

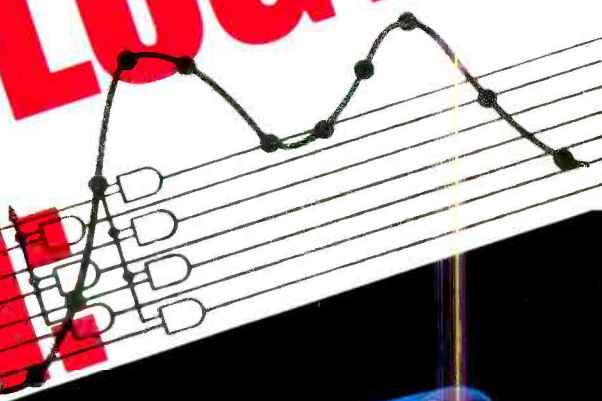
AUGUST 1977

# BME

BROADCAST MANAGEMENT ENGINEERING

# DIGITAL TECHNOLOGY PART III

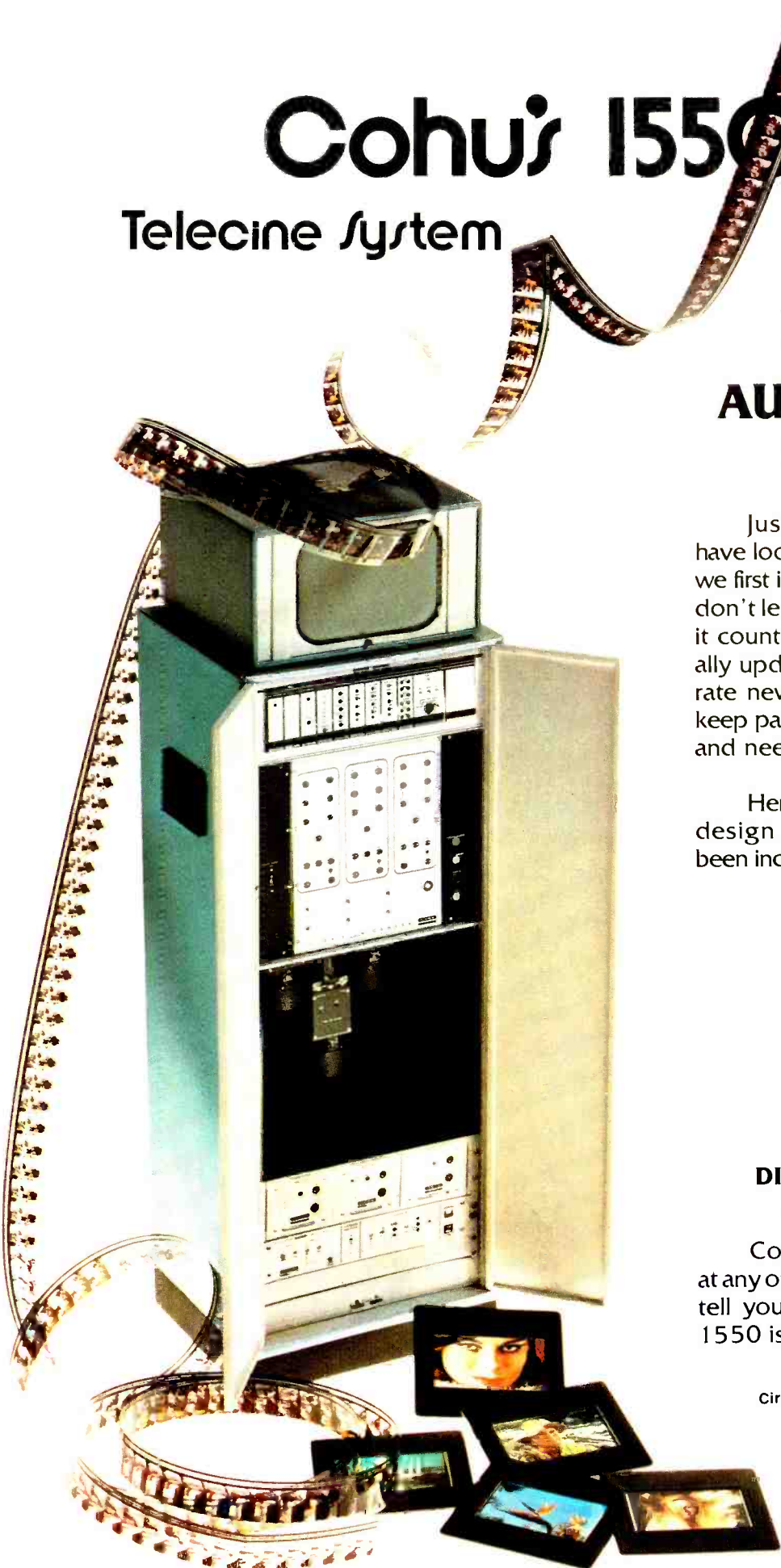
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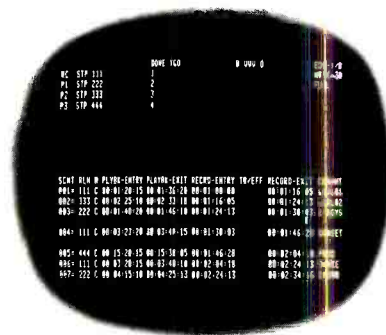
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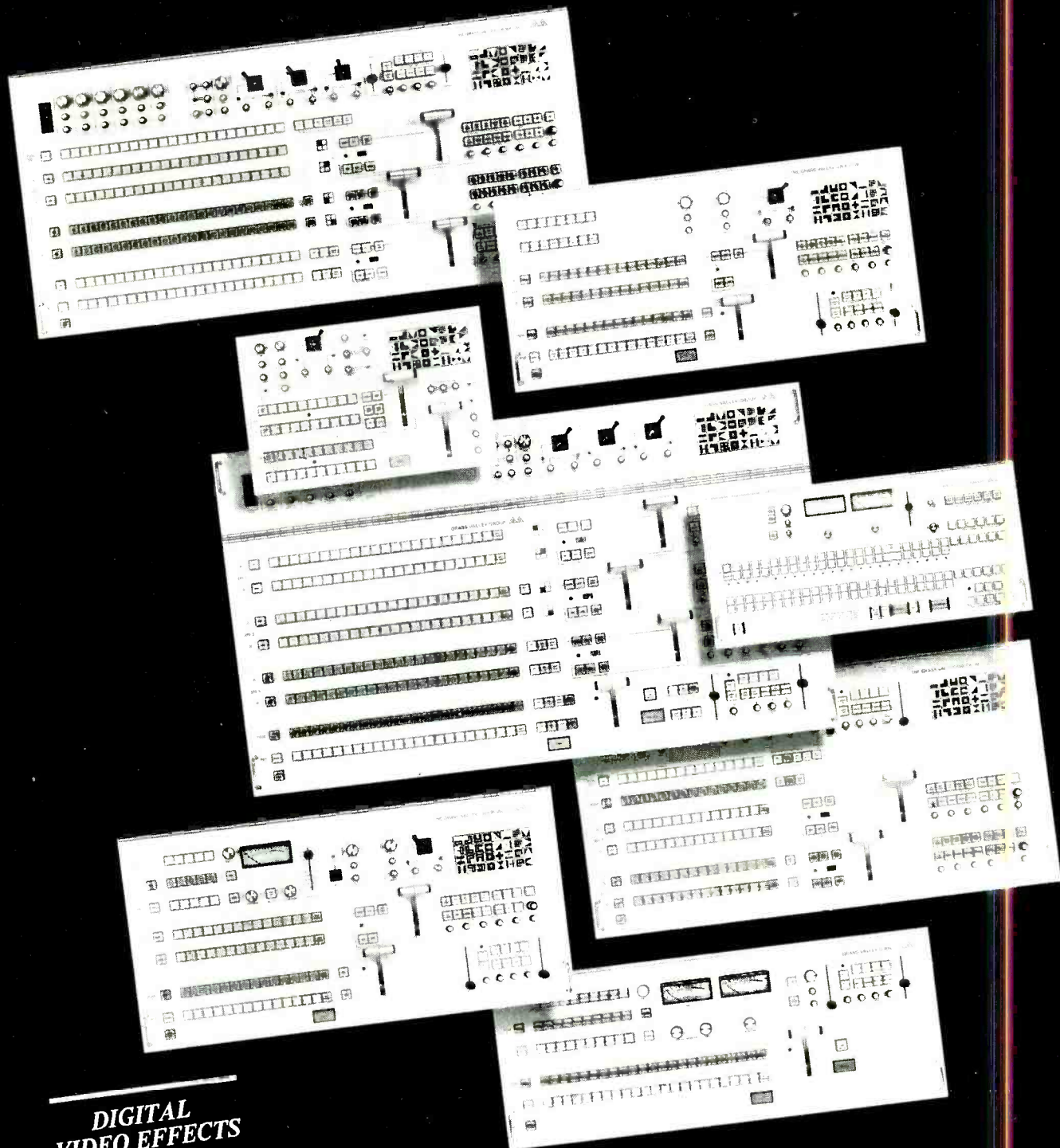
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**BPA** BM/E, BROADCAST MANAGEMENT/ENGINEERING, is published monthly by Broadband Information Services, Inc. All notices pertaining to undeliverable mail or subscriptions should be addressed to 295 Madison Ave., New York, N.Y. 10017. BM/E is circulated without charge to those responsible for station operation and for specifying and authorizing the purchase of equipment used in broadcast facilities. These facilities include AM, FM, and TV broadcast stations; CATV systems; ETV stations; networks and studios; audio and video recording studios; consultants, etc. Subscription prices to others: \$15.00 one year, \$25.00 two years. Foreign: \$20.00 one year, \$35.00 two years. Foreign Air Mail: additional \$24.00. Copyright © 1977 by Broadband Information Services, Inc., New York City. Controlled circulation postage paid at East Stroudsburg, PA.

