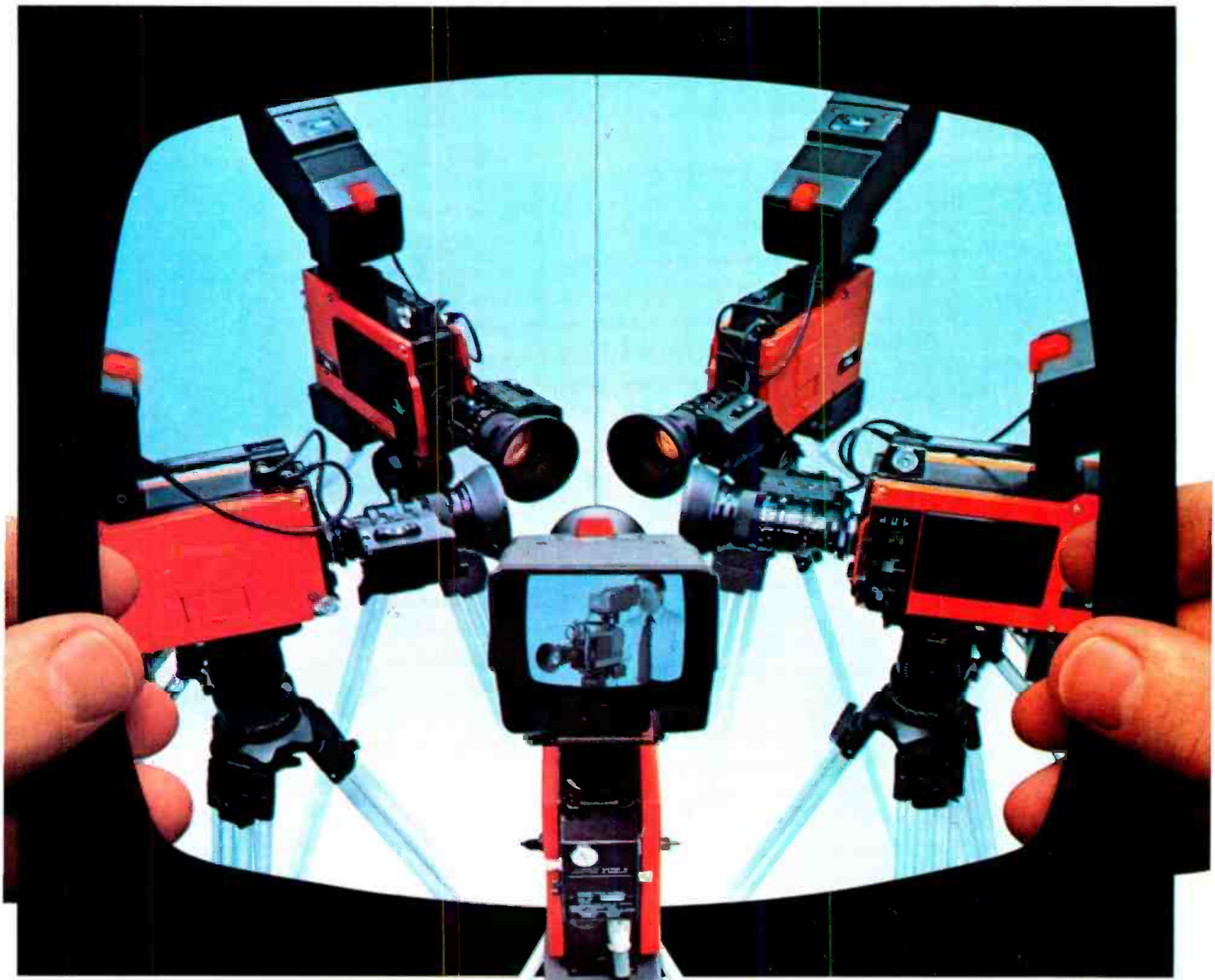
Recently put into operation was an automation system for the tape room, using an Apple II computer to automatically record, play, switch audio, select demodulator channels, and take the burden of operation from those sometimes inexperienced operators.

To sum up the design and implementation of the rebuilding of the WCBU studios, the concepts of *quality*, *flexibility* and *straightforward operation* were stressed. It took a great deal of planning and discussion to decide on the operational features that best fit the use to which the facility is put, and to fit the ability of the people who use it, from inexperienced operators of on-air programming, to talented production people who can create innovative and complex products in the production studio.

The WCBU facility has proven to be successful. As with any new facility, there have been problems, but few of the problems have been related to functional design. In fact, the flexibility of design, through patch panels and duplication of equipment among the three areas, has made the shakedown process of new equipment less of a problem than most stations would experience. It is an easy task to service a tape deck, for example, without disrupting operations, by patching another into its place. Unusual or special arrangements can almost always be put together, because a wide range of equipment types is available.

Planning is the key, and it pays off. The thick file of notes in Turcot's desk is testimony to the planning it took at WCBU. The operation of the station is testimony to the value of that planning. □

Compare



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Radio sound quality

Notes on headroom

By Gary A. Breed, chief engineer, WCBU-FM/WTVP-TV, Peoria, IL

One of the factors affecting the quality of broadcast audio is *headroom*, the capability of handling audio levels that exceed normal program levels. It is a performance parameter that you have to look for, as its audible degradation may be subtle. It is essential to have good headroom performance to maintain top audio quality under the dynamic conditions encountered in all types of program material.

Need for headroom

The nature of audio program material, whether voice or music, is one of a high peak-to-average ratio, unlike sine wave test signals commonly used for audio performance measurements. Making headroom even more important is the nature of the VU meter, which has ballistics to follow *average*, not *peak* levels. It becomes essential that your audio system maintain quality performance at levels far in excess of 0VU, because that 0 meter reading does not tell you that there are peaks occurring at much higher levels. Without adequate headroom, your station may have excellent annual proof results, but still sound less than excellent, due to distortion of peaks, crosstalk or any other problems that can occur because of high program levels.

The recording industry is equally concerned with headroom, and has responded with the widespread use of peak-reading audio level meters to avoid unnecessary processing of audio before mastering. Some broadcasters make use of peak-reading meters, but they still need to keep track of average levels. Loudness, as perceived by the listener is a function of the average audio level.) I use AGC and limiting amplifiers, often very sophisticated, to maintain a high average level for maximum loudness, while holding down the peaks as much as possible to keep within the constraints of 100% modulation.

On the whole, most broadcasters will probably continue to use the conventional VU meter as their level indicating device, in order to monitor the average level. They will also use the audio processing equipment to further increase that average, while limiting the peaks. With this metering and processing configuration, all audio equipment should have performance of an acceptable standard at levels up to 10 to 15dB above the normal operating levels (for example, 0VU). Otherwise, peaks will be clipped, distorted or otherwise degraded.

Measuring headroom performance

The simplest way to check headroom performance is to set up the test arrangement with sine wave test signals at normal levels, corresponding to 0VU, then increase the level until distortion increases to an unsatisfactory amount. Usually, at some point the distortion will increase rapidly, due to clipping as some part of the audio chain becomes overdriven. For worry-free performance, all signal paths should be capable of operating to at least 10dB above normal with almost no change in distortion, preferably 15dB. Start with the transmitter and work backward to the audio source equipment. That way, you know that the audio path is good at all points beyond your test device. A minimum standard would be no more than 1.5% distortion at 10dB above normal, and no more than 3% at 15dB above normal. Better performance can be achieved, of course, but the audio quality will be basically unaffected if the previously mentioned figures are met.

Evaluating equipment types

Each individual component in the audio chain needs to have adequate headroom performance, or the weakest link will cause the system's demise.

Microphones

With gain adjusted to normal, establish the VU reading of the loudest expected volume and determine the performance up to 15dB above that level. If no distortion increase occurs, great! If the microphone preamp does *not* have adequate headroom, a pad should be inserted between the microphone and the preamp to allow 15dB of headroom and the loss made up elsewhere in the system where headroom is abundant.

Turntable systems

Adjust gain to normal levels using a test record. If the test record has an overdeviated track, use it to find the maximum level likely to be encountered. Also use an assortment of discs (probably 45s) to find the highest levels that the preamp input will find. Hook up the test equipment and measure performance at this highest level, plus headroom allowance. If performance is not adequate, first check to see where the gain control is in the circuit. Many preamps have gain control located *between* stages of the amplifier, and a good first stage loses its performance advantage when a later stage is overdriven. Again, reduce the levels to that which gives the right performance, and make up the gain elsewhere.

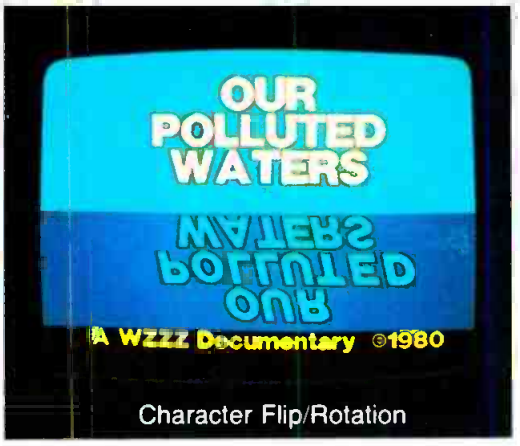
Audio consoles

Whether you are evaluating various models for selection of new equipment or checking out your existing unit, be sure it meets headroom criteria from *all* inputs to *all* quality outputs, including monitor outputs. Once it has been determined that the console is performing the way you want, be certain to maintain the same input and output levels that were used as references during the tests.

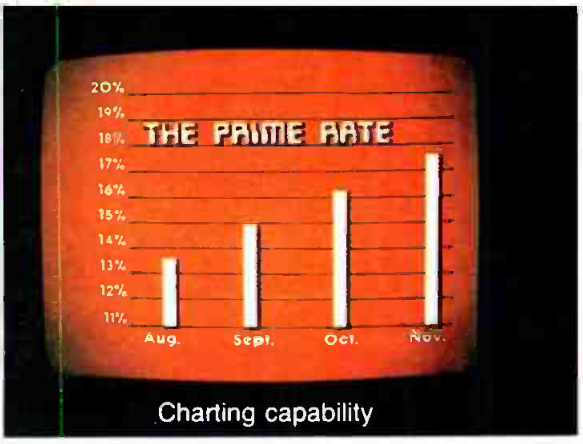
Audio processing

Be sure that the headroom performance of these units is right, also. Check them under non-processing conditions as well as in normal operating modes. These units must handle peaks as program material and as information for the processing circuitry. Make sure they respond to peak material without quality degradation and that they will operate as processors with peaks in excess of those normally encountered. Most units have both input and output level controls, so keep them balanced, maintaining a constant level between units and throughout the audio chain.

Dual channel mix

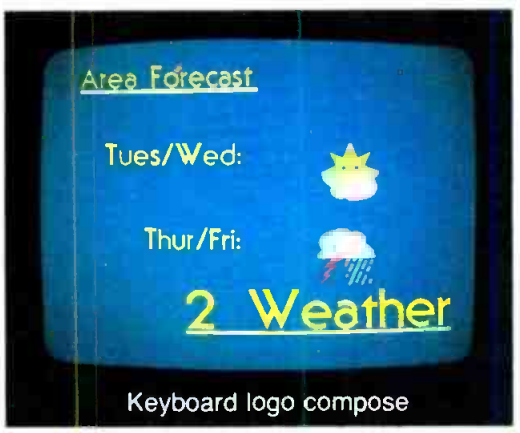


Character Flip/Rotation

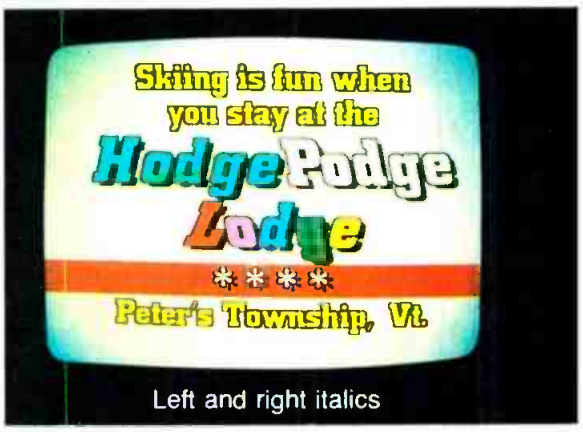


Charting capability

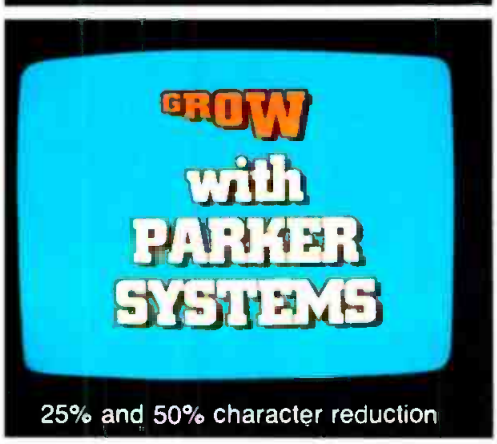
Static headline, changing copy



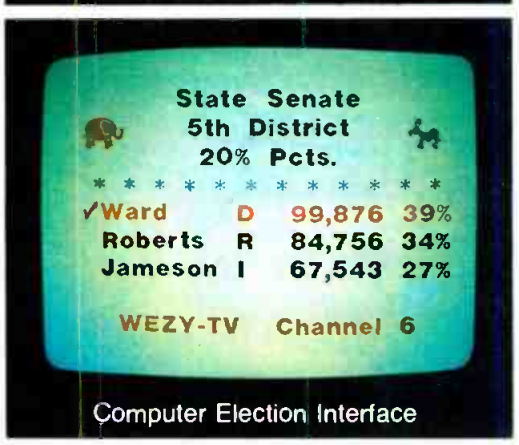
Keyboard logo compose



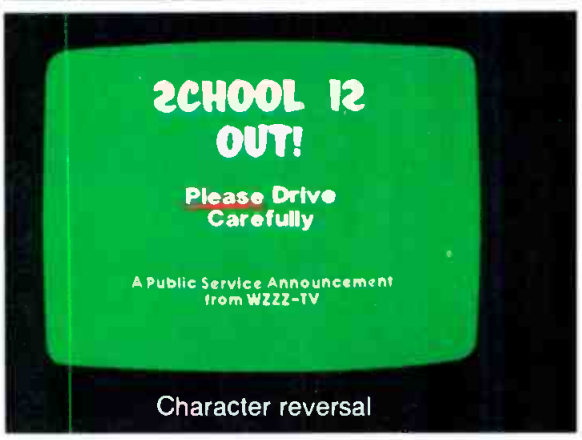
Left and right italics



25% and 50% character reduction



Computer Election Interface



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Sound quality

Amplifiers

Line amplifiers, distribution amplifiers, telephone line equalizers and amplifiers all need to have good headroom performance. More than one station has an excellent proof-of-performance, but does not sound nearly as good on the air because the telephone lines from studio to transmitter site were never checked for headroom and were overdriven by program peaks. I have not yet found a telephone company unwilling to remedy a headroom problem, but it may take a little effort to locate the right person who understands your requirement for performance.

Another example of headroom performance is a distribution amplifier that is on the market with published specifications that look fine and is rated at 0dBm output level. What is overlooked is that 0dBm is also the threshold of clipping, and to get good headroom you would have to run the DA at -10 or -15dBm output. If you buy equipment with inadequate headroom performance, send it back and get something else. Another general note is to watch for losses, such as mismatches, pads or heavily loaded outputs. You can use up the headroom performance of the associated equipment as you turn up the level to overcome these losses.

Tape equipment

Audiotape recording and playback equipment requires attention to maintain all phases of its performance, including headroom. Alignment, bias, record and playback levels and the type of tape all influence headroom performance of tape equipment. Most stations choose one type of tape as their standard, and one brand of cartridge, in order to maintain consistency.

To evaluate headroom, first do a complete alignment of the tape unit using your tape, a test tape and the manufacturer's recommended procedure. Once set up, check headroom performance from input to output. Unless your test tape has test signals at higher than normal levels, it will be difficult to determine whether headroom problems are in the record or playback processes. The most likely place for headroom problems is in the record mode. Some popular tape equipment uses record heads that magnetically saturate at about 4dB above standard level. In order to achieve desired headroom, it may be necessary to reduce the record level below standard. The added noise is probably less objectionable than the distortion of program peaks. In an all-cart operation, or at stations that record their music for automation, the improvement can be dramatic.

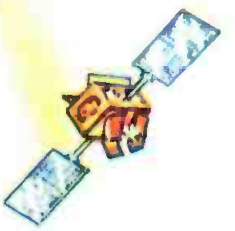
Crosstalk

Involving the station wiring, switching and distribution equipment, crosstalk is closely related to headroom because both deal with excessive levels. When checking for crosstalk, do not forget to check at 10 to 15dB above normal, and you will be sure that an allowance has been made for program peaks. In looking for a crosstalk solution, headroom type measurements can be used to establish optimum levels for in-house audio distribution.

Ongoing evaluation

An ongoing evaluation of headroom is necessary, just as are all other performance standards, if you are trying to maintain quality. Routine adjustments in levels, changes in wiring, and other small changes can add up to a loss of adequate headroom at some point in the audio chain. Keeping on top of the situation is the best way to prevent degradation in the future. □

cable engineering



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TELETEXT

Cable television is the fastest growing communication technology ever known. Bolstered by advances and developments from many areas of communications and saddled with the needs and demands of paying subscribers, CATV has its own set of problems. In this demographic issue, **Broadcast Engineering** looks at technology and listens to the industry to see what is, and will be, happening in CATV.

CABLE ENGINEERING

Cashing in with cable

By Carl Bentz, technical editor

Welcome to the first indepth look at cable television by **Broadcast Engineering** taken in several years. Although broadcasters have mixed opinions of the effects CATV has had on them, there is generally a mutual respect between the two industries. If it were not for efforts by CATV operators, the massive satellite interconnects currently in use by broadcasting groups might not have developed as quickly. Broadcasters' needs for newsgathering, however, speeded the creation of production equipment that could also be used by CATV production efforts. Some CATV services may draw viewership from broadcast channels, but regular stations continue to give better general coverage to metropolitan areas than CATV can.

UHF TV appears to have been helped by CATV. Because of previously limited bandwidths of CATV equipment, the UHF frequencies were converted to VHF. CATV allowed greatly improved reception for numerous UHF independents and PBS UHF affiliates, because past UHF tuner technologies left much to be desired. Commercial VHF stations, particularly ABC, CBS and NBC affiliates, are not as pleased with CATV carriage. Cable allows a viewer to see the *wrong* commercials. Recently messages of programming support from "local advertising" have indicated this displeasure.

System operators and programming organizations have an optimistic outlook on the future of CATV. Until satellites became vogue for many services, the local stations were *the* signal sources. Local stations will always be a necessary programming source, they think. But CATV people see their biggest challenge to be system expansion and upgrading to handle an ever-growing selection of program materials. □

"Cable Delivers!"

The National Cable Television Association 31st Annual Convention, to be held May 3-5 at the Las Vegas Convention Center, promises to be informative. Beginning with the reception on Sunday evening, May 2, attendees will be kept busy. Hundreds of exhibits featuring cable programming and applicable hardware have already been booked for the 3-day convention. For those interested in more technical matters, 13 sessions have been scheduled.

More than 40 technical papers will be delivered in the technical sessions. The following general subject categories have been set.

Monday, May 3

- New Developments in Addressable Hardware
- Data Transmission Systems

Tuesday, May 4

- Why Isn't Fiber-Optics Being Used in Cable TV?
- Satellite Technology and Microwave System Design
- Multibeam Satellite Dishes
- Data Transmission Technologies
- Interfacing CATV with New Consumer Electronics Products

Wednesday, May 5

- Local Programming Facilities Design
- Control of Noise and Distortion in Distribution Systems
- Future Technologies
- System Reliability/Status Monitoring
- Videotext
- Satellite Spacing

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Future trends in CATV technology

By John Ovnick, chief engineer, RCA Cablevision Systems; Bob Hamell, manager, CATV headend products; Bert Arnold, manager, distribution systems; Karl Angel, manager, terminal equipment; and Bob Schoenbeck, staff technical adviser, RCA Cablevision Systems.

Cable TV systems will be increasing their bandwidth capability in the future and making more efficient use of the operating bandwidth now available. Automatic monitoring and control of CATV equipment performance will be used to improve system reliability and reduce maintenance costs. Subscriber terminals will provide additional services and will be controllable from the headend.

Competitive franchising activity for new CATV systems has resulted in operating companies committing to provide additional channels over and above the typical 36-channel 300MHz system. Cable-system technology is responding to this requirement with wider bandwidth components (amplifiers, passives, cable) and headend equipment to generate new channels to use the additional system bandwidth. The RCA model 452 trunk/bridger amplifier, made available in 1981, has a bandwidth of 400MHz.

The cost increase of a 400MHz system relative to a 300MHz system is in the order of 20%. However, the increase in the number of available channels is almost 50%. This indicates that the increased bandwidth is a cost effective way to increase channel capacity. Many older cable systems will take advantage of the increased bandwidth technology when existing franchises expire and system rebuilding is required.

Today many cable systems generate one or more alphanumeric signal channels. The data-rate relative to the bandwidth used is very low for this method of data transmission, which provides inefficient use of the cable spectrum. Future technology will allow alphanumeric data signals to be transmitted during the vertical interval of normal TV channels rather than consuming additional channels. This type of data transmission will probably use a standard teletext signal format that requires a decoder at the cable subscriber's terminal or a decoder as part of the home TV receiver.

RCA Cablevision has conducted extensive testing of its headend and distribution equipment to verify its performance capability relative to this new teletext signal. An area of performance that is very important to the wideband teletext signal is phase response. Poor phase response in any portion of the system can cause excessive transients and result in data errors. RCA cable products were tested individually and as a system for transient response, and the results confirmed that RCA cable equipment is ready for teletext signals when they become available.

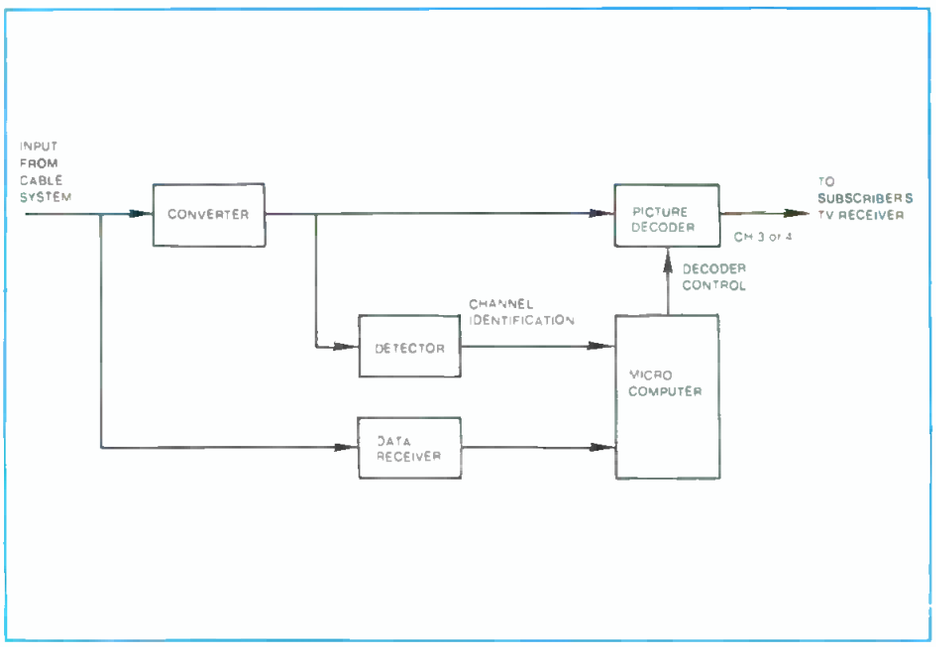
The cable operator will also be able to devote a complete TV channel assignment to data transmission if desired. All of the horizontal lines normally used for picture transmission could be used for data rather than one or two lines in the vertical interval, as is normal for conventional teletext. This would provide efficient use of the channel spectrum.

A portion of the CATV spectrum that is relatively untapped is the return signal path. This spectrum will gain usage as technology provides cost-compatible 2-way cable services.

Digital technology will gain more usage in headend and distribution equipment to perform monitor and control functions. Use of these functions will aid in maintenance and improve reliability of cable systems.

New amplifiers will have the ability to monitor performance parameters and to remotely switch feeder-cable return paths. New headend products will have microcomputers to monitor and analyze equipment functions. System control from a central location will become possible.

Terminals will be available in the near future with more features. First, they will have increased channel coverage to be compatible with the increased cable system bandwidth. Synthesized tuning will be the norm. Each terminal will be addressable and controlled from the headend. This will allow cable operators remote control of such things as tier level of service and subscriber disconnect. Premium channel decoding will be an integral part of this terminal. Figure 1 shows a



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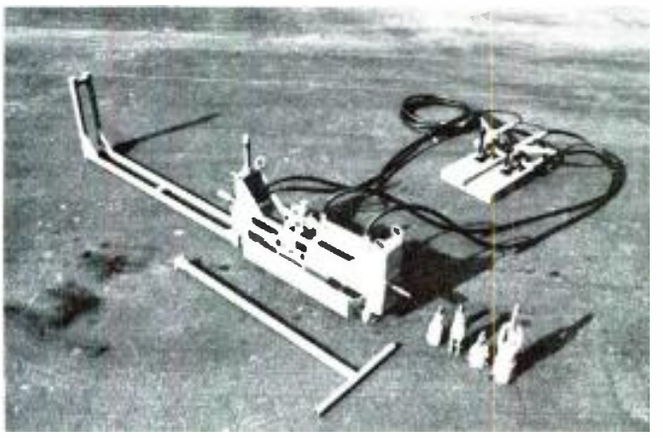

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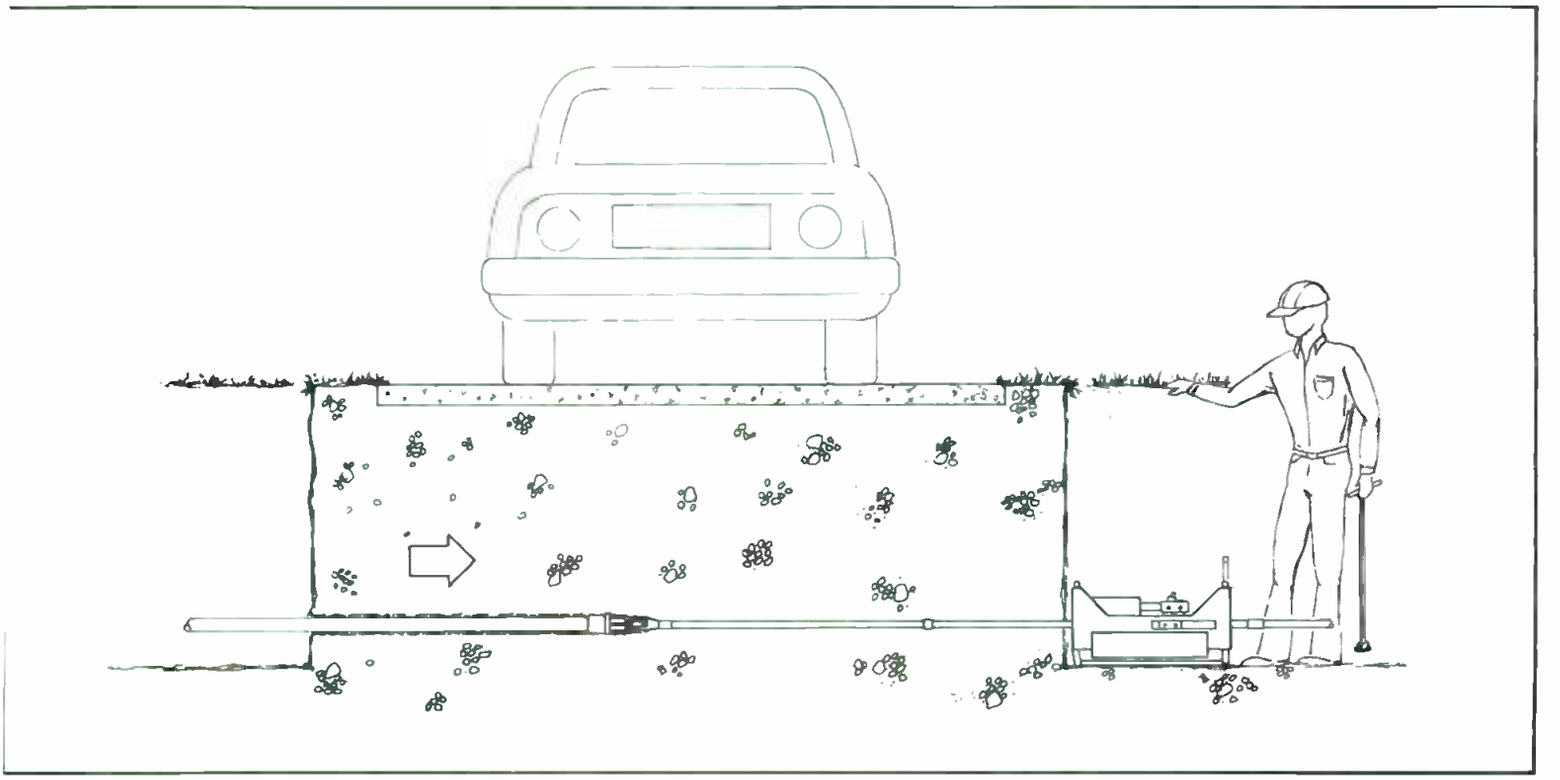

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converter with these near-term features.

Farther downstream another generation of subscriber terminals will be available with additional features and additional capabilities than those previously described. These units will demodulate the cable signal to baseband audio and video, which allows a more secure scrambling system to be used on premium programming. It also allows subscriber remote audio level control. Teletext data signals can also be processed from the baseband video. A return data transmission feature will allow 2-way interactive services. This terminal will be upgradable to provide the different features with plug-in modules. Figure 2 shows this type of terminal.

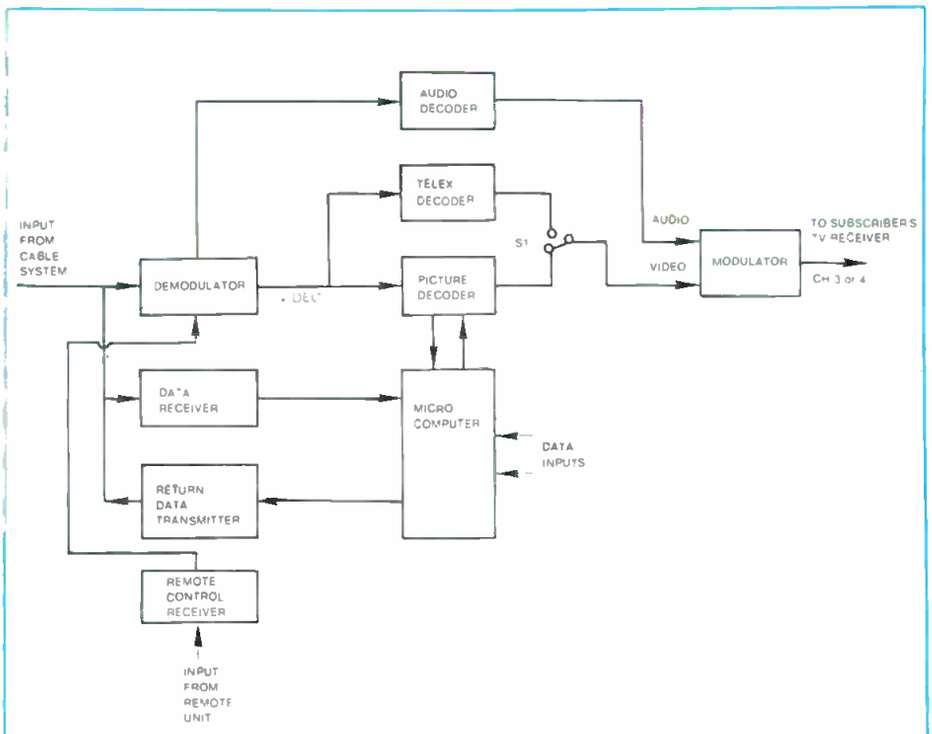

Figure 2. Future subscriber terminal.

Use of fiber-optics will be an alternative to conventional coaxial cable for construction of CATV systems. Some experimental point-to-point transportation trunking fiber-optics systems have been built, but the cost at present is higher than using conventional coaxial cable.

Present fiber-optics systems suffer from the fact that the light signal is converted to a VHF signal for amplification and then converted back to light for transportation down the fiber. This means the signal is degraded by the transducers in addition to the VHF amplifier. This additional degradation reduces the spacing between repeaters to the point where it is not cost competitive with coaxial-cable systems.

The light signal must again be converted to VHF if a conventional TV receiver is connected to the system. Fiber-optics will continue to be used for experimental point-to-point signal transportation, but will not gain widespread usage in CATV distribution systems until it becomes more cost effective. □

Block conversion for satellite receiving stations

By Kathryn F. Harrer, Video Communications Division, Scientific-Atlanta, Atlanta, GA

Block downconversion is a new approach to satellite receiving systems that has many advantages over conventional systems. Comparing price, serviceability and compactness, block conversion excels in all three categories. The new equipment requires special design considerations for broadband operation.

This material was presented at the Scientific-Atlanta Satellite Communications Symposium '81. It has been edited and reprinted with the permission of Scientific-Atlanta.

Comparing the systems

Figure 1 shows a block diagram of a conventional system receiving a single polarization. There is no frequency conversion at the antenna. The 3.7 to 4.2GHz signal from the antenna is boosted by the low noise amplifier (LNA) and sent via coaxial cable to the receiver. If more than one receiver is fed from the LNA, there will be an N-way power divider in the line before the receiver (N = number of

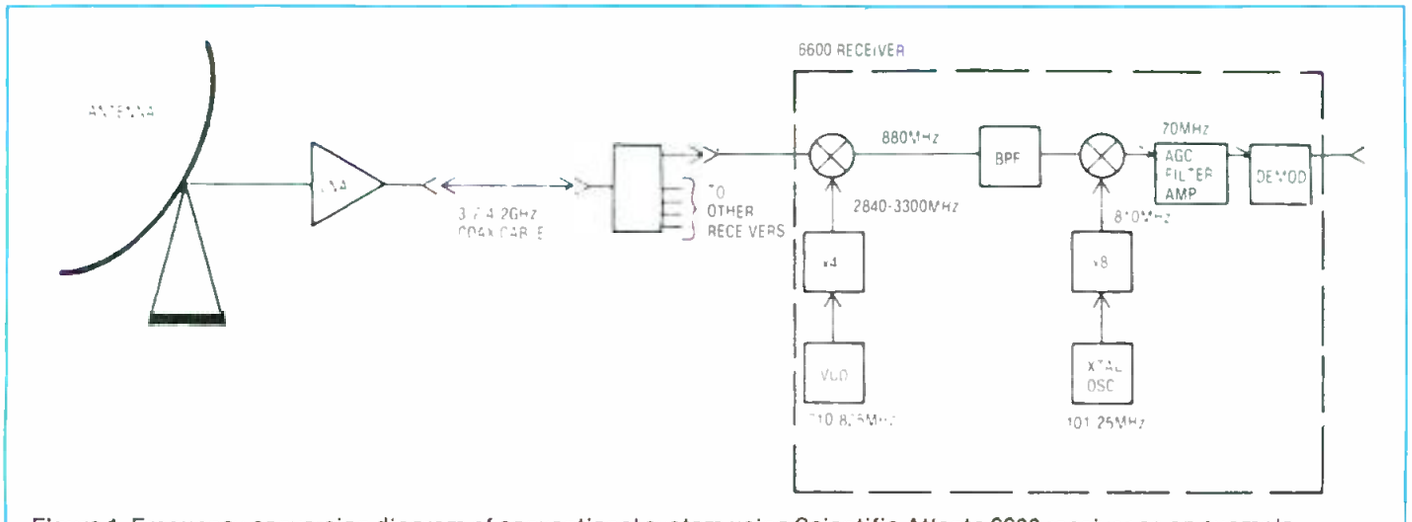

Figure 1. Frequency conversion diagram of conventional system using Scientific-Atlanta 6600 receiver as an example.

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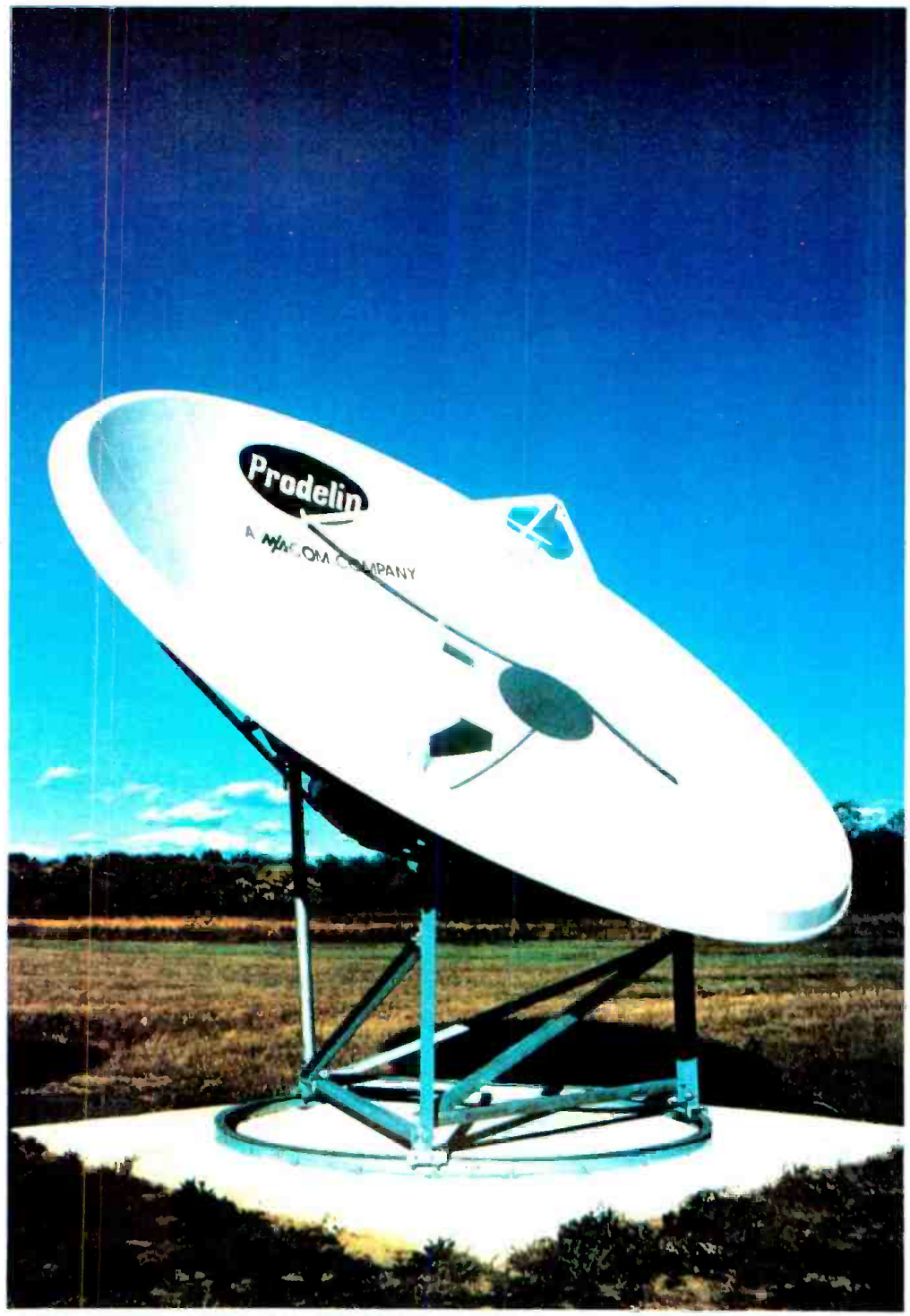

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made of fiberglass, which provides [illegible] strength and corrosion

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recommendations contained in CCIR 465 and Report 391-1.

[illegible] parabolic reflectors of these

one inch damage to [illegible] In addition

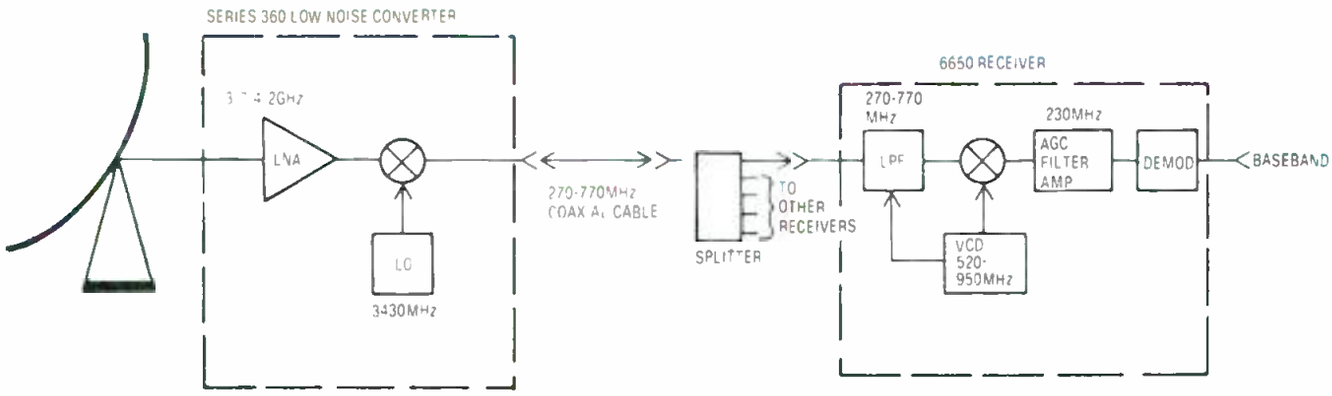

Figure 2. Frequency conversion diagram of block conversion system using Scientific-Atlanta 6650/360 receiver as an example.

Block conversion

receivers). Channel selection is accomplished in the first conversion where the desired channel is converted to a first IF frequency of 880MHz. This signal is filtered, then mixed with a fixed frequency local oscillator (LO) for a second IF of 70MHz. Gain control, filtering and demodulation are performed at 70MHz.

Figure 2 shows the block conversion technique used by a receiver in conjunction with a low noise converter (LNC). The LNC is situated at the antenna and contains an LNA and a downconverter. Downconversion is accomplished by mixing the 3.7 to 4.2GHz signal from the antenna with a fixed LO at 3430MHz, to result in a first IF of 270 to 770MHz. This signal is amplified and sent to the receiver via coaxial cable. The desired channel is selected in the second conversion for a second IF of 230MHz. Gain control, filtering and demodulation are performed at 230MHz.