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# BROADCAST INDUSTRY NEWS

## FCC Issues Notice of Inquiry On AM Stereo and FM Quad

The FCC issued two Notices of Inquiry, one for AM stereo and the other for FM Quad. The action is the first formal step toward official action on these issues.

The FCC will seek information on the impact that AM stereo might have

of the further development of FM and will concern itself with the technical impact that the various proposed systems might have. Matters of concern include the compatibility of any of the AM stereo systems with existing mono receivers, the effect on ERP, and the possibility of establishing one of the five competing schemes as standard. The FM inquiry will look at essentially the same areas as they affect the FM

portion of the spectrum.

Comments are due in the AM inquiry by Oct. 15th, and replies by Nov. 15th. Comments on the FM issue are due by Sep. 15th, with replies due, Oct. 15th.

## 1-In. VTR Standard OK'd

A new standard format for professional quality non-segmented one-inch helical videotape is now virtually assured.

continued on page 8

## CBS Mounts Assault On 35mm Film Use

It's official. CBS has designed and built a videotape production and post-production facility with which it expects to radically reduce its reliance on 35mm film for its prime-time programs.

Joseph Flaherty, vice president of engineering and development, for CBS Television Network, provided details of the new facility in a paper delivered to the 10th International Broadcasting Symposium, in Montreux, Switzerland. (See Montreux Report elsewhere in this issue.)

The system designed by CBS for use in Hollywood, where most of the CBS prime-time production is done, is expected to produce a 40 percent savings in below-the-line production cost. Essentially, the system consists of 5 Sony BVH-1000s, 1-inch Omega helical VTRs, Thomson-CSF 1515 triaxial color cameras, a Thomson-CSF Microcam, associated TBCs, a post-production switcher and other necessary gear.

According to Flaherty, the CBS goal with its ENG operations was to develop an electronic system at least as good as 16mm film, and the current enterprise was designed to produce results at least as good as 35mm film. To illustrate, Flaherty showed a tape in which identical scenes were recorded on 35mm film, 1-inch videotape with the Thomson 1515, and 1-inch videotape with the Microcam. Processing was handled normally for each medium as it would have been for ultimate transmission. The results showed that the 1-inch videotape compared favorably with the 35mm film image. The image of the 1515 was at least equal, if not superior, while the Microcam appeared slightly inferior to both film and the 1515. To the untrained eye, the dif-

ference would probably not be apparent once all three media were transferred to 2-inch videotape for transmission. In the experiment, all three systems operated under identical film lighting set-ups, and used the same film crew.