Block conversion advantage

The principal advantage of block conversion is lower cost. Converting from microwave frequencies to UHF at the antenna significantly reduces the use of expensive microwave components and cable. The conventional system requires a separate microwave downconverter for each channel received (see Figures 3 and 4). In block conversion the process is performed only once for up to 12 channels of a given polarization. Less expensive cable and "F" connectors may be used from the LNC to the receiver.

A cost comparison of the two systems, each receiving two polarizations with six channels per polarization, shows that the block conversion system cost is approximately two-thirds the cost of conventional equipment. For a single channel application

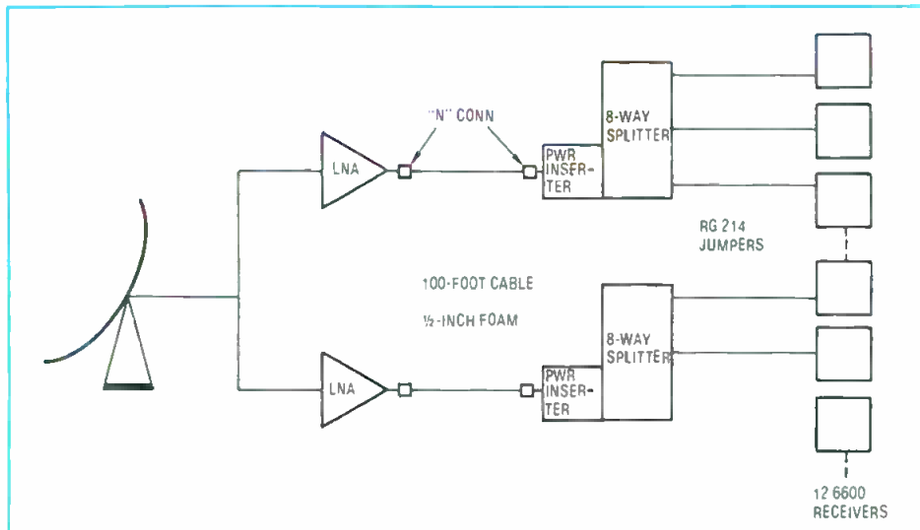

Figure 3. 6600 cable system with two polarizations receiving six channels each.

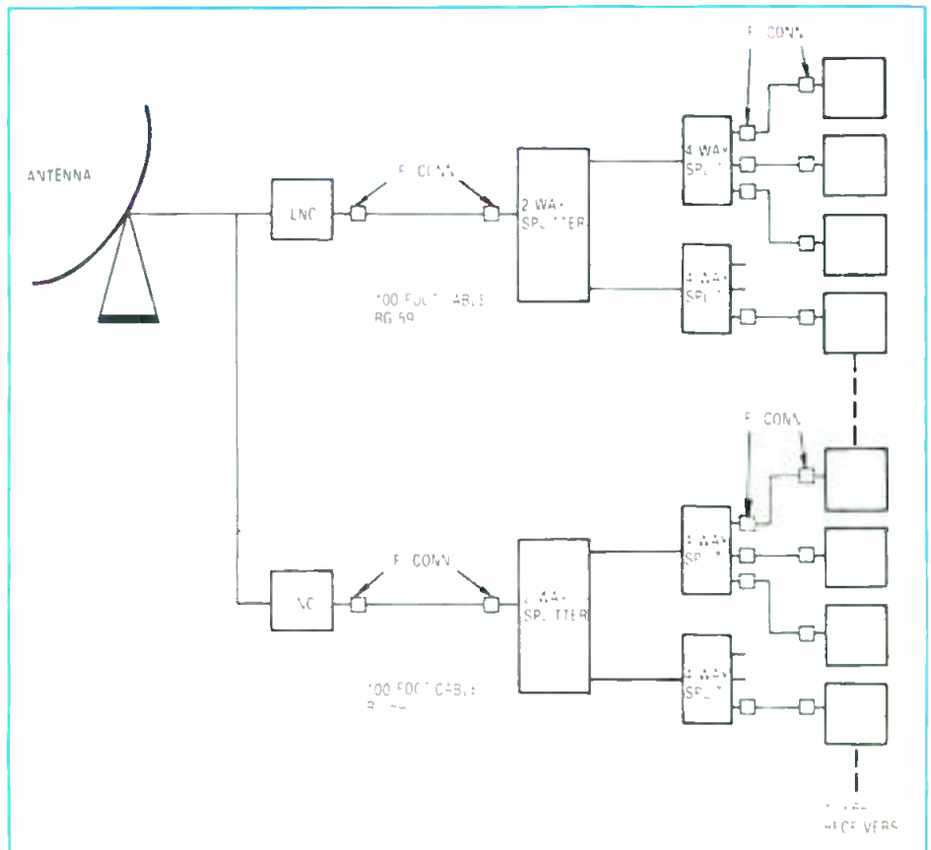

Figure 4. 6650 cable system with two polarizations receiving six channels each.

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with one receiver and one polarization, the savings are less dramatic but still substantial, at approximately 20%. A single channel receiving both polarizations, for example, one receiver and two LNAs or LNCs, saves only about 5%. Obviously, the more channels received, the greater the cost advantage of block conversion.

A second advantage of the new system is simplified field service and maintenance of the receiver, which contains no microwave components. Troubleshooting measurements are at frequencies below 1GHz rather than up to 4GHz, as found in conventional receivers. Test equipment is less expensive and more readily available to system operators.

A third advantage of block conversion is the size reduction of the receiver. Moving first conversion components from the receiver to the antenna permits a more compact receiver configuration, up to a 50% space savings.

Design considerations

Two crucial decisions in block downconversion system design are the choices of the first and second IF frequencies. Next in importance is the choice of the second LO frequency band. The selections involve tradeoffs between cost and feasibility.

For the first IF frequency band, cable and connector types used between the LNC and the receiver are prime considerations. Other determining factors are bandwidth requirements of individual components and availability of components such as power dividers, integrated circuits and hybrids that may be used to advantage in the circuitry.

To use inexpensive coaxial cable, the first IF should be as low as possible. Attenuation in coaxial cable increases approximately as the square root of frequency. RG59 has 7.5dB loss per 100 feet at 770MHz and 21.5dB loss per 100 feet at 4GHz. It would be practically unusable for any length at microwave frequencies. While RG59 costs about 10 cents per foot, low loss ½-inch foam dielectric cable with 8dB loss per 100 feet at 4GHz costs approximately $1.75 per foot. With 3dB loss per 100 feet, ⅞-inch air dielectric costs $3.00 per foot.

A first IF of 270 to 770MHz allows use of low cost cable from the LNC to the receiver. Two additional advantages result from this frequency range. First, UHF type power dividers and "F" connectors are readily available and usable. Second, low cost, small size frequency synthesizer ICs, prescalers and hybrid amplifiers for commercial UHF applications are ideal.

When using a low first IF, the lower the IF center frequency, the greater the percentage bandwidth. Bandpass filters become more difficult to implement. Electronically tunable filters may be required with a range greater than an octave. Variable gain networks and matching networks are exceptionally complex over large bandwidths. Lead inductance and parasitic capacitance may cause unacceptable gain deviations. Decoupling components must be chosen carefully because many components effective at the low end are self-resonant at the high end of the band. In-band intermodulation products and second or third harmonics of the IF signal also pose design problems. The key to successful circuit design involves simple circuits, minimum length bias and control lines and a compact layout with close attenuation to lead lengths.

The choice of a second IF also involves tradeoffs. Image rejection plus ease of filtering and demodulation of the final IF signal are important. Second LO tuning bandwidth is also of concern. With a second IF greater than 250MHz, image frequencies fall outside the 500MHz first IF signal bandwidth. Consider a first IF band of 270 to 770MHz with a high side LO. The center of the first channel is 290MHz. If the second IF is at 250MHz, the LO would be at 540MHz. An image appears at 790MHz, just above the upper band edge. Such a system could operate with a fixed filter in the first IF and suffer no image channel interference. Some carrier-to-noise degradation from image noise on the skirts of the filter at 790MHz may occur. To ensure that image noise is sufficiently attenuated by the filter, the second IF must be somewhat above 250MHz. This places the second IF in the band of the first IF, requiring extremely high RF-to-IF isolation in the mixer section, making this component difficult to specify and control.

A lower second IF will require a tunable image filter in the first IF section. A second IF of 70MHz, as commonly used with a channel centered at 610MHz, would produce an image frequency 140MHz away at 750MHz. Achieving 40dB image rejection over a 500MHz tunable bandwidth would require a complex and costly filter.

A high second IF places constraints on processing before demodulation. Placing transmission zeros at ±20MHz in the second IF filter response to remove cross polarization interference improves the quality of the picture, particularly where reflections from buildings may degrade cross-polarization isolation of an orthogonal mode transducer. But component Q's to provide notches so close to the desired signal become higher as the frequency increases. In addition, due to parasitics of the components involved, variable gain control circuits and amplitude limiters are much more difficult to implement at frequencies much above 70MHz. A phase-locked loop demod can be used to detect the video signal at high IF frequencies. The PLL demodulator provides improved performance at low carrier-to-noise levels in the presence of multiple subcarriers (as exist with additional audio and data signals).

A final consideration for the second IF is the tuning bandwidth of the local oscillator. The lower the IF frequency, the greater percentage bandwidth the local oscillator must tune. A bandwidth greater than an octave is difficult to implement in a cost effective design. It requires a larger control voltage swing applied to the VCO, or use of two separate oscillators, to cover the range.

In the Scientific-Atlanta 6650 system design, a 230MHz optimum second IF was chosen. A tunable image filter is required, but it is easily implemented by a seventh order low-pass filter with three varactor-tuned transmission zeroes that serve to eliminate LO leakage as well as attenuate the image frequency. At 230MHz, it is possible to provide adequate filtering and gain control for phase-locked loop demodulation. A high side LO of 520 to 980MHz is rather broad, but still possible in a single varactor-tuned design with a control voltage of ± 15V.

Block downconversion systems, involving multiple receivers, are less expensive than conventional satellite receiving systems. Also, although care in design of the receiver is involved, the receiver itself is simple and compact, yet performs as well as or better than a conventional receiving system. □

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Stereo audio by satellite

By Carl Bentz, technical editor

Greatly increased programming possibilities may result from the use of multiple channel audio, sourced from satellite networks using subcarrier transmission techniques.

Because of the enclosed signals of CATV, stereo audio accompanying a TV production can be accomplished. NHK in Tokyo and Rohde & Schwarz in Europe have made stereo audio TV broadcasting a routine medium. In the United States, however, the only way to get stereo for your TV program is through simulcasting with an FM broadcast station or through an FM modulated channel via a CATV system.

Several of the satellite programming services already include stereo audio with others to join in the future. The Warner Amex Music Television (MTV) service was one of the first satellite channels to use stereo technology with its music oriented programming. Since that time, the Warner Amex Movie Channel has also changed to binaural audio. Concerts and specialty programming in the music field required an improved means of modulation for the multiple audio channels available via satellite.

Three methods have been developed for the satellite stereo audio. In the Warner Amex plan, dual subcarriers on a video channel are used. One handles the L+R sum for mono listeners, while a second subcarrier carries the L-R difference for the compatible stereo signal. A peak deviation of ±200kHz is allowed on both subcarriers. Typical 75μsec pre- and de-emphasis is applied. Dolby processing of the information offers noise reduction during the initial satellite communications link.

The Movie Channel employs a conventional 6.8MHz subcarrier frequency, allowing cable programming the easy choice between only a mono feed from the L+R signal or full stereo. For MTV, however, the sum subcarrier was selected to be a non-standard frequency. Use of such a non-standard, it was thought, would encourage cable operators to offer full stereo to their subscribers. The sum subcarrier has been selected as 6.62MHz. For final transmission to cable subscribers, left and right channel signals are remodulated on an empty channel in the FM broadcast band (see Figure 1).

Another encoding scheme is offered on some satellite services through the Leaming Industries system. Two

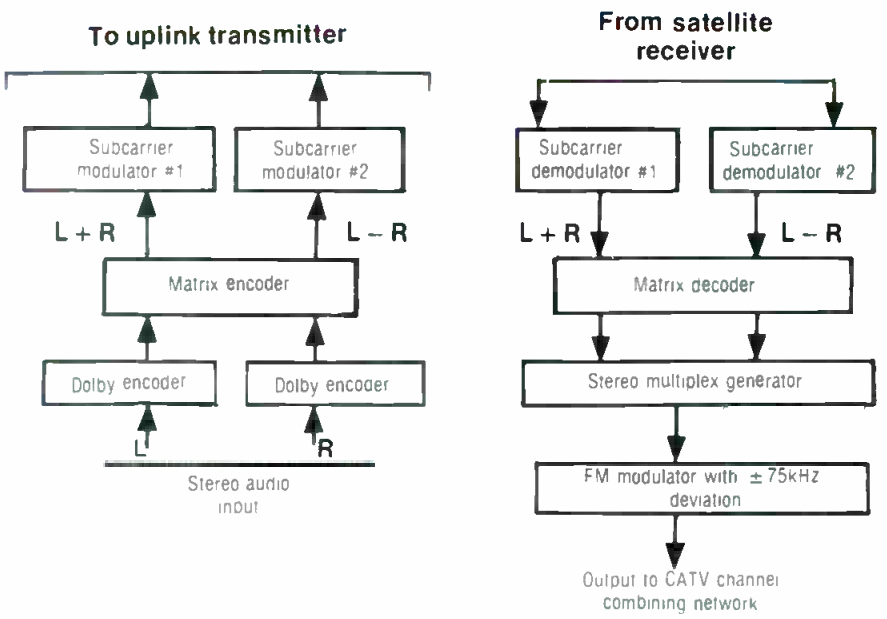

Figure 1. The Warner Amex stereo transmission system.

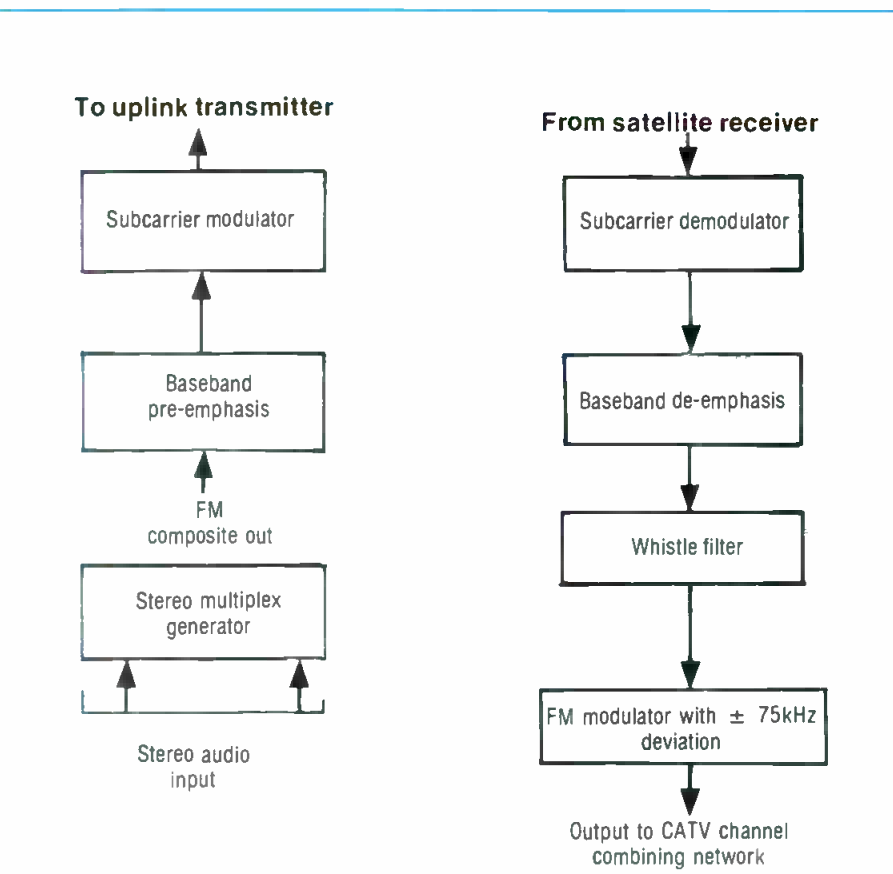

Figure 2. The Leaming composite subcarrier stereo transmission system.

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Stereo audio

audio channels are multiplexed on a single subcarrier, in essentially the same format that is used for FM broadcast stereo. In the cable headend, the wideband composite subcarrier is demodulated, de-emphasized and finally remodulated into the FM broadcast band. Whistle filters are included in the equipment to eliminate possible audible beats between the 15.734kHz H sync multiples and the 19kHz pilot carrier of the FM system. Additional notching is accomplished at 31.468 and 47.202kHz to avoid beat formation from those frequencies with the 38kHz multiple of the pilot (See Figure 2). No multiplex generator is required in the headend.

The third plan to stereo transmission via satellite has been developed by Wegener Communications. Discreet left and right low level subcarriers provide for stereo, but it is possible to handle up to four stereo pairs on the system. Subcarrier deviation is kept low to allow for closer subcarrier spacing. Adaptive pre- and de-emphasis is used in the Wegener system to optimize signal-to-noise figures of the demodulated signals. The left and right signals are finally applied to a stereo generator and modulator at the CATV headend for application to the cable (see Figure 3).

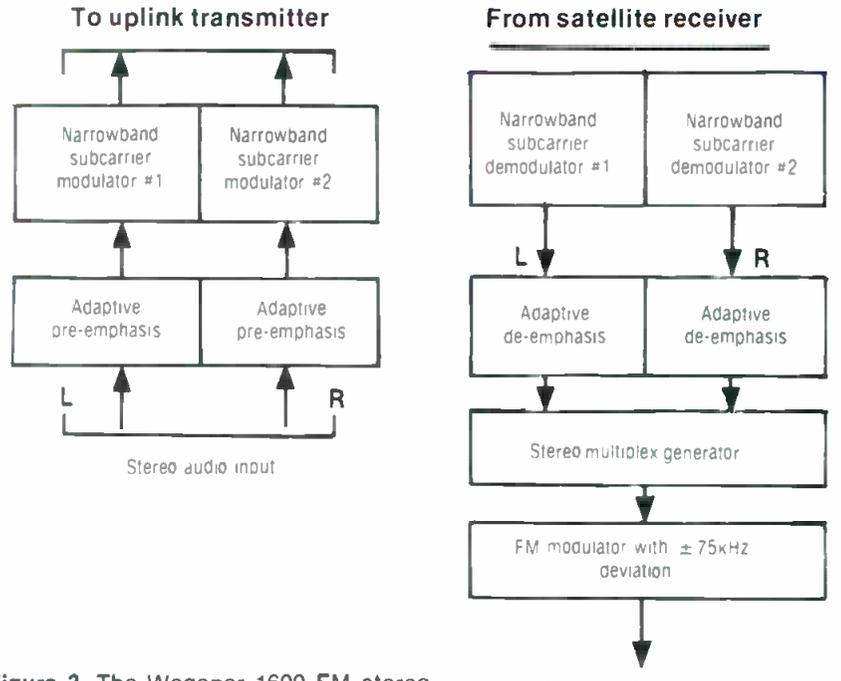

Figure 3. The Wegener 1600 FM stereo transmission system.

In addition to the Warner Amex services, the Leaming system has been adopted for use with CBS Cable and Bravo programming. The Wegener plan will be found on WFMT, Seeburg Music, Satellite Music Network, Bonneville Beautiful Music, Moody Bible, Continental Radio and Family Radio programming services. As CATV systems upgrade and purchase the necessary equipment for FM channel services, the selections will increase. Meanwhile, operators interested in any of the three services are advised to check with programming suppliers for guidelines on the proper reception equipment. □

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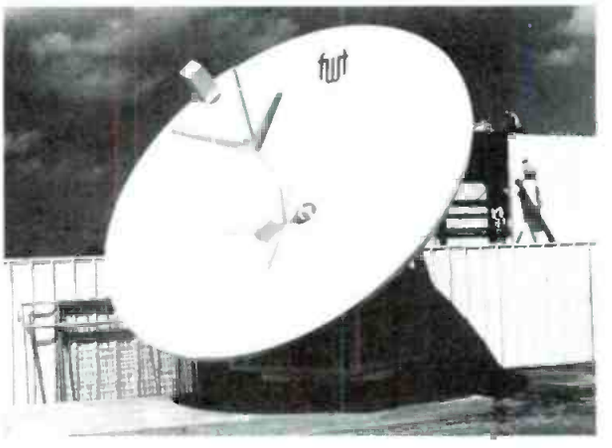

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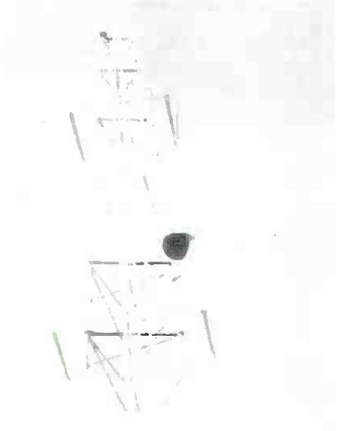

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Occasional splashes from the pool eased the 110° heat while taping a Kansas City area country club swim meet.

Local feature programming pays off

By Carl Bentz, technical editor

Visits with Kansas City zoo residents are favorite local production programs.

TeleCable of Overland Park, KS, has put a lot of effort into local origination of programming. Community support has kept that effort in operation. The organization, one of 20 systems of the Telecable group based in Norfolk, VA, first became operational in a small section of the Northeast Johnson County area is January 1971. Growth has been continual, with a present total subscriber list of 40,000.