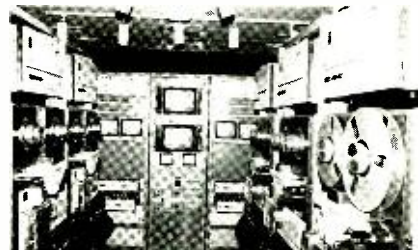
The system is intended to provide CBS with the flexibility of single camera production customarily used in film production, and the speed and economy of videotape production.

The BVH-1000s are housed in a trailer along with the other equipment. The production unit is designed to move from stage-to-stage and to be set-up with a minimum of effort. It will use four video cameras, all attached to their own VTR to record each camera's output. SMPTE time code will be recorded in the vertical interval to be used subsequently to sync up each tape for post-production editing. The fifth VTR will record the finished edited version made up of the selected portions from the individual outputs. The VTRs maintain an intelligible picture, completed with time code, in all modes from fast-forward to pause. This permits extremely fast and accurate switching of the cameras outputs in post-production rather than in production switching as is typical of previous video set-ups.

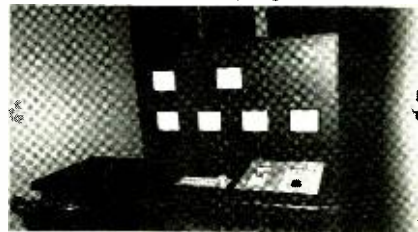
As Flaherty points out, the typical filmed program now contains 300 to 400 editing points in an hour long prime-time show. This number of edits would, at best, be very difficult to achieve in production switching. With the control and flexibility of the new system, many programs currently done in film can be done in videotape. Currently 41 percent of all prime-time programming uses single camera technique and without the recent development of lightweight, high quality video cameras, and the advent of high



Trailer houses production and post-production facilities which can be moved from stage to stage.



Sony BVH-1000s inside trailer. Each is dedicated to its own camera with one used to record edited program.



Comfortable surroundings provided at post-production console.

quality, economical 1-inch VTRs, this large portion of programming would have remained the unchallenged domain of film.

CBS currently transfers most of its programs to videotape—some 95 percent. It has been a long term aim of the network to move all of its operations onto one medium, and it appears that as of this autumn when the new facility goes into full operation, CBS will have taken a major step towards this end.

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Both Ampex and Sony, as participants of the SMPTE Working Group tackling the interchangeability problem, are parties to an agreement in principle defining the new standard.

Accord came in an amazingly short time considering the differences that had to be reconciled. It was only January of this year that CBS and ABC requested that SMPTE commence work on a standardization effort. Thus the

agreement on July 7 to vital compromises regarding audio head placement and video head drum structure was remarkable. The drum structure and writing speed remains essentially that used by Ampex. The audio format follows that used by Sony. Both companies had to compromise in other areas—to the benefit of users. The one-half sync head feature used by Sony to record VIT and VIR signals on lines 17 to 21 will be followed. Ampex will be able to keep its AST (automatic scan tracking) feature. Further, there is room in the audio head placement

scheme to get audio record verification (a VPR-1 feature).

Considerable work must still be done to work out details regarding tolerances acceptable, etc. but the working panel hopes the next meeting in September goes as smoothly as did the July meeting. Broadcasters on the panel are credited with applying the necessary pressure to get the prompt action witnessed so far.

Charles Steinbergh, v-p Audio Video Systems and Data Products Section, said Ampex was delighted with the outcome as a necessary step in the best interests of the industry. Just when the equipment meeting interchangeability standards will be available, however, depends on just how soon the final agreement can be thrashed out. Steinbergh said Ampex would work quickly and as aggressively as possible in getting new machines out. The matter has Ampex's highest priority, he said. Ampex will continue to market the present VTR equipment because of a strong "worldwide" market. Customers of new or old VPR-1 equipment will be able to retrofit their equipment to the new standard if they wish. A Sony spokesman, too, said he was delighted with the progress to date. Sony had already indicated (NAB '77) that it would make any modifications to the BVH-1000 necessary for standardization for \$1000.

While the achievement of new one-inch professional quality standards (for both segmented and non-segmented types) presages a decline in the role of quad machines, both will be around for a long time. Ampex reports more quad units were sold last year than in any previous year. They will continue to be in demand. The lower cost one-inch machines will open up new markets, observers predict.