Several of the first programming attempts have had continuing success. *Around Town*, which airs live Monday through Friday mornings, with taped repeats in the evening, passed its two thousandth show in November 1981. Hostess Anne Debus brings community leaders, newsmakers and a myriad of personalities into the studio for the program. Remote productions have been used from a local theme park, the Kansas City Zoo and area shopping centers. Subject matter has varied from serious discussions on drug abuse, acupuncture and breast implantation, through demonstrations in cooking and oil painting, to more light-hearted conversations with antique toy collectors and cartoonists.

Tom Leathers, publisher of a local weekly newspaper, hosts another long-lived series. Although his guests are often nationally known figures in government, entertainment and other areas, he brings out local issues as well with important people of the area.

One heated political campaign debate held on his program was later

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INTV conference replay

By Phil Dean, president, Phil Dean Associates, New Rochelle, NY

The Independent TV Association convened in January in Washington, DC, addressing the concept that the independent TV stations and the network affiliated stations have the same viewers, and there is no qualitative difference between them. This concept, introduced last year via the Burke Study, has been updated, refined and confirmed via a 1980 study conducted by the four independent TV stations in Los Angeles, CA.

Market share projections

TV broadcasters, whether network or independent, all have a common problem: cable TV. One panel discussion at the INTV meetings dealt with *cable and the independent*. Bill Harvey, publisher of *Media Science Newsletter*, took part in the panel discussion. He provided some recommendations to the independent broadcasters. Harvey said that in general an *independent* is much in the same position as a pay service, but is supported by advertising. For that reason, he said, investment in programming and audience promotion should be increased, keeping in mind that the primary target will be the established electronic media households.

Harvey also provided some projections for share of audiences during prime time viewing. Those projected percentages are shown in Tables I-IV, courtesy of *Media Science Newsletter*.

Table I.
Projected shares in all TV homes

	1980	1981	1982	1985	1990
Network Affiliates	83	81	78	72	60
Independents	13	14	15	16	16
PBS	3	3	3	3	2
Basic Cable	1	2	2	3	4
Pay Cable	2	3	5	8	17

Table II.
Projected shares in advanced new electronic media homes

	1980	1981	1982	1985	1990
Network Affiliates	65	63	62	59	51
Independents	15	15	15	14	12
PBS	3	3	3	3	2
Basic Cable	4	4	4	4	5
Pay Cable	17	19	20	23	27

Table III.
Projected shares in basic new electronic media homes

	1980	1981	1982	1985	1990
Network Affiliates	80	79	78	73	67
Independents	15	16	17	20	23
PBS	3	3	3	3	3
Basic and Pay Cable	3	4	4	5	5

Table IV.
Projected shares in established electronic media homes

	1980	1981	1982	1985	1990
Network Affiliates	87	86	85	82	78
Independents	12	13	14	17	21
PBS	3	3	3	3	3

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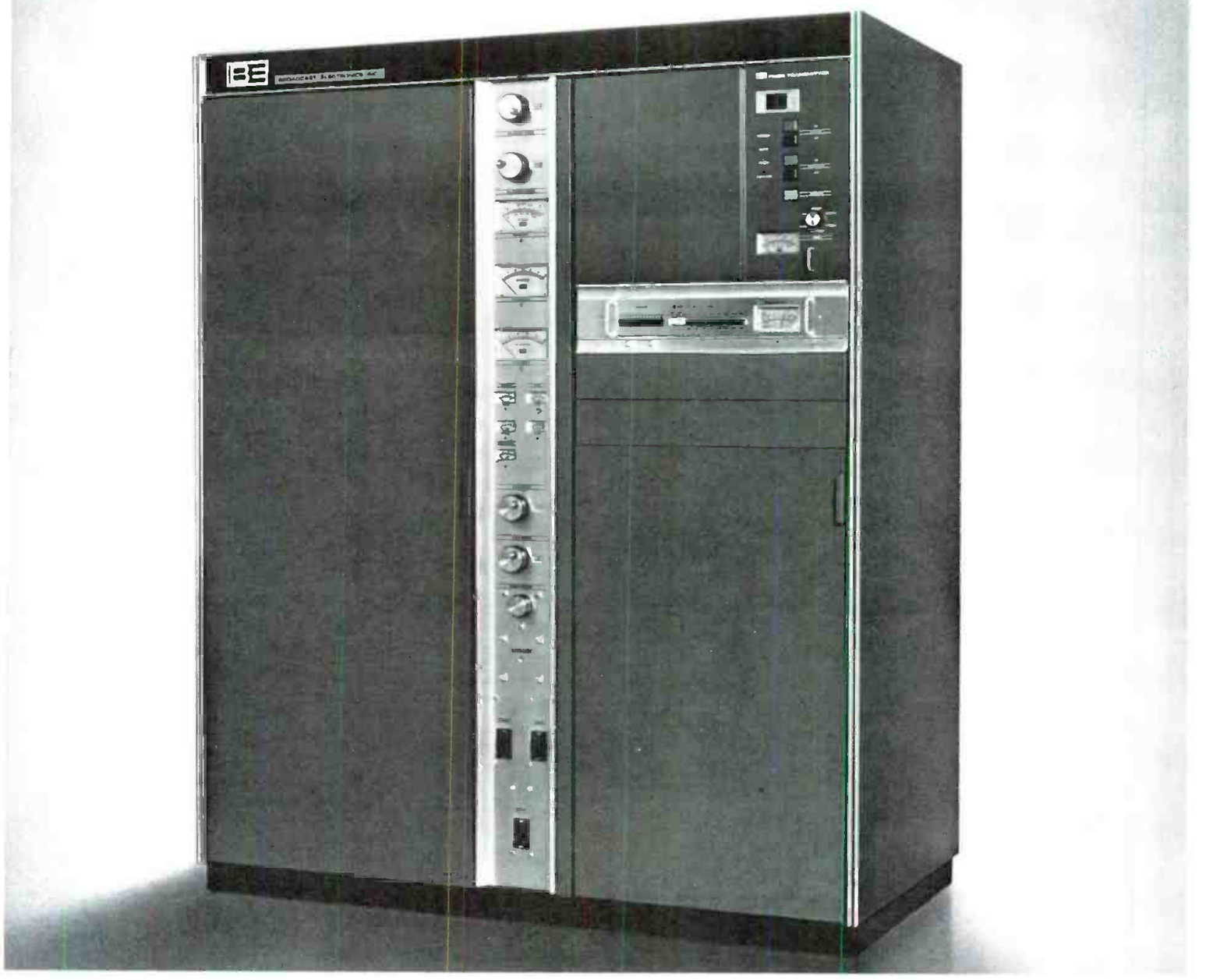

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Conference replay

The Washington flavor was strongly in evidence at INTV's Ninth Annual Convention with a number of congressmen appearing on the agenda and others visiting with broadcasters from their home districts. The political star of the occasion was President Ronald Reagan, who accepted an award from the INTV for excellence in communication.

Other stars from the political arena included Rep. Timothy E. Wirth (D-CO), House telecommunications subcommittee chairman; Rep. Robert Kastenmeir, (D-WI), chairman of the House subcommittee on copy right affairs; Bernard Wunder, assistant secretary of commerce for telecommunications and information; and Mark Fowler, chairman of the FCC.

Deregulation, copyright, PTAR (Prime Time Access Rule) and must carry rules were the primary targets of the politicos with independent operators getting encouragement from Wunder, on copyright legislation; Wirth, on easing of longline telephone costs; Fowler, on deregulation; and a "comme ci, comme ca" reaction from Kastenmeir on the must carry rules on his cable TV copyright bill.

A record turnout of about 650 registrants took advantage of the political locale to visit their congressmen as well as attend the 5-day convention. More Washington atmosphere was supplied by a reception at the Capitol Hill Club and a briefing at the White House by President Reagan.

The Washington syndrome was even more evident in the series of panels and workshops scheduled for the five days of the convention. Nearly every panel concerned itself with some phase of rulemaking or regulation. Vincent Wasilewski, NAB president; Thomas Wheeler, NCTA presi-

President Reagan accepts INTV Communication award.

Our Agile 24 satellite receiver system makes things perfectly clear.

Standard Communications' new Agile 24M/S satellite receiver system does everything a broadcast studio model does—except cost as much.

The Agile 24M is a highly cost-effective, reliable satellite receiver featuring advanced circuitry like a fully synthesized phase-lock-loop tuning system, a pre-selector tracking filter, and a PLL demodulator. Dual conversion design converts the incoming signal twice for better selectivity and image rejection. The threshold extension circuit reduces noise by as much as 2 dB on dark scenes, delivering a static threshold as low as 5.5 dB carrier-to-noise. That means blacker blacks in dark scenes, with reduced sparkles.

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Product marketing allowed at INTV convention

Something new was added to the recent INTV convention, a program market place a la NATPE's annual madcap melange of program product promotion.

The decision to allow syndicators and distributors to market their products to the independent operators at the convention was made by the Indie Board of Directors.

In the past, product marketing and merchandising at the INTV was not allowed. Herman Land, president of INTV, said that independent association members were worried that too much stress on the programming sales side might detract from the overall purposes and aims of the convention, as had occurred when distributors showed their wares at the NAB.

Despite extremely bad weather in Washington, and the fact that the Super Bowl was on one of the convention days, most of the 33 distributors attending were happy with the results and indicated they would screen their products again next year if the INTV continues the open screening policy.

One of the most unusual and most talked about unofficial exhibitors at the convention was Turner Program Sales, which was boosting, although not showing, half-hour cable feeds from CNN-2 and CNN. Sports programming, news and the political scene were among the major panel discussions during the convention.

Perhaps the most confusing of the panel sessions at the convention was that on DBS—the proposed new direct broadcast service. Comments by panelists included a dire forecast that the 'country's independent TV stations might be wiped out' if the eight DBS applications were granted by the FCC.

Marvin Rosenberg, the Washington representative for United States Broadcasting Company (Hubbard Broadcasting Company's entry into DBS), said DBS would provide many independents with the programming needed to survive in an increasingly competitive market place. In the middle was Richard Wiley, former chairman of the FCC now representing Comsat's Satellite Corporation, who saw "no deleterious effects in the broadcasting industry" and said that broadcasters should ensure their right to participate in new technologies, rather than oppose them.

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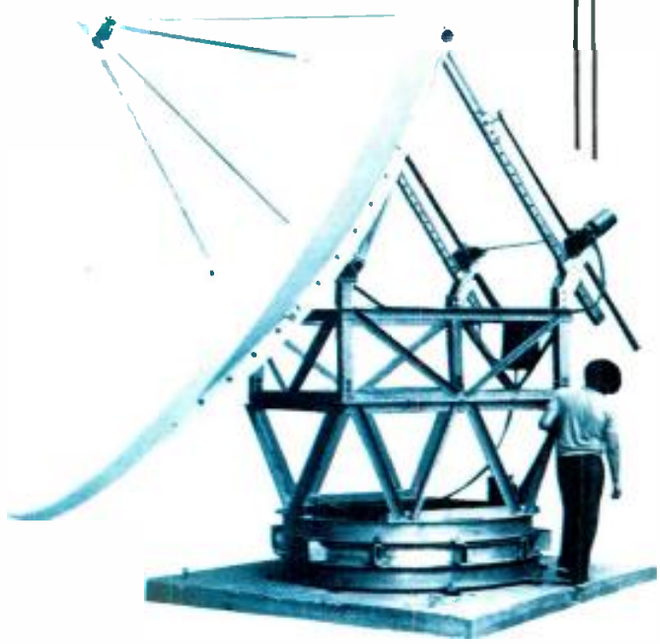

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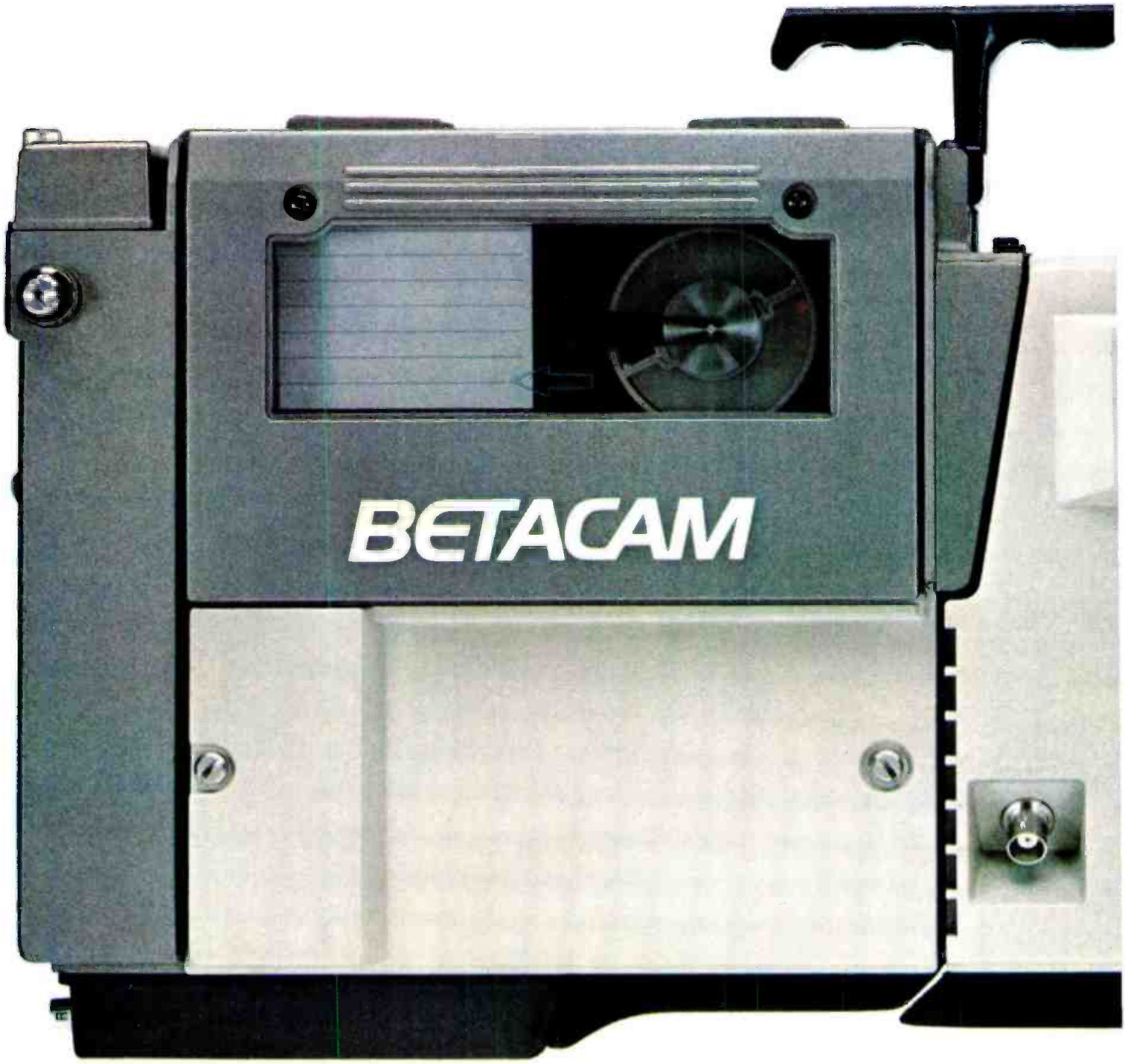

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The Betacam recorder also provides superior performance, with better picture clarity and a higher signal-to-noise ratio, even when compared to ¾" machines. It records for 20 minutes on a Beta L-500 cassette, and runs for a full hour on the low-power, rechargeable battery contained in the unit. And both cassettes and batteries are inexpensive and readily available.

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dent; Jack Valenti, president of the Motion Pictures Association of America; and Rep. Robert Kastenmeir, (D-WI), made up the star panel of the convention, "Cable Copyright Compromise: Reality or Fantasy," which did little to dispel the confusion that still surrounds the compromise activities of the broadcast industry and the cable industry.

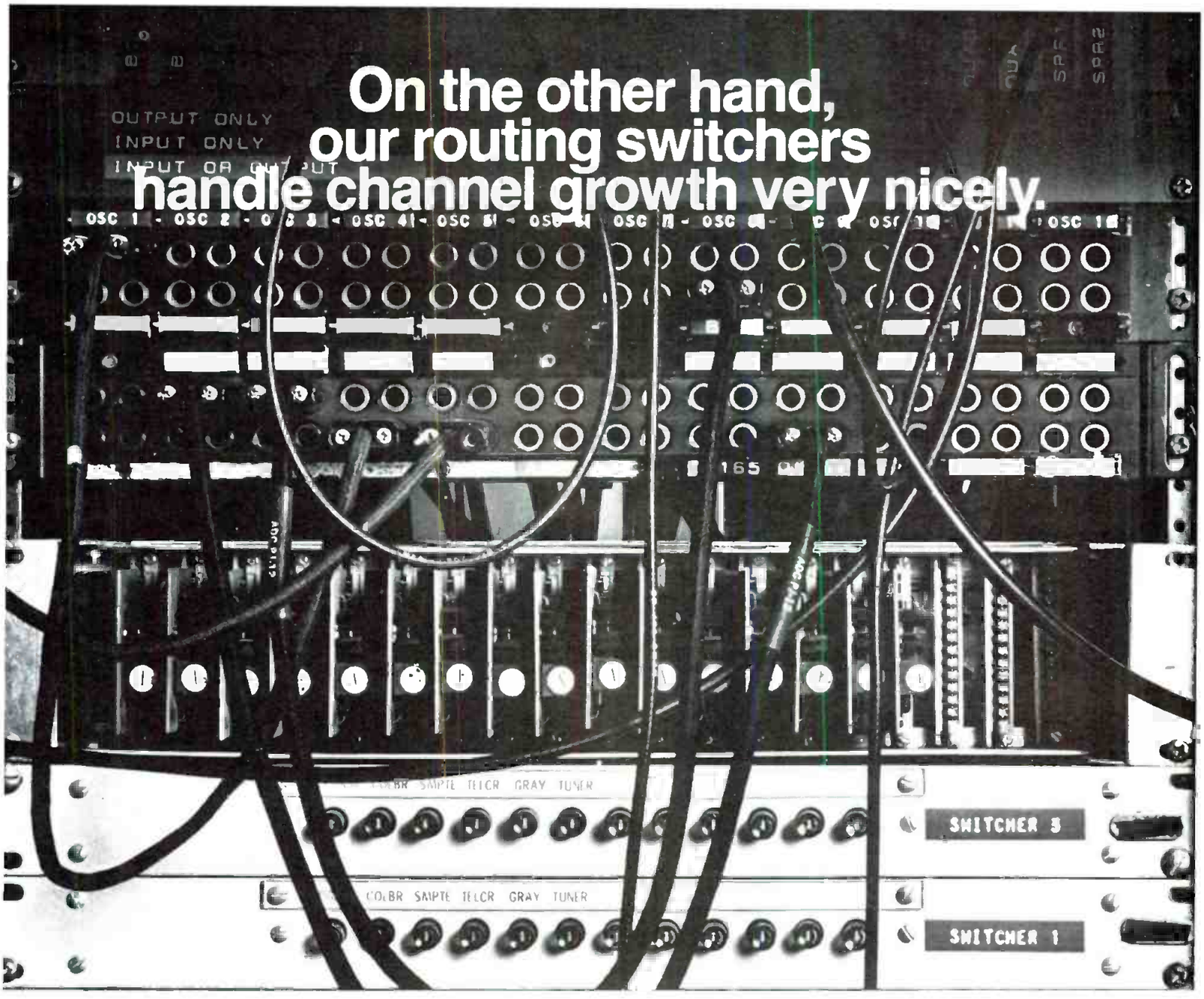
By any measurement, however, the Independent TV Association convention was a success, and independent operators were optimistic and enthusiastic about the future despite the dark clouds of cable and pay cable lingering just over the horizon.

As Herman Land, president of the INTV association said, "This convention marks the arrival of the Independent TV stations as a force in the TV world."

Land noted an increase of more than 100 attendees over 1981; a 40% increase in distribution membership over last year, basically due to the association's decision to allow screenings at the convention for the first time; and an increasing interest on the part of new stations to join the association. Next year, Land said, INTV will hold its convention Feb. 6-9 at the Galleria Plaza Hotel, Houston, TX. □

Herman Land, president of INTV, addressing the convention.

On the other hand, our routing switchers handle channel growth very nicely.



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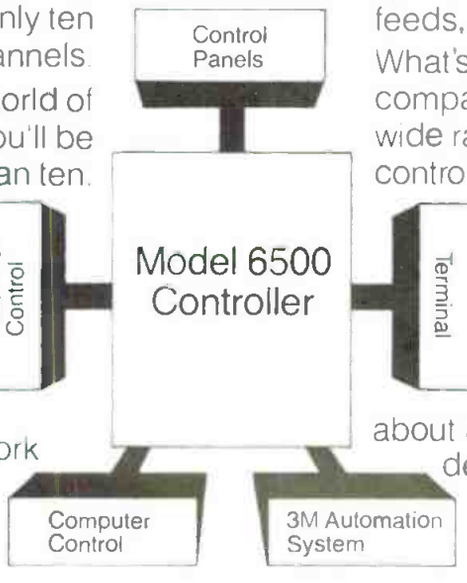

And they're perfect for switching in network feeds, satellite relays, and live remotes.

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"Tomorrow's Television"

SMPTE TV conference

By Carl Bentz, technical editor, and Bill Rhodes, editorial director

- Feb. 5-6, 1982
- Opryland Hotel Nashville, TN
- 651 attendees
- 24 exhibitors 41 booths

Although attendance was down from last year's SMPTE Television Conference, registration figures totalled about 651 participants. The exhibition hall included 24 booths with equipment related to the conference program. Several new equipment items were unveiled. The technical papers given by leaders in the industry were the highlight of the conference. Following a general theme of *Tomorrow's Television*, the papers fell into four categories: new TV technology, multichannel audio for television, digital control of TV equipment, and high definition television.