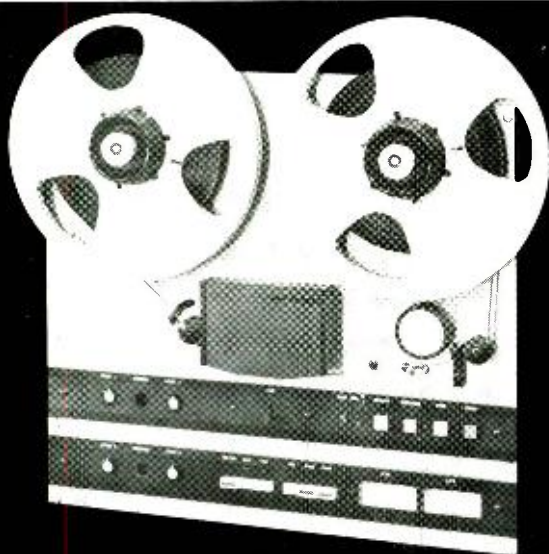
## NAB Seeks NLRB Action On AFTRA Strike Tactics

NAB president, Vincent T. Wasilewski, asked the National Labor Relations Board to proceed with "vigorous prosecution" against AFTRA on charges that its tactics in a strike against WPGC AM & FM are illegal.

In a letter to John S. Irving, General Counsel for NLRB, Wasilewski said that tactics used by AFTRA "would have enormous implications for the broadcast industry." AFTRA is charged with having its members threaten advertising agencies with suits if they allowed spots using AFTRA members to be aired on WPGC, Morningside, MD. AFTRA members have also, it is alleged, told agencies to pull from the stations any commercials

continued on page 10

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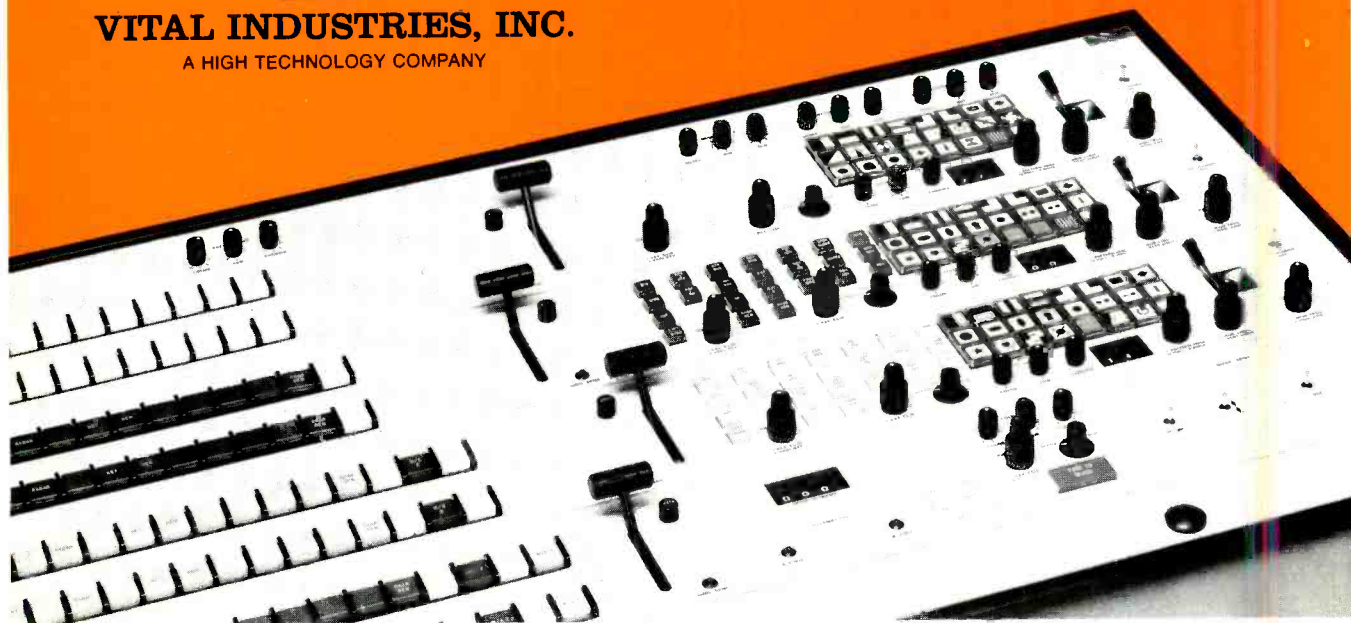
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## News

using their membership. First Media Corp., owner of WPGC, has filled "hot cargo" and secondary boycott charges against AFTRA.