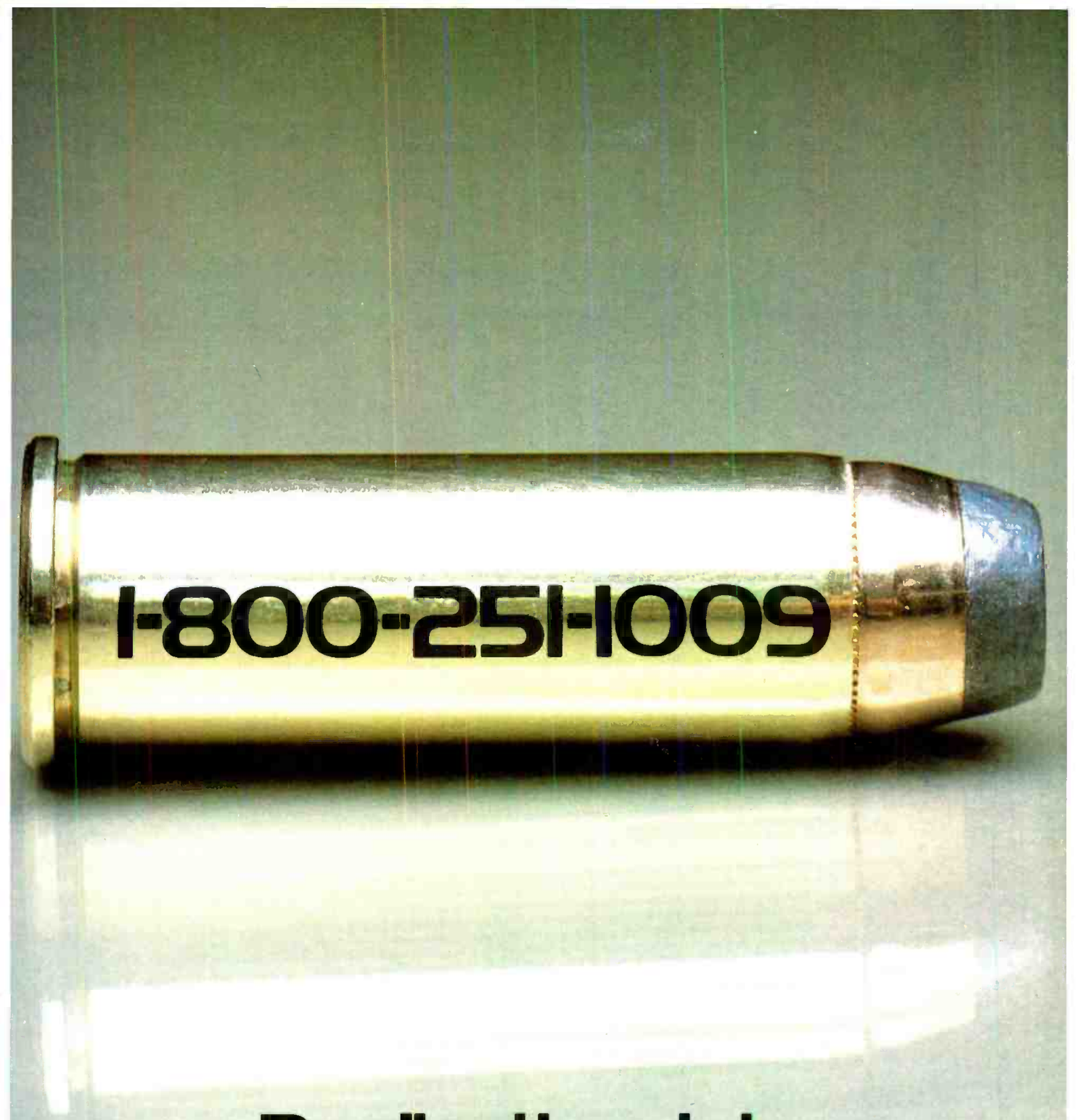
The Friday luncheon speaker, Robert Wussler, executive vice president of Turner Broadcasting, was well-received. "Your contributions to technological advancement have transformed what was only a futuristic dream a decade ago into the greatest growth industry in the world," he said.

New equipment shown at the conference included the Ikegami EC-35 electronic cinematography camera with accessories and the Sharp XC-700 camera with a digital CO-AX control system from Cinema Products. For-A Corporation of America introduced the TC-10 background and title colorizer in the VICA booth. Grass Valley Group demonstrated new software for its E-MEM and video switcher systems.

Harrison Systems displayed the new TV-3 TV audio mixing console. Thomson-CSF, which said that its first two Graphics V systems were currently being installed in stations, used a

Robert Wussler: "Many of you are responsible for the tremendous growth in communications today. Your contributions to technological advances have transformed what was only a futuristic dream a decade ago into the greatest industry in the world."

Donald Fink (standing) was one of the many attendees who addressed questions to speakers during the SMPTE 16th Annual Television Conference.



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SMPTE exhibitors

The exhibiting companies at the recent SMPTE TV Conference are listed below.
Use these reader service numbers to obtain more information.

Amperex Electronic Corporation	225
Ampex Corporation	226
Camera Mart	227
Commercial Electronics Inc. (CEI)	228
Chyron Corporation	229
Cinema Products Corporation	*
Digital Video Systems	230
Fortel	231
Fujinon	232
Grass Valley Group	233
Harrison Systems	234
Hitachi Denshi America	235
Image Video Ltd.	236
MCI/Quantel	237
NEC America	238
Rupert Neve	239
Sony Corporation of America	240
Studer/Revox	241
Telease	242
Thomson-CSF Broadcast	243
3M Company	244
Utah Scientific	245
VICA	246
Vital Industries	247

*For information, write: Cinema Products, 2037 Granville Ave., Los Angeles, CA 90025.

videotape sampler to show some of the system capabilities and assured interested individuals that a system would be on display at the NAB convention in Dallas. For information from exhibitors, see the listing of companies associated with this article.

Interested individuals were also given the chance to meet Abe Rolnick, newly appointed president of Digital Video Systems (see February 1982 **BE** Business News regarding DVS' new growth and financing program), and Neil Vander Dussen, recently appointed president of the new Sony Broadcast Products Company (see March 1982 **BE** Business News regarding the Sony Corporation of America reorganization). Interviews with Rolnick and Vander Dussen are found in this issue of **BE**.

The program included 31 technical papers grouped into four sessions. Most of the papers are being printed in special book form and will be available in April. Some early copies are scheduled to be sold at NAB-'82/Dallas. □

HDTV study group focuses on realism

By Blair Benson, TV technology consultant, Norwalk, CT

High definition television was a highlight of the recent SMPTE television conference. "Tomorrow's Television." HDTV attracted a lot of interest and engineering activity, made evident by a discussion among 82 engineers from around the world attending the meeting of the HDTV study group chaired by Donald Fink. The meeting convened the day before the conference.

Detailed studies being conducted on the feasibility and parameters of a new system were reported on by the members of the group. The objective is to create a greater feeling of presence and realism for the viewer by the use of more detailed pictures displayed in a wider aspect ratio on a large screen, accompanied by high quality stereophonic sound.

The major accomplishment during the meeting was the recruitment of volunteers for four subgroups charged

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KVIE-TV Gets More for Their Dollar

Ve were surprised that we could get all the features THE EDGE™ has
o offer at a price way below the competition. It's a real value."

lichael Wall, Director of Engineering, Sacramento, California

Price Waterhouse Likes the Human Touch

"THE EDGE is easy for anyone to operate, no matter what his experience. This is important to me because it means operators can focus all their energy on creativity."

Harry Larson, Director of Audio Visual Operations, New York City

South Carolina ETV: Running Smoothly

With only five cables, we were up and editing with THE EDGE. It was so portable we took it on remotes. And there is a smooth interface between our VTR's and THE EDGE."

Glen McKinney, Broadcast Engineering Supervisor,
Columbia, South Carolina

CMX Means a Great Deal says Videosmith

"The name CMX on an editing system says it all for me. I know I'm getting maximum performance for my money."

Ron Smiley, General Manager, Philadelphia

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'MX did some thinking before they introduced THE EDGE. Not only is down time inimal, but the built in diagnostics help me identify a trouble spot before it ecomes a major problem."

rry Richards, Director of Engineering,
ethlehem, Pennsylvania

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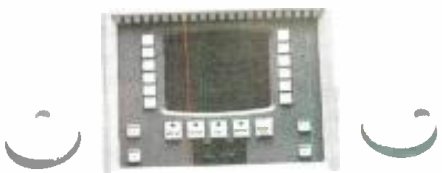
"The modular nature of THE EDGE enables us to expand and update. That means we can plug in the latest technical advances and also keep up with our customers' expectations for state of the art equipment."

Bob Nudo, Sales and Marketing, Hollywood

It's clear that these innovators in television technology representing the ever-expanding world of videotape editing recognize the total value of THE EDGE, the medium-scale computer-assisted editing system from CMX. That's why it keeps winning over experts like these every day.

Let us lead you to THE EDGE.



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Compare the 3M TT-7000 VTR and NTC-10 Time Base Corrector to the competition. Nobody puts together more of the features you want than 3M. And once you see our unit, we think you'll agree that buying anything else is like getting half a machine.

The 3M TT-7000 Video Tape Recorder gives you:

- Autotrack following (ATF), with multipoint sampling, ¼ reverse through 2X forward, plus preset slo-mo speeds and direction (optional).
- Video and sync confidence heads.
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- Sixteen line correction window.
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- Compact size (8¾" high by 17½" deep by 18½" wide).
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- And front panel plug-in modules.

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to investigate the areas of psychophysical considerations, component hardware, production techniques and transmission.

Systems

Renville McMann, president of Thomson-CSF Laboratories in the United States, opened the Saturday afternoon session with an enthusiastic endorsement for the early development and adoption of worldwide standards for a hierarchy to support compatible systems. He suggested a progressively scanned frame rate higher than the present 24 for film and 30 for 525-line television, and a widescreen format with an aspect ratio of 3:5 or possibly wider. For transmission by satellite, because bandwidth capacity is proportional to power, the present transponder power limits the transmission bandwidth to 20MHz.

An alternative would be to use digital transmission with bandwidth compression. However, this would entail the use of expensive receiver decoders. Consequently, McMann favors FM transmission, with the use of bandwidth reduction deferred until experience has been gained with conventional techniques. For HDTV display systems, he expects theater presentation to pose the greatest problem, and to be solved initially by the use of motion picture film transferred from television.

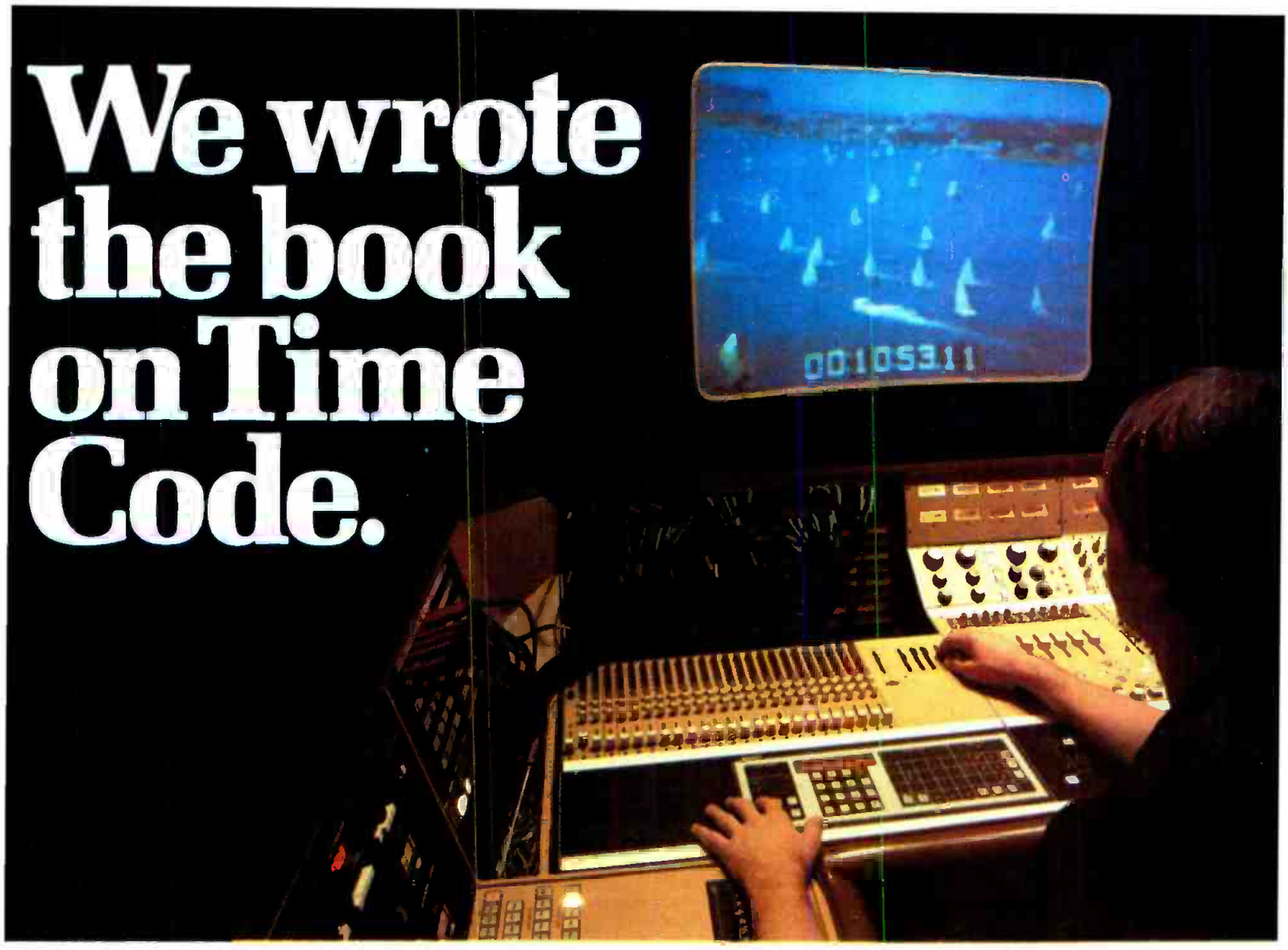
Charles Sandbank and M. Moffat of the BBC proposed an HDTV system compatible with present 625-line standards, wherein the high frequency luminance and stereo sound would be transmitted in a 6 to 10MHz band above the 5.5MHz PAL spectrum. On the other hand, for a new, noncompatible standard they recommended the choice of a frame rate greater than 100Hz in order to minimize aliasing.

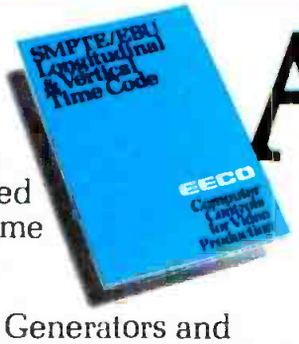
In his discussion of camera and display system variants in a future HDTV system, Charles Rhodes, of Tektronix, proposed a more efficient use of spectrum than that of the present NTSC system by employing time-division multiplexing of time-compressed chrominance components in the horizontal-blanking period. The luminance signal would be time-compressed, as well, to accommodate the chrominance signals. Two components would be alternated every other line by the use of a line store. The wider band color component would be accommodated by the omission of every other horizontal sync and blanking pulse.

A somewhat similar 625-line system was proposed by T.S. Robson of England's Independent Broadcasting Authority. In this system, the luminance and chrominance signals are time-compressed to 40 and 20μsec, respectively, compared to 48 and 12μsec for the Rhodes proposal. Line alternation of the color components, similar to that by Rhodes, is proposed. The advantages of the system, according to the IBA are as follows:

- a 5dB chrominance signal-to-noise improvement in FM transmission

We wrote the book on Time Code.





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At Technology's Leading Edge. Like all EECO Video Products, our VITC Generators and Readers are innovated for performance, providing quality, reliability and precision at competitive prices. And our Readers allow you to extract VITC at wind speeds.

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by avoiding the triangular noise degradation of a 4.43MHz color subcarrier;
- elimination of cross-color and cross-luminance degradation;
- extension of luminance bandwidth; and
- conformance with WARC Regulations 1 and 3 for 12GHz satellite transmission.

IBA plans to demonstrate the system at the International Broadcast Convention in September in England.

Equipment

NHK described the design and performance features of the videotape record recording and playback system used for its HDTV experiments and demonstrations. A Sony type C 1-inch helical machine was modified to provide the bandwidth and low noise characteristics necessary to be equal to or better than good quality 35mm motion picture film.

The major changes were the use of component, rather than composite, color signal recording, and the conversion to two video signal heads, rotating at twice normal speed. One head records the complete luminance video signal, including sync; and the second narrower head, the two chrominance signals using time-sharing techniques. Because the heads do not record a continuous signal during each rotation, the signals are time-compressed before recording and time-expanded after playback demodulation and processing. Cobalt-doped, iron-oxide tape is used at a tape speed of 97.6cm/sec and a writing speed of 51.7m/sec, 4-times and 2-times, respectively, that of type C. The luminance channel bandwidth is 20MHz and the signal-to-noise ratio 41dB. The figures for the chrominance channel are 5.5MHz and 47dB respectively.

Production

In cooperation with NHK and CBS, several HDTV segments were produced and recorded by Francis Coppola and Zoetrope Studios, Glen Larson Productions and 20th Century-Fox, and the CBS Television Network, for use in demonstrating the practical broadcasting application of the NHK system and equipment. The demonstrations are described in another article soon to be published in **Broadcast Engineering.**

The field and studio experiences in producing these segments were described by Richard Green of CBS. The shows were the Tournament of Roses on New Years Day, the Rams-Redskins football game, the ABC weekly series "Fall Guy," and specially produced "Six Shots and Double Suicide" from Zoetrope Studios. Green found that the equipment was rugged, reliable and required no special staging or lighting techniques.

The editing decisions were made off-line on the CBS ½-inch Betamax system using cassettes recorded simultaneously with the HDTV tapes. The HDTV tapes were conformed by assembly editing on modified type C HDTV equipment. Green, in his closing comments, echoed those of McMann. He recommended that the industry proceed with the generation of standards for studio production, worldwide. □

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Meet our new OS3350/5. It's the first-ever NTSC 525-line waveform monitor, complete picture monitor, and 40 MHz oscilloscope combined in a single, portable package.

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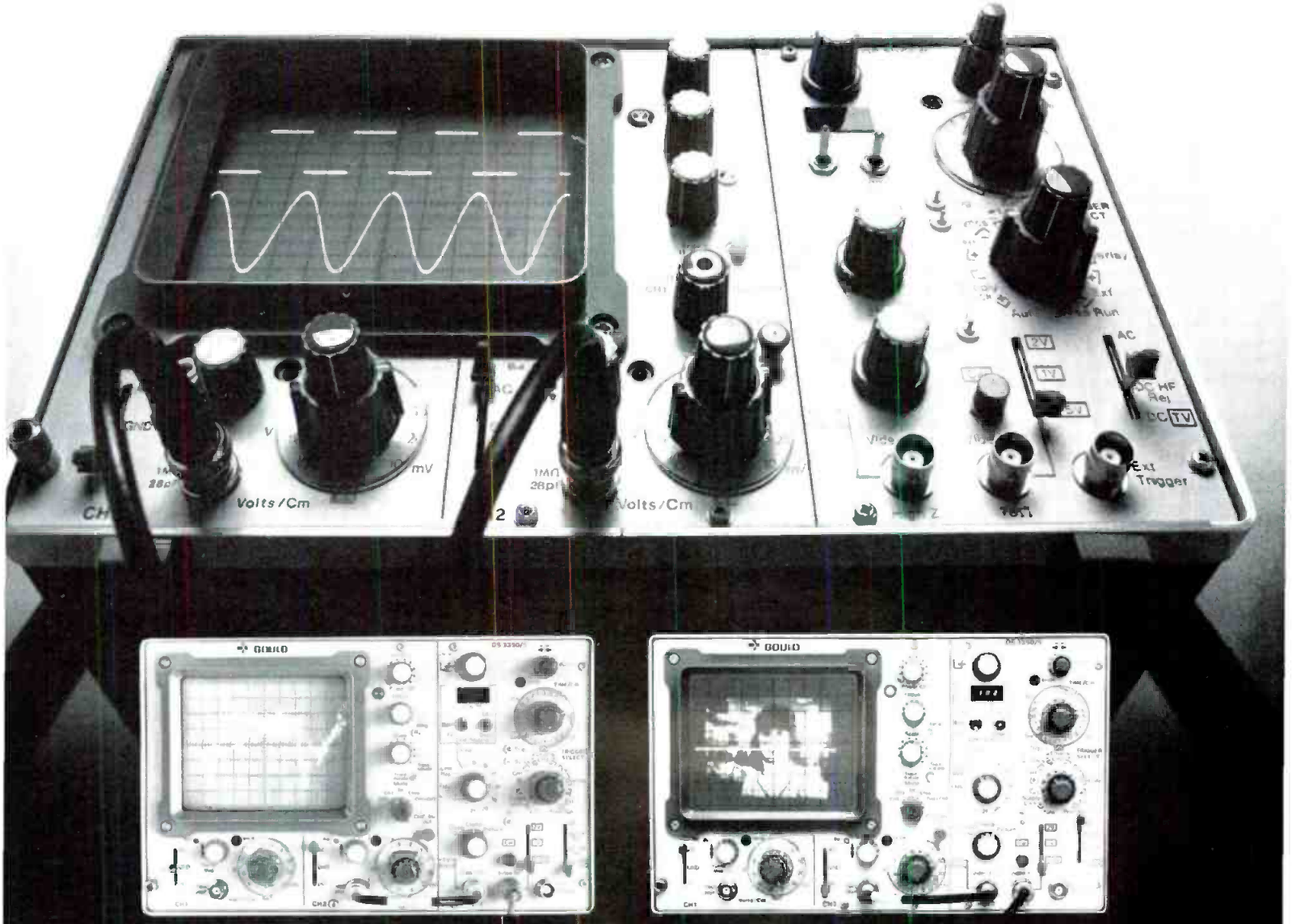

Gould's monitor/oscilloscope can look at a video signal line-by-line...

Or it can display the complete picture, with a bright line indicating the line under examination.

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conversations

BE had the opportunity at the recent SMPTE conference to interview Abe Rolnick, newly appointed president of Digital Video Systems, and Neil Vander Dussen, recently appointed president of the Sony Broadcast Products Company. The following is a summary of these interviews, which cover the individual and company goals of these two executives.

Rolnick

Vander Dussen

Abe Rolnick was recently appointed president of Digital Video Systems. Rolnick was formerly with AES, a supplier of word processing equipment. John D. Lowry, former DVS president, now chairman of the board, made this appointment as part of the transition program the company is undergoing. (See **BE** February 1982.)

BE: How does your background apply to Digital Video Systems?

Rolnick: I've built companies the size of John Lowry's DVS, or smaller, into multimillion dollar businesses.

Continued on page 90

Neil R. Vander Dussen was recently appointed as president/chief executive officer of the new Sony Broadcast Products Company. Vander Dussen comes to Sony after 25 years with RCA, most recently serving as executive vice president of RCA's diversified businesses. He also has held positions with the Broadcast Systems and Commercial Communications Systems divisions. Vander Dussen is originally from the greater Kansas City area.

BE: What are the overall business philosophies associated with you

Continued on page 92

Kahn Communications, Inc. is pleased to announce that the following leading stations have installed, or plan to install, Kahn AM Stereo Exciters:

New York
WABC* (FCC Tests)
WNBC**

Baltimore
WFBR** (FCC Tests)

Pittsburgh
KDKA* (FCC Tests)

Philadelphia
WFIL* (FCC Tests)

Washington, D.C.
WMAL*
WGMS**

Houston
KILT**
KULF**

Dallas
KAAM**

Miami
WVCG**
WGBS**

Orlando
WDBO**

Columbus
WCOL**

Denver
KIMN**

Atlanta
WQXI**

Birmingham
WSGN**
WATV**

Memphis
WHBQ**

Charlotte
WBT**

Richmond
WRVA**

Savannah
WSGA**

Chicago
WLS*
WMAQ**
WGN**

Boston
WBZ*
WHUE**

Salt Lake
KSL**

Logan
KVNU**

Tulsa
KVOO**

Kansas City
KCMO* (FCC Tests)
KMBZ**

Seattle
KIRO**
KJZZ**
KAYO**

Eugene
KUGN**

Greensboro
WBIG**

Rochester
WBBF**

Syracuse
WFBL**

Phoenix
KOY**

Canada
CHED* (DOC Tests)
CKY** (DOC Tests)
CKXL**
CKLG**
CJJD** (CHAM)
CHAB**

Los Angeles
KHJ* (FCC Tests)
KDAY**

San Francisco
KFRC* (FCC Tests)
KNBR**

San Antonio
KTSA* (FCC Tests)

St. Louis
WIL**

Omaha
WOW* (FCC Tests)

Ft. Wayne
WOWO*

Ft. Smith
KFSA**

Charleston
WKAZ**
WCSC**

Hartford
WTIC**

New Haven
WELI**

Worcester
WFTQ**

Paducah
WKYX**

Bristol
WFHG**

Toledo
WSPD**

Grand Rapids
WOOD**

Milwaukee
WEMP**

Mexico
XTRA* (Govt Tests)
XEHL* (Govt Tests)
XEOY* (Govt Tests)

* Units already at station.
** Stations who granted us permission to announce their plans to equip.

Kahn Communications, Inc. • 839 Stewart Avenue • Garden City, N.Y. 11530 • (516) 222-2221

Circle (118) on Reply Card

Low power

By Harry Martin, Washington, DC

The prospects for early establishment of the more than 1000 new LPTV stations hoped for last year is bleak because of FCC budgetary constraints and the inability of the agency to devise a plan for station allocation that would be expeditious and legal, according to speakers at the 3-day LPTV '82 conference held in late January in Washington, DC. Twelve hundred LPTV applicants, would-be applicants and other attendees heard speaker after speaker say that LPTV is on the way; but, because of regulatory delays, its development will be much slower than originally expected.

The problem is that the FCC now has more than 7000 pending LPTV and translator applications to process, but has neither the manpower (at this writing, only two FCC engineers are doing LPTV/translator work), nor the computer needed to begin the task. And, no additional money to improve the situation will be available until the end of the year. Until then, the FCC's LPTV staff, such as it is, will continue to process applications manually at the rate of two or three per day.

Compounding the problem is the fact that a substantial number of the 7000 applications now on file have not

The author is a partner in the law firm of Midlen, Reddy, Begley & Martin.

TV outlook

yet been put on cut-off lists. Once they are, it is expected that thousands of additional competing applications will be filed. Further, a substantial proportion of the applications that have reached cut-off already have drawn competing proposals. Because the FCC has rejected Congress' lottery scheme as unworkable, it is conceivable that the FCC will be faced with the task of resolving many hundreds, if not thousands, of cases involving mutually exclusive LPTV applications through its existing hearing processes.

Given the considerable time and expense involved for even a routine comparative hearing, it is not realistic to hope that the FCC can dispose of its LPTV backlog in this fashion. The FCC would probably have to hire 50 to 100 new administrative law judges and reviewing attorneys to decide the new cases. But, with reductions in force ("RIFs") involving 300 staff jobs in the offing for fiscal 1983, it is unlikely that *any* new judges or lawyers will be hired by the FCC in the near future.

In spite of these grim realities, the tenor of the conference was upbeat. Its organizers were successful in bringing previously divergent LPTV constituencies together under a common banner. Applicants, equipment suppliers and regulators looked alike in the red, white and blue *I'm for LPTV* buttons handed out at the hotel.

Although many participants in the conference were sobered by the

THE $250,000 CART MACHINE.

by Ray M. Kohfeld, President, Ramko Research

PhaseMaster, The industry's most advanced broadcast reproduction system.

From the beginning of the PhaseMaster cart machine project more than two years ago, we were convinced there was an electronic solution to the problem of stereo phase stability. Consistent stereo reproduction and machine-to-machine compatability could be solved. We believed that for many crucial system parameters, performance could be achieved in a cart system that would meet or exceed the best reel-to-reel machines.

What we didn't realize however, is that the development of the "ultimate" cart machine would cost over a quarter of a million dollars and take thousands of man-hours to accomplish. We finally achieved what we were after—no, what you were *after*—but not without some very trying times.

Early on, the goals were clear.

By employing leading-edge technology throughout each area of the tape system, we felt that the PhaseMaster could out-perform everything in the audio chain. Right on through the transmitter. The signal-to-noise, distortion and wow and flutter performance criteria had to rival reel-to-reel specs while retaining all the conveniences and benefits of the standard plastic tape cart. The major problems of tape skew and guidance had to be overcome in order to deliver a system which would, once and for all, take care of phase problems. This problem was judged by us to be absolutely critical for proper and consistent stereo reproduction. FM now, and AM just around the corner.

The final goal we set for ourselves was to design a cart system that offered automatic machine-to-machine compatability—an important benefit that to our knowledge no other reel-to-reel, cartridge machine or add-on processing system offers. We believe that it is a significant factor for the broadcaster to be able to pickup anyone's cart at random, record it on any PhaseMaster and then play it back on any PhaseMaster; the program material being precisely locked in-phase. Whatever the phasing of the original source, the signals will be automatically and faithfully reproduced. Ultimately, tape skew, chatter or even head misalignments would no longer be a problem.

Side-to-side stereo shift; holes in the mono mix or worse yet, reception; audio modulation due to tape chatter from the cart: major problems that we've lived with for years. You waste valuable time trying to get around it, cart manufacturers would like you to believe that it's solved in their carts, programming and management don't want to hear about it, and your audiences reach for the dial when your station doesn't sound good because of it.

To have introduced another cart ma-

chine that didn't solve all these persistent problems would have been negligent. To say the least, another mousetrap. As we've stated, the goals were clear from the onset, but not the solution(s).

Our attempts at phase correction: shortcuts aren't our way of doing things.

When we first looked at the problem, there existed only one other means of phase correction. This is an electromechanical approach which adjusts head alignment for each cart prior to the initial recording. Although this is certainly an improvement over what had existed (nothing), we felt it had many shortcomings. It can't correct phasing in real-time, the compatability factor is not high enough, it's overly complex-subject to breakdowns, and it adds valuable, additional time to a producer's already busy schedule of production.

What about stereo matrix?

Another approach which initially offered some technical promise at the outset was stereo matrixing. We went down this road early and discovered that a matrix system not only added unwanted electronic noise (something we were taking great pains to get rid-of) but it did very little to accomplish our goal of machine-to-machine compatibility. These fundamental drawbacks are inherent in this design approach and we eventually discarded it after many attempts to make it do things it just couldn't do.

Cross-correlation and signal injection: not the answers either.

After discarding the stereo matrix approach, we researched the viability of mixing timing signals onto the Left and Right audio tracks. This was closer to what we had in mind but detracted from the end result in that the audio had to be reprocessed which naturally degraded the high quality audio we were aiming for.

The third technique investigated was a cross correlation scheme that is essentially a form of probability theory with user adjustments. This also was eventually dismissed because of its inability to second-guess many complex waveforms and the necessity to readjust for various types of program material.

Although all of these approaches have some merit and have since shown up in the marketplace, the individual shortcomings were too much of a compromise of the promises to ourselves that we could do it better. Much better.

The answer! Perfect phase correction via the Q-track.

The elegantly simple and totally unique answer to the phase-stability problem came because of persistence and, at times, downright obstinence to not accept anything less than what we set out to achieve: picture perfect phase accuracy and stability—an ultimate, real-time correcting solution to the biggest problem the cart system serves up to every broadcaster.

The phasing (or more accurately, time base) correction system in the new PhaseMaster cart machines takes a sample of the upper (Left) audio channel, encodes it and then records it on the cue track without interference to any other information. Upon playback, the encoded signal is reconstructed and compared to its mate on the upper track so that we now have two identical signals to compare with each other. This has been the key. We are now able to compare apples to apples. Dissimilar information normally found in Left and Right audio is no longer a limiting factor. After these two identical signals are compared by a clever signature-determining circuit, a control signal is developed. Any time-base differences between these signals are applied via control signals to timing circuitry in both the Left and Right audio for correction. The result? Phase correction in real-time... measured in microseconds. The heads, the tape or both can be severely out-of-whack and the PhaseMaster's phase compensating electronics don't care. The audio can be complex, sinousoidal or recorded only on one track.

You can record your program material on any PhaseMaster Record/Play machine and rest assured that it will reproduce exactly like the original source no matter it be across the hall or across the world.

Control instrumentation technology helped us find the solution and we're now preparing for patent application.

Compatability with your present system.

The new PhaseMaster also offers you compatability with all your present, previously recorded carts. An easy transition can be made at your own pace without having to rerecord your station's entire library. To state it simply, PhaseMaster now gives you a professional R/P system without the drawbacks you've grown accustomed to.

Last, but not least, the best mechanical design you've ever seen.

The deck is a ⅝" casting for stability, with a stainless steel cover plate for wear-resistance and EMI shielding. A crystal-controlled D.C. servo motor insures timing accuracy to within ±0.05% and, practically no heat generation. The speeds are field selectable: 3¾, 7½, and 15 ips.

Your carts are securely held in position by the edges to prevent distortion, using spring-loaded rollers. Insertion and withdrawal is smooth and positive-feeling. The machined head stack is rock stable, and we've included internal illumination for periodic inspections and maintenance. There are no microswitches to break or jam—and never any start-up wow because the motor is started by an optical sensor as you begin to insert the cart. To keep damaging heat away from the tape, the capstan is ceramic. And bearings have a longer life because the motor doesn't need to run continuously due to the cart sensing design and the ability of the motor to reach full speed by the time the cart is fully inserted. The pinch roller is engaged by an adjustable air-damped solenoid with a teflon coated plunger for fricton-free, quiet operation.

On the PhaseMaster R/P machine you get front panel switch selectable inputs; integral diagnostics for faster, easier maintenance; three cue tones are standard. An automatic 4½ digit timer is standard. Left/Right audio plus phase analysis solid-state meters, motor "out-of-speed" and "already played" indicators are standard, too.

With the kind of performance we didn't compromise.

We've set new standards for wow and flutter: .04-.07%. The amplifier's signal-to-noise is −65dB utilizing dynamic noise reduction without companding or expansion. Frequency Response is ±1.0dB. And, of course, there's balanced I/O's and a +25dBm output capability.

It's been worth the wait.

We call it the $250,000.00 cart machine. That's what we invested on our bottom line to engineer a system that you can have for less than $1,400.00.*

Call us collect at (916) 635-3600 or contact your Ramko sales rep for more information and a schedule of when you can have a free, two week trial of PhaseMaster—*the industry's most advanced broadcast reproduction system.*

*PhaseMaster playback machine. Prices subject to change without notice.

Engineered For Your Bottom Line.

RAMKO

Ramko Research, 11355-A Folsom Blvd., Rancho Cordova, California 95670 (916) 635-3600

Circle (100) on Reply Card

magnitude of the regulatory and budgetary problems blocking speedy institution of the new service, most agreed that solutions can and must be found to solve these problems. Furthermore, the level of enthusiasm for low power shared by all who attended LPTV '82 focused the entire Washington telecommunications community on LPTV issues at a crucial moment. The conference was held on the eve of the FCC's consideration of final rules for the new service. If there were any remaining doubts about whether LPTV would win a permanent place in the FCC's regulatory scheme before the conference, the presence of 1200 LPTV hopefuls in Washington ended those doubts.

The freeze

The FCC is concerned about the processing delays that face LPTV applicants. In order to stop the flood of new proposals and make it possible to begin processing some LPTV applications, the commission last spring instituted a freeze on the filing of new applications. The main exception to the freeze permits the filing of applications for areas that receive TV service from less than two regular commercial stations.

On February 9, 1982, a cut-off list was published that listed 300 new LPTV applications that meet the freeze exceptions. The applications on the list that did not draw competing applications are now eligible for grant. At this point, no one knows how many (if any) of the 300 survived cut-off. New cut-off lists for freeze-excepted areas will be published periodically to facilitate the grant of as many LPTV construction permits as possible in the shortest possible time. Although this process holds some promise of getting LPTV off the ground, it will work only for rural areas where there is no competition for LPTV frequencies.

MX'd (mutually exclusive) applicants face substantial delays regardless of whether their proposals meet the freeze exceptions. This is because, absent a lottery, the law requires that the comparative hearing process mentioned above be used to decide among conflicting proposals. At LPTV '82, Molly Pauker, the FCC staffer principally responsible for drafting the new rules, advised applicants who find themselves in MX situations to "get out and deal." Certainly, the incentive to settle conflicts through merger and buy-out agreements will be great when MX'd applicants realize that the FCC is never going to be provided with sufficient resources to resolve LPTV conflicts through hearings.

There still is hope that a lottery for MX'd applications eventually will be approved. Congressman Wirth (D-CO), chairman of the House subcommittee with principal responsibility for overseeing FCC activities, recently issued a statement strongly critical of the agency for not adopting lottery procedures. Also, the FCC's LPTV problems have become an important issue to many other congressmen and senators because of pressure from constituents caught in the logjam. Once the dust settles from the FCC's decision to reject Congress' lottery plan, there is a good chance that new attempts will be made by Congress and the FCC to devise a workable system.

FCC Commissioner Ann Jones, who delivered the keynote address at LPTV '82, predicted the following LPTV developments:

- Commission approval of the establishment of the new service would come in March 1982.
- Petitions to reconsider one or more parts of the order adopting LPTV rules would follow and not be re-

solved for several months, perhaps a year.

- In the meantime, the FCC would begin to develop a computer program for sorting out the applications now on file. This process, the commissioner said, would take at least a year.
- Also this year, the FCC will pick a new 15-member *task force* to attack the backlog. The task force will be in place by year's end.
- The freeze on new applications will not be lifted until 1985 or 1986, because it will take at least that long to process the applications now on file.
- Without a lottery, the freeze on new applications may not be lifted until after 1986.
- Initial processing—to begin *after* the planned computer system is in place and *after* all presently pending applications are cut-off—will most likely begin with applications proposing a first or second local service. Thus, rural areas will be the first to receive service.

Jones also expressed her view that there should be no limitations on who can own LPTV stations. She hopes to see new satellite-connected LPTV networks created and believes restrictions on the number of stations one party can hold will stand in the way.

Form 301

A useful suggestion surfaced at a panel discussion after Jones' speech. Someone in the audience pointed out that there still are many vacant UHF assignments in various mid-sized US cities. Because the FCC's rules permit regular TV stations operating on such assigned frequencies to employ transmitters with TPO's as low as 100W, there is no reason low power applicants should not refile their proposals as standard TV proposals on FCC Form 301. This idea offers the following advantages:

- LPTV processing delays could be avoided.
- Cable TV systems are required to carry local TV stations, but not LPTV stations.
- Regular TV stations are protected from interference from LPTVs, while LPTVs are secondary and must accept any interference caused by a new regular TV station.
- The FCC seems to be proceeding toward deregulation of TV, which means STV probably will be permitted on TV stations in small markets, and logging and public service program requirements will be relaxed.
- The facilities of regular stations can be improved so that regional coverage is possible, once that becomes an affordable option. On the other hand, LPTVs will always be limited to small coverage areas.

Of course, applicants for regular facilities face expensive and time-consuming hearings if competing proposals are filed. But this is true for LPTV applicants, too.

Private lottery

One final note from the conference: It appears that someone, either the organizers of the conference (who plan a new LPTV trade association), or another enterprising group, will organize a private lottery and arbitration service to deal with LPTV applications. Under such a plan, all applicants MX'd for the same facilities would agree to submit their applications to the independent arbiter who would determine, through a lottery or some other mutually agreeable method, who the winner would be. Losers could receive their expenses and be able to try their luck elsewhere. Most important, the FCC would be presented with a *fait accompli* and could make an immediate grant. This may offer the only method of relieving anxiety among LPTV applicants in what is proving to be a frustrating first year for the new service. □

INNOVATIONS FROM ABROAD

Pro video from British manufacturers

By Michael J. Adams, British correspondent, United Kingdom

As the information becomes available, **Broadcast Engineering** will bring you *Innovations from Abroad*, highlighting new equipment from manufacturers in other countries. Many of these manufacturers may not have US representatives at this time. For your convenience, however, reader service numbers have been included in the text. Use them if you need more information.

The Professional Video Show '81 at London's Wembly Conference Centre last November took the place of the Video Tradex international exhibition. The change in title and approach reflects the expansion in program production for videocassette or disc and cable distribution. The exhibition was aimed at end users in broadcasting, program distribution, industrial communications and training programs. A continuing reduction of the gap between broadcast and non-broadcast was evident.

Flying spot telecine

The Transcan Video 168H professional flying spot telecine features instant changeover from 16 to Super 8mm film with switchable color standards for 625 PAL or SECAM and 525 NTSC. The system can reproduce color or mono contrasts up to 150:1 for improved picture quality. Joystick manipulated differential controls adjust black/white, balance and gamma parameters. The resulting coarse and fine gamma range is approximately 0.8 to 2.0. Black/white balance changes allow operational changes for any color variation in the film.

The 168H system is gentle with film, yet provides fast forward and reverse search modes. Speed control permits viewing at any TV standard, variable speeds and stop frame viewing. A raster positioning control matches the equipment to the film frame, rather than making the film match the equipment.

Circle (200) on Reply Card

Camera tubes

The English Electric Valve Company exhibited some of its professional electro-optical tubes and a new hand-held TV camera. The studio grade Leddicons provide 30, 25 and 17mm formats. One highlight was the P8400 series with its built-in potentiometer-controlled integral light bias. Other features are the low capacitance target contact for improved signal-to-noise ratio; an anti-microphonic mesh assembly; ultra-high resolution photo layers; and a 1-inch scan format for improved geometry and registrations. For the ⅔-inch format users, the P8161 Leddicon is ideal for CCTV, ENG and EFP applications. The smaller format couples high resolution, precise geometry and long life.