Wasilewski warned, "If AFTRA can lawfully require agencies to pull spots from struck stations, it could set precedent for lawfully pressuring broadcasters into pulling network, syndicated, and locally produced programs using AFTRA members off the air at struck stations."

## Royalties For Recording Artists Could Ruin Radio Says NAB

In a filing with the U.S. Copyright Office, NAB registered its opposition to the payment of royalties to recording artists.

Such payments, said NAB, would be "unconstitutional, inequitable, contrary to law and detrimental to the public interest." The NAB filing said the Constitution cites authors as eligible for copyright protection but noted that performers do not come under this

category. It also noted that while the Copyright Revision Act of 1976 establishes protection for original works of authorship, this does not cover performance and recording of musical works.

Such payments, said NAB, "would threaten the ability of many stations to continue to provide responsive service to their communities." If some performers are poorly compensated, according to NAB, then this is an intramural dispute between the record companies and recording artists and not a "broader problem that compels government intervention."

## 2nd Carnegie Comm. To Study Future of Public Broadcasting

With an initial \$1 million grant and a fulltime staff a second Carnegie Commission has begun work on a study of the future of public broadcasting. The commission, headed by Columbia University president, William J. McGill, will examine the impact of new technology on public broadcasting and other matters, including the structure of the current public broadcasting system.

The first Carnegie Commission on Educational Television resulted in the Public Broadcasting Act. The Carter administration has promised that recommendations of merit forthcoming from the new Carnegie Commission on the Future of Public Broadcasting when it completes its work in 18 months, might result in legislation.

Though the new commission will look at the structure of public broadcasting the emphasis will be on programming and technology. Questions of funding and structure that may be raised will be left to the White House and Congress.

## Big Market For Small Dish Seen

Cumulative worldwide sales of satellite small earth station equipment will total over \$1.1 billion between 1976 and 1986, according to a study by Com-Quest Corp., an independent research and consulting firm.

According to the study, annual sales of \$24 million in 1976 will increase at an average annual rate of more than 20 percent to \$152 million in 1986. Numerous market segments offer attractive opportunities both at home and abroad. Some of the markets mentioned in the report include satellite business systems, cable television, and radio and television broadcasting.

In dollar volume, the total market is almost evenly split between the U.S. and foreign countries. The report saw opportunities for small earth station equipment in several of the regional

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**"I am most impressed with Cinema Products' approach to the design and manufacture of film equipment, as well as the diversity and dependability of their products. CP-16R and STEADICAM are the prime examples!"**



Timothy Wolfe  
Chief, Film Production  
Maryland Center for Public Broadcasting

"The Maryland Center for Public Broadcasting is the production facility for a network of PBS affiliated stations throughout the state," says Timothy Wolfe, Chief, Film Production.

"Most of our programs are specifically tailored to meet local needs, while others are produced for a national audience. The film production unit provides a wide range of materials for broadcasting, from film inserts which are rolled into live or taped broadcasts, to hour-long dramas and documentaries."

**"The CP-16R is the finest production camera of its kind..."**

"We are well equipped for all phases of 16mm production. Included in our inventory is a CP-16/A, a CP-16R/A reflex with orientable viewfinder, a Model 6C mixer, and we have just ordered a J-4 zoom control system for several of our lenses."

"The cameras are extremely quiet, well built, and simple to service. Certainly the CP-16R is the finest production camera of its kind, and we use its single/double system sound capability extensively."

Motion picture cameraman Kevin Weber concurs. "I have been using the CP-16R on a daily basis for the past year or so — filming community theatre, dance, and music presentations in the Baltimore-Washington area," says Weber. "After hundreds of location productions, the CP-16R continues to function perfectly. The camera is very professional, yet it retains a simplicity that makes it extremely



Cameraman Kevin Weber (right) and Timothy Wolfe, Chief, Film Production, Maryland Center for Public Broadcasting.

functional.