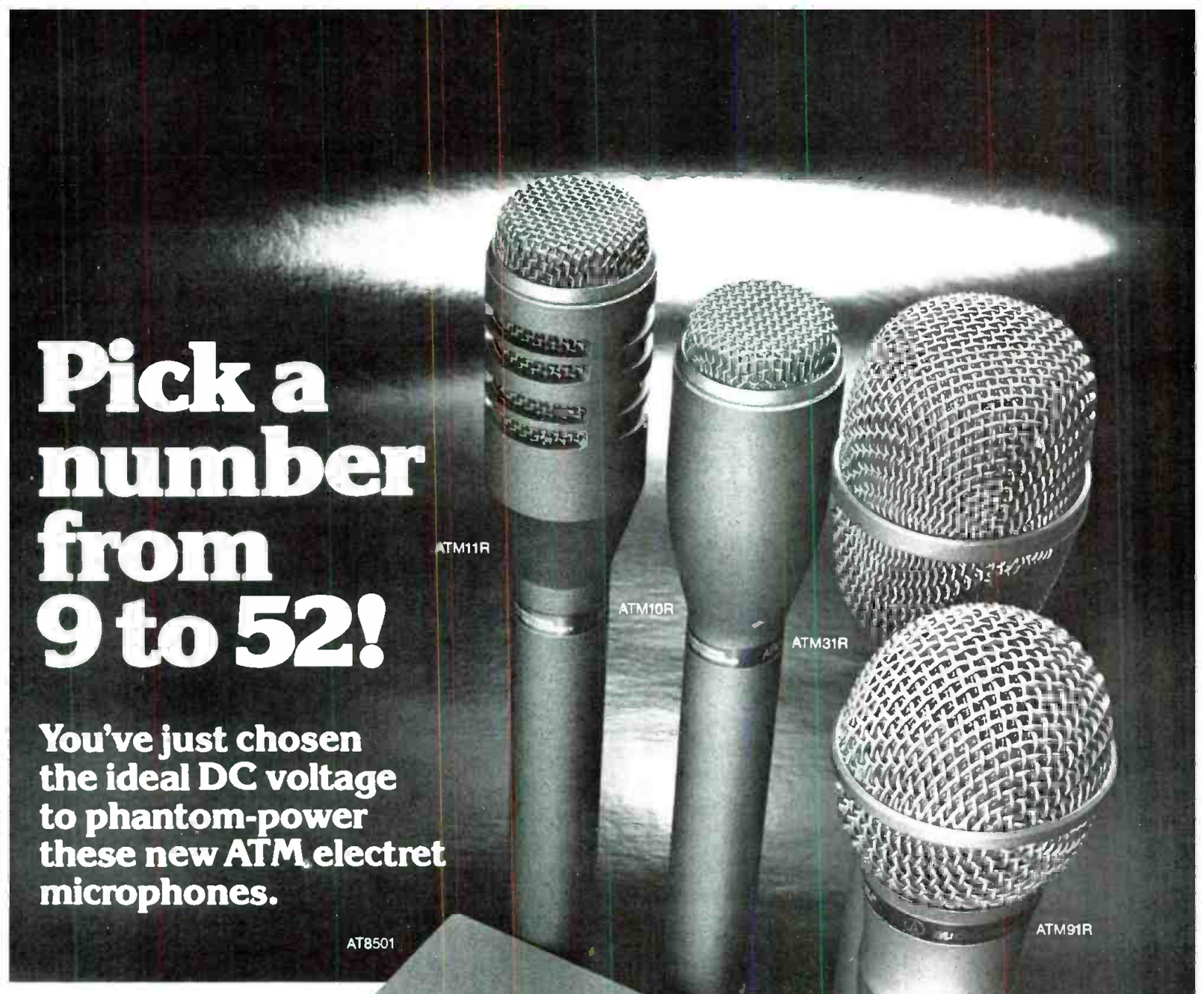
Circle (201) on Reply Card

CCD camera

EEV also presented a working model of the P4300 hand-held monochrome camera. Its P8600 charge-coupled-device (CCD) image sensors provide an image area of 8.5 x 6.4mm with an image element format of 576H x 385V. The camera contains all driver, sync pulse and video processing circuits to allow production of a 625-line CCIR-compatible composite

Pick a number from 9 to 52!

You've just chosen the ideal DC voltage to phantom-power these new ATM electret microphones.



Introducing four "universal" phantom-powered electret microphones. Designed to work from external power, internal regulation automatically handles any voltage from 9 to 52 VDC without adapters, switches, or rewiring. Just plug in and enjoy. With current drain a mere 0.3 mA at 9 volts (4 mA at 12-52V) a 9V battery lasts thousands of hours, not just the 60 or 70 hours typical of other mikes.

When your power supply isn't available, or isn't enough, use ours. The new AT8501 Dual Battery Supply holds two 9V batteries. One to use, and one in reserve. Instant switchover and test LED eliminates guesswork. And spares are as near as the closest shopping center. Neat!

But convenience and versatility are just two of the advantages of the new ATM models. All-new electronics provide plenty of headroom inside the microphone with no more than 1% THD even when used in acoustic fields of 141 dB SPL. Which sets new standards for clean sound even close-up to big brass or inside a powerful drum kit.

And the sound you hear is wide-range and *musical*. Presence without peaks. Highs to 20,000 Hz but without a raspy "edge." Yet despite their responsiveness, these new ATM microphones have the "Road Tough" reliability proved so often on stage and in the studio.

Before you add another microphone, compare our sound, our convenience, our reliability, and our cost. Write for literature and list of nearby ATM microphone specialists. Get great sound...right from the start! AUDIO-TECHNICA U.S., INC., 1221 Commerce Drive, Stow, Ohio 44224. (216) 686-2600.

audio-technica®

Circle (121) on Reply Card

Innovations

video signal. Without the lens or battery, the camera body weighs only 2 pounds. A separate video monitor is required.

Circle (202) on Reply Card

Intercom system

The Bradbury Group specializes in ancillary equipment for broadcast. On display was the model 310 series studio talk-back/intercom system. One of two system designs places all active circuit boards in remote units. Modules for these systems include a voltage controlled amplifier, logic control and speech decoder cards, an audio tone generator, an audio distribution amplifier, a 1x12 matrix amplifier and an 8-input matrix card.

Circle (203) on Reply Card

Shuttered TV camera

The J.D. Jackson Electronics high speed TV system was developed under a British Ministry of Defense contract. It is capable of recording on magnetic tape for up to 110 minutes at 200 pictures per second with the exposure time of each limited to 400μsec by a shutter system. A triggered flash with an open shutter reduces the effective exposure to about 10μsec of high intensity flash is used, to 2μsec for close-up work with short duration flash. The camera uses Amperex lead-based camera tubes with an anti-comet tail gun, bias light pipe, antihalation disc and small area target contact. Outstanding resolution, signal-to-noise ratio, key lag and highlight handling performance are valuable in high speed work. Highlights to 10% of the picture height and a brightness 32 times a normal peak white produce no trailing or blooming effects. A compressed gray scale is reproduced within the highlight area.

Circle (204) on Reply Card

Pan/tilt head

W. Vinten exhibited a complete range of lightweight camera mountings. The Avocet ENG/EFP pan/tilt head incorporates a lubricated friction system for smooth movement and a sophisticated balance mechanism with a 180° tilt range. The Teal studio pedestal allows smooth elevation and crabbing for cameras from 12 to 120 pounds. Also featured were the Portaped pneumatic tripod and the Dolphin crane arm, recent entries into the industry.

Avocet ENG-EFP pan/tilt head

Circle (205) on Reply Card

Video kaleidoscope

Chromascope P-135 from CEL Electronics is a video synthesizer. This video kaleidoscope can produce a constantly changing design of abstract, multicolored images. External video sources, cameras or VTRs may be included in the patterns. Additionally, patterns may be superimposed onto external signals. The system offers a mixer-fader, a sequence timer and a modification timer. Patterns can be held indefinitely; sequenced, faded or blended, as required. Shapes, textures and colors may be externally modulated with music for a varied light form working in time-to-frequency structures. Video, monitoring facilities, RGB outputs and RF signals are provided.

Circle (206) on Reply Card

High resolution CRT

The Electronic Visuals EV6151B color picture monitor retains the electronics of the EV6000 series but employs a new picture tube. The new screen resolution to 9MHz uses EBU-phosphor chromaticities for PAL usage. Electronic Visuals also showed their recently introduced PAL and NTSC waveform monitor and vectorscope line.

Circle (207) on Reply Card

Electronic traveling matte

The Electrocraft Consultants Chroma-Matte is an electronic equivalent of the photographic traveling matte, overcoming many problems experienced in chroma-keying. Linear matting techniques allow 3-dimensional work, where hair, smoke or transparent and defocussed objects are used as part of the foreground with their shadows retained on the new background. The matte signal is derived from primary blue or green, using RGB information from the background of the foreground subject. At RGB level, the matte signal is balanced out of the foreground signal, encoded and returned to the Chroma-Matte for final linear adding to the new encoded background signal. □

Circle (208) on Reply Card

new products

Instrumentation system

The *Tektronix* TM5000 series IEEE-488 standard automated instrumentation system offers measurement of almost every parameter involved in a complete proof of performance procedure. Although aimed primarily at the equipment manufacturer, networks or large scale broadcasters could reduce the drudgery of system tests to within a minute at sign-on.

Circle (270) on Reply Card

Production switcher

The *ISI* model 904 video production switcher provides 10 video inputs (blackburst/colorizer included) to a 6-bus system. Two independent mix/effects units each offer 16 patterns with hard and variable soft or bordered wipe transitions.

Circle (271) on Reply Card

Decoder

The *Gray Engineering Laboratories* model VID-125 VITC decoder performs a dual function by decoding both a cue-track SMPTE longitudinal edit code and a vertical interval time code present on a composite video signal (VITC).

Circle (272) on Reply Card

Remote control panel

The UltiMatte-4 offered by the *Vlahos-Gottschalk Research Corporation* operates on a linear principle, reproducing all foreground information seen by the TV camera, including smoke, dust and hair.

Circle (273) on Reply Card

Headsets

Clear Com's CH-41/42 cameraman's headsets employ a rugged, dynamic microphone and a dynamic to carbon transistorized in-line unit that provides 5dB more output level than a carbon mic.

Circle (274) on Reply Card

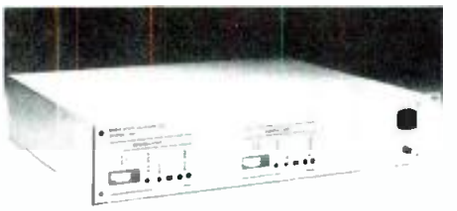
Compression driver

The *JBL* 2425 high frequency compression driver, a device for high power sound reinforcement and custom studio monitor installations, incorporates a unique ferrite magnet structure for extended frequency response with minimal distortion and greatest efficiency.

Circle (275) on Reply Card

Demodulator terminals

The *Modulation Associates* Stereo SAT, which permits reception of program audio services on Westar III, is fully compatible with all current single channel per carrier demodulators in use by major radio networks on Westar III.



Circle (276) on Reply Card

ENG adapters

Total Spectrum Manufacturing's Mono-Brace, suited for use with long focal length lenses, adds to camera stability and relieves strain caused by many hours of supporting the camera and lens on your shoulder. TSM's Lite/Mike adapter, available for all ENG cameras, enables quick, convenient mounting of portable lights and/or microphones.

Circle (277) on Reply Card

Lighting systems

The *LTM* Cable MicroLight (CML) and Micro Set Lighting (MSL) systems provide control and precision in lighting of closeup photography, miniatures, special effects and commercial product shots.

Circle (278) on Reply Card

Video generator

The *Jatex* VGEN time code display, video black, and color bar generator uses the company's Scene-dex time code, which has four digits and is written as audible tones on an unused sound track of videotape.

Circle (282) on Reply Card

Audio production package

The *MCI* Broadcast Audio Production Package includes the MCI JH-600 series recording console, an 8-track 1-inch recorder, and an 8-track 1-inch stereo recorder. □

Circle (283) on Reply Card

Conversations

Rolnick continued from page 78

With AES, a world leader in word processing equipment, I was one of the founders. My role was largely that of operations and daily management. Under my direction, AES grew from one million to 170 million dollars in a period of eight years. When I left them, I had a staff of more than 200 engineers working for me, plus marketing people and production managers, in several plants. Typical volumes, where we did a production plan or process layout, were in terms of units per minute.

With DVS I see myself as bringing a little bit of professionalism to the company. It has gone through an entrepreneurial phase and is now in a developmental phase. It needs a different kind of person to run it. AES had a million dollars to work with when I started. We had a product in concept, but no distribution organization. DVS is a bit further advanced. It has a distribution organization with some products. It's a reasonable starting point.

BE: Will you be working with engineering and design at all?

Rolnick: I could, over time, as I get more familiar with the broadcast technology. I'm familiar with digital, screen-based editing, as it applies to words, letters, forms and numbers. We'll see how we can use it in terms of the same base of editing, how it applies to this technology and this market. I don't expect my main objective to be involved in the design area, however.

BE: With you as president, will John Lowry still be invlved in equipment design, considering that nearly all the current DVS products are products of his work?

Rolnick: I don't find a problem with that at all. He doesn't intend to treat this investment in DVS in a way that he can now go off and do something else. John is primarily responsible for all of our products. I have great respect for his knowledge in the business.

BE: What direction do you think new products will take?

Rolnick: Our direction in products will have to be more and more user friendly. The more sophistication, the fewer complex lines of activity necessary to support the product. You have to aim at the lowest common denominator of the users. In terms of the technical know-how, it's necessary to succeed.

By the end of the coming year, there are a number of designs that have to have finalization states, so we can get them finished and to market to enable us to take a new direction. To build the engineering department into a super engineering department will be a major investment for a while. We plan to double it this year. Right now our engineering department is too small. It's too small in terms of what we can possibly do and in terms of opportunities and the time windows I think we have to meet to make commercial successes of some of the ideas that John Lowry has.

BE: Might we expect an entry into graphics?

Rolnick: For graphics you need the framestore synchronizer. The rest is just adding a PDP11/23 or something and getting some software. I won't say that tomorrow we're going to start a project to do that, but it's not out of the realm of possibilities. The technology base is there and that's what excited me about Digital Video Systems. It serves well as a good building foundation.

BE: There is a US hesitancy toward implementing Teletext, Prestel or the various other systems. They seem to be a success in England, yet we seem to be waiting for the French Antiope. Do you understand that delay and might DVS be involved in the textual technology?

Rolnick: Prestel, specifically, is not a commercial success. In times where companies are paying 18 to 20% interest, money is tight. Everybody wants to make a market share right now, to be profitable and live through this tough economic time. To take on ventures that have not proven themselves yet in other countries. I can see the hesitancy clearly.

In Canada, the government is the big mover behind projects, not private

industry. If it were not for the government, I think we would be not so far advanced. I don't see us making a major console input or making data bases, but I won't rule anything out. For the horizons I see for the company, it's not there.

BE: Are there any problems associated with manufacturing in Canada and shipping into the United States?

Rolnick: As an exporting company most of our products are sold outside Canada. It's mostly a matter of filling out papers. We have brokers who handle it every day. Canada, as a nation, exports a great deal of equipment. I've only been with the company a month and already I've met two brokers who want the business. The American authorities are easy to work with.

BE: What about the cost of manufacturing in Canada?

Rolnick: There are two advantages. One is the labor rate. Translated back to US dollars, it is lower than the US labor rates. At one time the Canadian dollar was five cents more than the US. Now it's 80%, 20 cents less. There's no major issue there.

On any activity that is labor intensive, you can save money. From the point of view of components, most of the parts originate somewhere in the United States. Yes, there's a few dollars that appear to stick in customs brokers' fingers as things fly back and forth, but we make it up by taking the differential between Canadian and US dollars for labor. The manufacturing costs are comparable. The real difference is in the productivity of the employees and that's a matter of selection.

You've got to look upon yourself as a company with two choices. You can grow or you can die. Anywhere in between is impossible. If you're not growing, by definition, you're dying in electronics. You have to work hard and put the money into engineering to allow for the continuing product lines. I think you'll see an unusually large percentage of our dollars going toward meeting the engineering budget. We are not budgeting for off-the-wall profits. We want to build the technology base. Where the usual case is 6 to 8% of revenues reverted back into engineering, we will be above 10%. As a result, in the foreseeable future there will not be huge profits for the investers.

BE: You have just left a position that was very successful. Are there any qualms about starting over again with DVS?

Rolnick: Every job has different challenges. It is all in what makes you happy. If you can get job satisfaction, you can come home at night and feel you had a reasonable day and contributed something—that's all that matters when everything is said and done. I try to do my best everyday. And I can't do any more. That's it. If I come home frustrated, but in my heart

I've done the best I can that day and there was no more I could have given—no additional concept, idea or activity I could undertake that day—I sleep very well.

BE: How is DVS going to progress with you at the helm?

Rolnick: If I can succeed, and I think I can, I'll make a major company out of DVS, the world class company that I'd like to make out of it. The objectives, short term, are to improve the product that we have today, finish off many of the concepts that are trends in design, and generally improve the reliability and quality of our products. Long term, we'll put money into engineering and come up with an aggressive product line. From there, we'll build a good sales and manufacturing organization. □

Vander Dussen
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coming on board at Sony, the revamping of Sony Corporation of America and the purchase of MCI? What does this mean as far as Sony's thrust in the marketplace, worldwide and nationwide?

Vander Dussen: A number of years ago, Sony recognized the potential and importance of the broadcast market in the United States and other countries. A decision was made to invest heavily in new product development and in establishing organizations in each country to properly support the products in terms of service and followup. The organization has had a dramatic growth in the last three to four years. We believe that growth has occurred because the products we've introduced have met a market need. Investment in sales, support, service, engineering—all those things that go along with a product—have been expanded in parallel with the new product growth, so the total, presented to the users, was something that people wanted to buy.

Our philosophy and policies are not different now. They are to continue to do what we have been doing, but to try to do it even better; to continue to expand our investment in engineering; to try to take advantage of the many new technologies that are so rapidly developing; and to try to understand from the people here what they want the equipment to do so we can end up with a product that meets the need for a price that the user can afford.

The establishment of a broadcast products company will give a stronger organization to do an even better job of those things. We will have the management and the people to understand what the users want so we can make sure that our research centers in the United States and Japan properly understand and can spend their engineering expertise to develop those products. Also, when the products are available, we will have the marketing, service and followup organizations to do a job we're proud of and that we can present to our customers with honesty and integrity.

BE: Will we see an increase in equipment production in the United States?

Vander Dussen: Sony, a worldwide company, will not sit back and wait until the market is willing to buy its products. Its philosophy is to invest in that market in terms of facilities and people, to prove that they deserve to be accepted as part of that marketplace. The investment comes first; the acceptance later. That investment that Sony makes in each of the major countries includes being part of that country. Sony Corporation of America is a company that is part of America. We have had manufacturing plants here for many years. We have the technology center, a tape manufacturing facility and a speaker manufacturing plant. We manufacture some of our broadcast products here. On a limited scale we will be doing more of that. In the past, now and in the future, we will be even more a part of this country in that involvement, yet relying certainly on the technological advances we have in Japan, too. Being able to take advantage of both, being able to take advantage of this country's assets and the Japanese assets and putting them together will do a better job of serving the market that we're going to address. It's that simple.

MCI will retain its identity, because they are an excellent company. They are recognized in the industry, and we don't want to lose that.

The problem is not the philosophy. The problem is having outstanding people that can implement the policy and make it responsive to those general directions and do the kind of job that we and our users can not only be satisfied with, but also consider to be excellent.

BE: Having manufacturing facilities in a country would seem a tremendous boost in terms of the company image in that country. But in terms of economics, is there a break in import/export duties for a company with manufacturing facilities in both places?

Vander Dussen: Yes and it varies by country. That is a consideration. Other considerations have to do with how can we have the best price advantage, depending on where equipment is manufactured. The rest is taken into consideration as Sony looks at each area. But beyond that, the top management of Sony recognizes that the privilege of being an accepted supplier in an area is also an obligation to be a responsive manufacturer in part of that community. That is one of Sony's important attitudes and strengths. We want to be not just a supplier in the industry, but we want to be part of that industry as a manufacturer that recognizes local obligations as well. I don't want to imply that we won't continue to manufacture part of our products in Japan—because certainly we will—but there will be an ever increasing recognition and aggressive program to see what the alternatives are and how we can do more locally as well; how can we do those things that make sense for both the country we're in and for our ability to meet requirements of the marketplace.

BE: Are any further expansions in the United States being considered?

Vander Dussen: We will be expanding our operations to meet our commitments, but at this point I cannot say exactly what they would be. Certainly Sony is going to look at all areas of opportunity. One thing that's exciting to us is the recognition that there are so many opportunities now and those are going to be growing. We have so many capabilities that could address various segments of this market. And we are in a position where we can understand, choose, invest and then be successful in different areas. It's an opportunity we are looking forward to with excitement. □

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however, the FCC declined to select one of the five incompatible transmission systems contending for approval as the industry's technical standard. The commissioners left that decision to the marketplace.

"Harris has decided to enter the market aggressively despite its belief that the FCC should have decided the issue. The company will mount a campaign to convince broadcasters and the public that its stereo system is the best."

Gene T. Wicker, vice president and general manager, Harris Broadcast Division, Quincy, IL, said his sales department "is holding 150 contingent orders from AM stations for stereo systems, some placed as early as two years ago. Now that the FCC has flashed the green light we will seek to convert those to firm orders and to book new ones.

"Harris was the only transmitter manufacturer to submit a stereo system to the FCC. The other contenders produced receivers or components. The company is the largest transmitter maker in the country, supplying more than half of all the AM and FM transmitters installed by American broadcasters last year.

"Harris said its patented stereo systems is the only one that maintains the same bandwidth as current monaural systems. This reduces the possibility of out-of-band interference among stations, a requirement stressed by the FCC. The company also said its system provides excellent audio quality, is compatible with existing monaural radio sets, and gives stations essentially the same coverage area for stereos they now enjoy with mono."

Although Harris is obviously committed to penetrating the AM stereo market, behind the scenes there is still doubt and concern. In an exclusive interview, Gene Edwards, vice president of marketing, Harris Corporation, said that people at his organization are extremely disappointed that the FCC could not settle the issue by selecting a single technical standard for AM stereo.

"Harris supported the FCC's adoption of a single-system concept on the basis that we felt that it would serve the best interest of the consumer, broadcaster and equipment manufacturer," Edwards said. "In our opinion, the marketplace approach is utterly unrealistic and is not in the best interest of all concerned.

"However, we would support a marketplace decision if all the FCC-licensed AM broadcast stations were allowed to vote by ballot on the system of their choice. We believe that this would resolve the problem for the broadcaster on what equipment to install and for the consumer who must invest in the correct receiver."

Kahn/Hazeltine

Leonard Kahn, when contacted concerning the FCC decision on AM stereo, expressed concurrence and delight. "We've been waiting 22 years to be allowed to enter the marketplace," he said. "It's something we believe in."

To supplement his remarks, he sent **BE** the following formal statement issued by the Hazeltine Corporation, Commack, NY:

"Stereo radio broadcasts using the Kahn/Hazeltine System are expected to begin almost immediately after the effective date of the FCC's authorization. Hazeltine and Kahn Communications stated that more than 40 AM radio stations in the United States already have the Kahn/Hazeltine system stereo transmission equipment installed for broadcasting or planned for installation.

Leonard Kahn, originator of the system, said these stations, including all music stations of the ABC, NBC, RKO, Westinghouse, Meredith, Lin and Bonneville broadcasting groups, cover virtually all major population centers in the United States. Kahn said he looked forward to a rapid buildup of demand for both radio receivers and additional transmission equipment for the Kahn/Hazeltine system.

"Transmission equipment for the Kahn/Hazeltine system will be available from Kahn Communications, Garden City, NY, which is planning its production schedules to meet expected orders for such equipment from AM broadcasters.

"Hazeltine Corporation and its wholly-owned subsidiary, Hazeltine Research, are making available to receiver manufacturers non-exclusive licenses under United States and corresponding foreign patents covering inventions of Leonard Kahn and Hazeltine that are used in receivers for the Kahn/Hazeltine AM stereo system.

"It was noted that the Kahn/Hazeltine system has been extensively tested in actual commercial broadcasting in the United States under FCC experimental authorization, and also in Canada and Mexico."

Regarding AM stereo's reception in the consumer market, Kahn said, "If it's handled right, receiver manufacturers will be convinced that this is the time to change the image of AM from a second rate service to a quality service. It's a perfect time. There's no reason why the public should not be allowed a choice between quality AM and quality FM."

When asked about receiver availability, Kahn said that sets could be available in six to eight months for his system. "I'm hoping that the receiver manufacturers will come through with quality AM receivers, and the stereo circuitry is not that expensive," he said. "In fact, we've had a breakthrough in cost reduction of our type of decoder that makes it particularly attractive in quantity production."

Magnavox

When contacted about its position on the FCC ruling for a marketplace decision on AM stereo, Magnavox was ready with the following statement:

"NAP Consumer Electronics Corporation accepts the FCC decision to authorize the transmission of stereophonic broadcasting signals by all the proposed systems. We are ready to present the Magnavox system to the marketplace, and we are confident that it will receive swift product acceptance among broadcasters, radio receiver manufacturers and consumers.

"Working with Continental Electronics Manufacturing Company, we have designed and developed a stereo exciter that is ready for quantity production. In association with Belar Electronics Laboratory, we have designed a broadcast monitor for the Magnavox AM stereo system. Our signals can be on the air and enjoyed by the listening public in a very short time.

"We are planning another extensive display of our system at the upcoming NAB convention in Dallas in April. We also believe that the Magnavox AM Stereo system is the only proposed system for which integrated circuit chips are available for use in receivers to recognize its pilot and decode its stereo signals. Therefore, low cost receivers for the Magnavox System

could be available within a year for both the home and automotive markets.

"We are naturally disappointed that our system was not the only system authorized, especially because in April 1980, almost two years ago, the FCC decided to select a single system and preliminarily chose our system. We are convinced, however, that the marketplace will prefer the Magnavox system and will confirm the FCC's original choice."

Motorola

Leaders at Motorola were also ready with a formal statement immediately after the FCC ruling:

"An official of Motorola expressed confidence that Motorola's AM stereo system will be selected by the marketplace as the best system for a national standard in AM stereo broadcasting.

"Martin Cooper, vice president and corporate director of research and development at Motorola, said the company is committed to assuring the broadcasting industry that at the earliest data possible it will produce exciters and monitors, as well as decoder chips for AM receivers.

"The Motorola system, technically called Compatible Quadrature Modulation (or C-QUAM for short), was one of five stereo systems competing for recognition as a national standard by the FCC. The FCC has examined and evaluated the merits of these systems for the past four years but, because it did not determine which system would best serve the US market, decided to allow all systems to compete in the marketplace.

"Our submissions to the FCC and public testing have proved the superiority of Motorola's C-QUAM over other approaches. The quality and performance are measurably better than the others, and costs to the consumer are equal or lower.

"Motorola has maintained throughout the long evaluation period that the FCC should decide which of the systems would best serve the public. The company's position has been that a marketplace decision would slow introduction of AM stereo to the public and could substantially increase costs to the consumer. Because the FCC has chosen to let the marketplace make the ultimate decision, Motorola will aggressively attempt to get its AM stereo system accepted by the industry and public.

"Present AM broadcast stations in the United States can adapt to the Motorola system by adding an exciter and a monitor. First deliveries of this equipment will occur within about six months, and AM receivers equipped to receive these stereo broadcasts should be available shortly thereafter.

"Motorola will manufacture certain integrated circuit components necessary for the reception of its AM stereo signals as well as AM stereo receivers for automobiles. Production details are currently under review.

"Existing monaural receivers will be virtually unaffected by the use of the Motorola system. Tests and exhaustive theoretical analysis of the C-QUAM system have shown it will provide the American public the optimum combination of characteristics for monaural and stereo broadcast in the AM band."

Frank Hilbert, engineering manager at Motorola, pointed out some of the realities to be faced in this AM stereo battle. "Take the decoders alone," he said. "It costs the semiconductor firms more than $100,000 to tool up to produce the IC decoder chip circuitry for AM stereo.

That's negligible for the accepted system leading to millions of sets bought by the public.

"But, AM stereo is tough, and many receiver manufacturers don't know what they are in for. It requires a rather heavy development expense, which is a hurdle that some of us are already over. Motorola's current plans call for third-quarter availability of decoder chips, but that schedule can be accelerated if the industry so demands."

NAB

The National Association of Broadcasters, serving more than 4700 and radio and 660 TV stations, was also quick to issue a formal statement. Vincent T. Wasilewski, president of the NAB, issued the following in response to the FCC vote on AM stereo broadcasting:

"From the outset, the NAB has led the effort for swift adoption of AM stereo.

"Although we are on record urging the FCC to choose a single standard, the commission, on reflection, has decided otherwise and has voted to throw it open to the marketplace.

"This association will concentrate every effort to equip broadcasters with the technical and marketing information necessary to aid them in converting to stereo transmission, if they so desire.

"Both the American public and AM broadcasters only profit by stereo broadcasting if consumer demand is present, and that is predicated on availability. Our efforts will now shift toward ensuring that AM stereo becomes a marketplace reality."

NRBA

The position of the National Radio Broadcasters Association has been clear for a long time: AM stereo is needed, and the FCC should decide on a single system to assure the future of AM stereo. The NRBA has objected strongly to a marketplace decision on AM stereo, contending that it could lead to total chaos. And that, in turn, could erase any benefit to the AM broadcaster and to the public.

Closing remarks

No industry-wide consensus from broadcasters is possible at this early date, but there are indicators of how they feel. Many stand ready to begin almost at once to install and use the system of their choice. And, we've talked to broadcasters who have strong personal preferences as to the system they want to see emerge as victor. ABC, for example, expects to go the way of independent sideband, as planned all along. However, a formal announcement to this effect awaits an endorsement by top management.

Unless the FCC reverses itself again, the battle is shaping up for a potentially fierce struggle in getting a national standard accepted for AM stereo.

But, there is a simple solution within the grasp of the FCC, even with its situation of being technically understaffed. With five systems accepted, and with the years of testing by broadcasters behind AM stereo, a marketplace decision is available by simply letting AM broadcasters vote, station-by-station, for the system they prefer. The system obtaining the maximum vote then becomes the national standard.

Such a vote could be gathered quickly, and computer tabulated. The cost would be peanuts, the future of AM stereo would be assured, and it would be a US broadcaster's decision, not that of some external source. □

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TUBES, HIGH POWER, SPECIAL PURPOSE WANTED: 304TL, 4CX1000A, 4-1000A's, 5CX1500, etc. Also some receiving types, 53, 7F7, 7N7, 6HU8, etc. DCO, 10 Schuyler Ave., No. Arlington, N.J. 07032. (201) 998-4246, (800) 526-1270. 3-83-3t

RE-BUILT BROADCAST EQUIPMENT in stock ready to ship. Broadcast Products, Box 846, Ft. Pierce, Florida 33454, (305) 466-0000. 3-82-2t

(2) HITACHI FP-1212, 3-tube cameras with extended red tubes & 16-160 F1.8 Fujinon lenses in excellent condition. Used only in studio. Broadcast plumbicons, less than 1,000 hrs., no spots. 50-foot cables, extender boards, $12,000 or best offer. **(3) Houston Fearless cradle heads** (250 lb. cap.) 2 with dual handles, in excellent condition, plus 1 more head needing parts. **(3) Houston Fearless heavy-duty** (400 lb cap.) **Field** tripods in excellent condition (quick-set Gibraltar equivalent), plus one more with missing foot. **(4) Houston Fearless dollies** for above in excellent condition. **$2,000 or best offer WRITE: EMORY MEDICAL TELEVISION NETWORK,** 69 Butler St., S.E., Atlanta, GA 30303. PH: (404) 588-3556. 3-82-2t

PANASONIC ¾" EDIT SYSTEM, NV-9200 & 9500 VCR's, A-950 Controller and CVS-504B TBC. Additional Equipment Available. (312) 975-3389. 4-82-1t

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420 FT. SELF-SUPPORTING GALVANIZED TOWER still standing in desert climate, excellent condition—as is, where is (Las Vegas, Nevada). Best Offer. **LISTEC KRESTEL CAMERA CRANE,** like new, w/field tires, 1 year old, used in studio, $17,500 or best offer. **ISI 821 MASTER CONTROL SWITCHER.** 20 X 2 (PST, PGM) w/auto transition, keyer, clock, AFV plus 6 input breakaway/over/under audio system. Make Offer. Contact, General Manager, KVBC TV, P.O. Box 44169, Las Vegas Nevada 89116. (702) 649-0500. 4-82-2t

GRASS VALLEY 1600-7K SWITCHER: 24 Input, 8 Bus., 3 ME's, Analog Borderline on all ME's and Downstream Keyer. RGB and Encoded Chroma Keyers, Machine Preroll System, Quad Split, Dual Power Supply System New Condition. Call Lou Bell, KNTV. (408) 286-1111 4-82-1t

EQUIPMENT FOR SALE (CONT.)

USED EQUIPMENT BARGAINS: RCA TT-10 AL 11KW transmitter. RCA TT-35 CH w/driver & diplexer just removed from service. 3⅛" and 6⅛" transmission line, with fittings and hangers. GE PE-240 film camera with Eastman multiplexer, projectors; CVS 500B TBC; Envirozone air filters; Collins 2.5KW FM model 831 D/310Z-2 4 years old, low time; Gates FM1B, with 3 yr. old Sparta SS exciter. Good condition. Call Ray LaRue, Quality Media Corp., (800) 241-7878. In GA (404) 324-1271. 4-82-1t

REMOTE PRODUCTION CRUISER: Beautiful Crown chassis, carpeted, full AC, camera platform on roof, 1600 mi. on diesel & drive train, good tires and brakes, includes (3) GE PE-350 cameras, working well, 10:1 & 2-18:1 lenses, motorized reels & TV-81 cables, Grass Valley sync & line gear, new color prog. monitors, 12X6 prod sw'r w/effects, 8X2 GE audio, well designed & professionally built. Other cameras available if preferred. $150,000.00. Call Ray LaRue, Quality Media Corp., (800) 241-7878. In GA (404) 324-1271. 4-82-1t

VTR'S RCA TR-70, FULL CAVEC, SS rec amps, DOC; (3) RCA TR-60 record only units 1000 hrs. Total time each; Ampex 1200B Amtec Colortec and Chroma, Vel Comp, RCO, DOC; Ampex VR 3000 with metering and charger, IVC 870. Call Ray LaRue, Quality Media Corp., (800) 241-7878. In GA (404) 324-1271. 4-82-1t

COLOR CAMERAS—NEW: Special purchase brand new Thompson CSF MC-301, 3 tube Saticon cameras with 14:1 Fujinon F1.7 lens, 1.5" viewfinder, AC supply $9,000.00 studio accessories available. Call Ray LaRue, Quality Media Corp. (800) 241-7878. In GA (404) 324-1271. 4-82-1t

COLOR CAMERAS—USED: (1) Norelco LDH-1; (1) GE PE-350; (3) GE TE-201, good operating condition; Hitachi, FP1020/JVC 2600 battery belts charger—AC supply 1000 hrs. total. Toshiba/GBC CTC-7X, minicam, plumbs. Call Ray LaRue, Quality Media Corp., (800) 241-7878. In GA (404) 324-1271. 4-82-1t

WANTED TO BUY

INSTANT CASH FOR BROADCAST EQUIPMENT: Urgently need: Transmitters, AM-FM-TV, film chains, audio consoles, audio video recorders, microwave; towers; WX radar; color studio equipment. Call Ray LaRue or Bill Kitchen, Quality Media Corp., (800) 241-7878. In GA, (404) 324-1271. 4-82-1t

$500 REWARD FOR UHF TRANSMITTERS: For information which leads to our purchase of any UHF TV Transmitter. Call Ray LaRue or Bill Kitchen (800) 241-7878. In GA, (404) 324-1271. 4-82-1t

WANTED: FM TRANSMITTER 3 to 10 KW. Good condition; 3 to 5 years old. Please call B.J. Howell, KFOX Radio, Inc., (213) 374-9796. Write 123 Torrance Blvd., Redondo Beach, CA 90277. 4-82-1t

INTERIOR MODULES FOR OLD COLLINS 212-F-1 console including power supply; Volumax 400 peak controller; old Magnecord tapedecks; RCA 44 ribbon mike; RCA ribbon mike desk stand; old roundback carts KVXL, Box 4, Bisbee, Arizona 85603. 3-82-1t

AM AND FM TRANSMITTERS to 5kW wanted. Any condition considered. 805/646-2356. 832 County Dr., Ojai, CA 93023. 3-83-2t

WANTED: Pre-1928 radio equipment and tapes. August J. Link, Surcom Associates, 305 Wisconsin Ave., Oceanside, CA 92054, (714) 722-6162. 3-76-tf

HIGHEST PRICES PAID for 112 Phase Monitors and for clean, 12 year old or less, 1 KW and 10 KW AM Transmitters. All duty and transportation paid. Surplus Equipment Sales, 2 Thorncliffe Park Dr., Unit 28, Toronto, Canada M4H 1H2, 416-421-5631. 2-79-tfn

INSTANT CASH FOR TV EQUIPMENT: Urgently need transmitters, antennas, towers, cameras, vtrs, color studio equipment. Call toll free 800-241-7878. Bill Kitchen, Quality Media Corporation (in Georgia call 404-324-1271). 6-79-tfn

WANTED: Radio Transcriptions 16" E.T.'s any Eddy Arnold or other Country 15" or 12" Transcriptions. Will consider others. Interested in Radio Station Libraries to purchase, all speeds of records. Boyd Robeson, 2425 W. Maple, Wichita, Kansas 67213, (316) 942-3673, 722-7765 Ev. 9-80-tfn

WANTED: USED RECORDING EQUIPMENT of all ages and varieties. Mics, outboard, etc. Dan Alexander, (415) 441-8936. 1-82-6t

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WANTED, VIDEO TECHNICIAN, maintenance experience required. ENG experience preferred. Great opportunity for Operations Engineer, doing some maintenance to move into a maintenance oriented position. Live and work in a warm resort community. Contact: John Ross. Chief Engineer, KIII-TV, Corpus Christi, TX, (512) 854-4733. 3-82-2t

MAINTENANCE ENGINEER FOR AM AND TV station wanted. FCC license and two years maintenance experience required. Salary: $20,000 to $24,000 D.O.E. Contact: Chief Engineer, Bethel Broadcasting, Inc., P.O. Box 468, Bethel, Alaska 99559. Bethel Broadcasting, Inc. is an Equal Opportunity Employer. 3-82-2t

VIDEO ENGINEER – IMMEDIATE OPENING: Award winning Boston production house has an immediate opening for a top-notch video engineer. Heavy emphasis on commercial production. Maintenance and management experience a desired plus. Excellent salary and benefits package. Call (617) 329-4080 or write to: President, Videocom, Inc., 502 Sprague Street, Dedham, MA 02026. 3-82-2t

KILT-FM, HOUSTON, HAS IMMEDIATE OPENING for Assistant Chief Engineer who will be totally responsible for the daily studio operation. Individual must be capable of routine maintenance and troubleshooting of wide range of studio equipment, RPU's, STL, and monitoring equipment with minimum supervision. FCC license required for RPU maintenance. Above average salary with excellent company benefits including group insurance, retirement plan, and much more. E.O.E. Contact Dan Woodard, C.E., 500 Lovett Blvd., Houston, TX 77006. (713) 526-3461. 4-82-1t

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HELP WANTED (CONT.)

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Immediate Assistant Chief Engineer opening requiring first class FCC license and min. 1 year broadcast experience. Studio equipment maintenance experience desired. Call and send resume to:

Richard Silvera
Greater Media, Inc.
P.O. Box 859
East Brunswick, NJ 08816
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HELP WANTED (CONT.)

ENGINEERS, TV Systems Engineers, Electronic Technicians, Technical Supervisors, Maintenance. Immediate openings. Experienced. Full time. Full benefits, plus Pension. Excellent salary plus commissions. Send resume to Technical Operations, Inc., P.O. Box 840, New Hyde Park, N.Y. 11040, or call Personnel Mgr. (516) 352-2238. 9-80-tfn

DIRECTOR OF ENGINEERING – STATE ETV NETWORK: Duties include direct supervision of staff of 28 operating, 4 VHF, 1 UHF transmitters, 1 translator, 10 station microwave interconnection system, and a network origination center. Experience should include system design in addition to management of operation, maintenance, and installation of production and transmitting equipment. Salary range of $17,940-$23,452. Contact: Personnel, AETN, Box 1250, Conway, AR 72032. 4-82-1t

CHIEF ENGINEER, LONG ISLAND AM-FM: Excellent opportunity to grow and learn. Good salary. Resort living. Resume to Barry Grant, WRCN, P.O. Box 666, Riverhead, NY 11901 or call (516) 727-1570. 4-82-2t

HELP WANTED (CONT.)

MAINTENANCE ENGINEER – Videotape post production company in beautiful Pacific Northwest has immediate opening. Good pay and benefits. Contact Mike at (206) 623-5934. 4-82-2t

ENGINEERING SUPERVISOR for top market TV-VHF station in Northeast. Experience in both operations and maintenance, plus strong management experience to direct and supervise technicians in a union environment. EE degree desired. MUST have good knowledge of analog and digital circuits, and experience with audio, video and RF. Send resumes in confidence to Broadcast Engineering, Dept. 562, Broadcasting Engineering P.O. Box 12401, Overland Park, KS 66212

TOP RADIO ENGINEER sought to maintain new transmitting plant and to build new studios. Must take a disciplined approach to maintenance, record keeping, and new construction. Top salary. KQDS, Box 6167, Duluth, Minnesota 55806. 4-82-2t

VIDEO MAINTENANCE TECHNICIAN. Responsible for the maintenance, troubleshooting and repair of video equipment and systems. Requires good working knowledge of electro and mechanical operating principles of video reel-to-reel and cassette records, camera chains, MATV and other supportive equipment that make up a B/W and color TV studio and distribution systems. Qualifications: Graduate from technical school, minimum of 2 years maintenance experience. Stop by for an interview 9 AM - 11:30 AM Mon.-Fri. or call 353-2380 for an appointment. Boston University, Office of Personnel, 19 Deerfield St., Boston, MA 02215. (Outside Boston area send resume or call collect.) An Equal Opportunity Employer. 4-82-1t

ENGINEER, SENIOR at television transmitters. Council Bluffs, Iowa. Salary range $20,342-$25,500. Supervision of engineers at two UHF transmitter sites. Maintain equipment for maximum performance. Requirements: FCC license and 4 years experience maintaining UHF transmitter. Phone (515) 281-4498 for application and job description. Contact: Personnel Office, IOWA PUBLIC BROADCASTING NETWORK, P.O. Box 1758, Des Moines, Iowa 50306. EOE/M-F. 4-82-1t

TV MAINTENANCE TECH. ENGINEER: Experience with IVC 9000's, Ampex Quads, CMX Systems. Analog electronic animation equipment valuable. Career opportunity for someone with broad experience in maintenance planning and supervision. Salary commensurate with experience. Write in confidence to Dolphin Productions, Inc., 140 East 80 Street, New York, N.Y. 10021. 2-82-3t

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POSITION WANTED

SEEKING TECHNICAL POSITION in south central Pennsylvania or northern Maryland. Associates Degree in electronics. 1st Class Phone with Radar Endorsement. For resume write P. Braun, 311 Sandy Ct., RD 4, Hanover, PA 17331. 4-82-1t

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HIGH QUALITY 1" video production company seeking association with 1" editorial house, preferably in southeast United States. Union to benefit both parties through immediate expansion plus interchange of services and ideas. Dept. 560, Broadcast Engineering, P.O. Box 12901, Overland Park, KS 66212. 4-82-1t

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