"I enjoy shooting from the shoulder, so I often utilize a 10mm lens, and jump right into the action on stage. From this vantage point, my camera can become another character who is in close touch with the performers. The CP-16R is one of the finest handheld cameras I have encountered: silent and reliable, capable of handling almost any filming situation."

**"Working with STEADICAM means developing a new technique of moving and shooting."**

Says Wolfe: "A recent assignment to produce a short film about the sport of Siberian Husky dog racing presented us with an excellent opportunity to explore the unique capabilities of Cinema Products' new STEADICAM camera stabilizing system. Especially since director

Cameraman Steve Dubin with CP-16R and STEADICAM. STEADICAM converts virtually any vehicle into an "instant" camera platform.



Marian Siegel wanted to include both tracking and point-of-view shots of the race itself.

"From Brenner Cine-Sound (Washington, D.C.) we rented a Universal Model STEADICAM and Cinevid system for use with our own CP-16R, allowing cameraman Steve Dubin sufficient lead time to familiarize himself with the unit under the guidance and supervision of Brenner technicians."

"The evening before the shoot, Steve took a feed from the Cinevid and recorded his moves on a video cassette machine. Time well spent, since working with STEADICAM means developing a new technique of moving and shooting."

"Using 7247 color negative for maximum depth of field, Steve shot with an 85N6 on the Angenieux 12-120mm zoom lens at f/16, keeping the focal length between 12-25mm."

**"STEADICAM replaces costly and time-consuming methods of shooting."**

"Steve moved easily with his STEADICAM, in and around dogs and trainers as the teams were being prepared for a run. He was then strapped to the tailgate of the truck for some tracking shots, leading the teams along little used trails, and ended the day riding in the dog sled on a run through the woods.



"With STEADICAM, Steve was free to make complicated shots on short notice with relative ease — shots which would have been impossible to make had he been limited to a dolly, tracks, and hours of crew rehearsals! And the finished piece has a remarkably fluid and refined quality."

"STEADICAM replaces costly and time-consuming methods of shooting," concludes Wolfe. "The Universal Model is especially attractive, since it can be used interchangeably with 16mm and 35mm motion picture cameras, as well as with video cameras."

"I am most impressed with Cinema Products' approach to the design and manufacture of film equipment, as well as the diversity and dependability of their products. CP-16R and STEADICAM are the prime examples! With products like these, filmmaking remains a viable operation for a television production facility such as ours."

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## News

satellite systems expected to be in operation by the early 1980s. Europe, Canada, Brazil, Indonesia, Iran, India, and Japan were all mentioned as likely markets. The cooperating countries in each consortium will provide, significant markets, according to the report.

### OTP On Its Way Out

The Office of Telecommunications Policy will probably be dissolved under President Carter's plan to reduce the number of White House agencies.

The OTP, with a budget of \$8.2 million and a staff of 59 was set up under the Nixon administration to advise the executive branch on communications policy in such areas as spectrum management, cable television, computer networks, and other far reaching communications developments. Under the new plan, the responsibilities of OTP are likely to be parcelled out to other cabinet level departments.

Reactions thus far from Congress have indicated that, at least, Rep. Lionel Van Deerlin and Sen. Ernest Hollings are concerned that the White House should choose to downgrade an area as important as this just when the nation is on the verge of a communications revolution as important as the industrial revolution. The White House, however, has said that this is not a downgrading but rather, a reorganization that would result in an upgrading of the quality of work on communications policy.

### FCC Asks Heavyweight Questions On Cable VS Broadcasting

Saying that the debate over the effects of cable on the economy of broadcasting has often produced "more heat than light," the FCC on June 9 opened a very broad inquiry into every aspect of what cable does, or doesn't do, to broadcast revenues. The purpose, the FCC frankly said, is to get solid data on which to base cable policies and rules, in support of its twin goals: maintaining over-the-air broadcast service, and at the same time fostering cable growth to provide diversity of programming. These goals are compatible, said the FCC. So the FCC asked for comment (Docket 21284) by December 1 on more than thirty questions, a number of such scope that they would seem to demand, individually, economic research on a massive scale (or supervision into the future). A few samples are: "Can cable be viable in large cities, and what are the main difficulties that curtail or prohibit its growth

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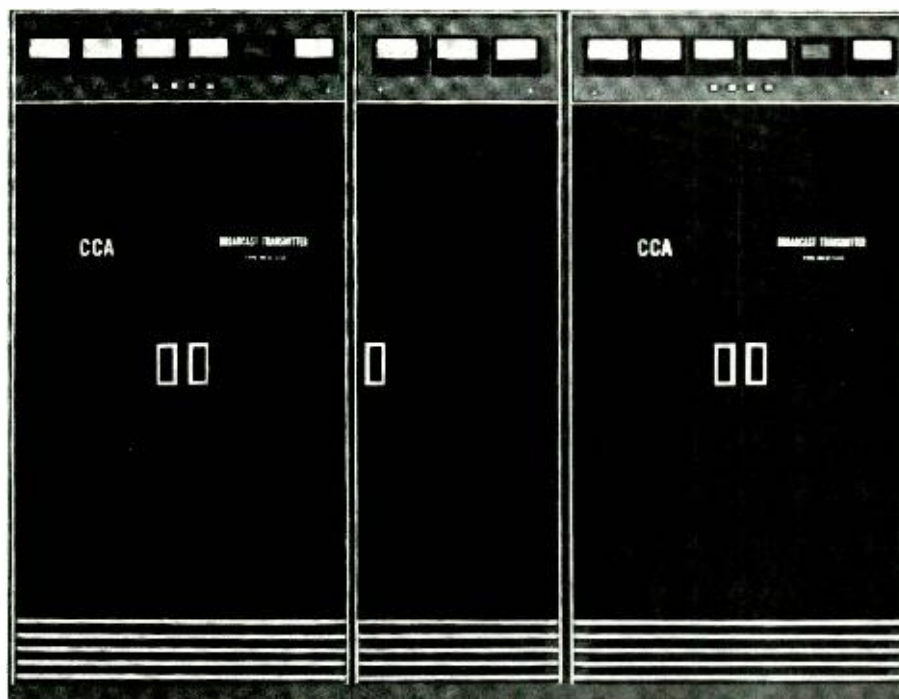
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Circle 106 on Reader Service Card



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The new CCA 55kw combined FM transmitter. Type-approved to operate from 25kw to 60kw. Stable grounded-grid design. Inherent durability using two independent parallel amplifiers. Available with optional Dual-Reliable switching.

The new CCA 55kw FM transmitter is everything you want—and nobody offers more. Ultra-reliable. The proven performance of grounded-grid design. Our demonstrated long tube life significantly lowers operating cost per hour.

The CCA FM55000EP system utilizes an all solid-state direct FM 100-watt exciter and combined high power amplifiers for inherent system reliability. Independent interlocks and separate AC feeds allow one amplifier to be worked on in complete safety even when the other is on the air. And the new CCA 55kw FM transmitter is available with Dual-Reliable automatic switching of exciters *and* final amplifiers to by-pass the combiner no matter what happens. You may never go off the air again.

CCA has it. Nobody offers more. Call our toll-free number for all of the details on the new CCA FM55000EP FM transmitter.

## *The New CCA*

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In Canada call toll-free: 800-261-4088, or (416) 438-6230

Circle 107 on Reader Service Card





# The Sony BVT-1000. Consider the logic.

A time base corrector is part of a system. A system that includes a video tape recorder.

Isn't it logical that a company which manufactures video tape recorders would have an inside track on what it takes to correct time base error in a VTR signal?

We're talking, of course, about Sony Broadcast.

The company that pioneered professional U-matic video recorders. And introduced the BVH-1000 1" High Band Video Recorder, that has the whole broadcast industry moving in a new direction.

Sony Broadcast has matched these impressive video recorders with an equally impressive digital time base corrector. The BVT-1000.

And before you face up to the difficult decision of which TBC is best for you, consider the logic of the BVT-1000.

**1. The economy of a complete package.** Sony Broadcast knows that line-by-line velocity compensation, complete video processing with advance sync, drop-out compensation, and the ability to handle both direct and heterodyne color are not just "options."

They're requirements. Requirements that broadcasters need and use in day-to-day operations.

So we make all these so-called options standard built-in features of the BVT-1000. And you save dollars in our greater production efficiency.

**2. The advantage of superior technology.** The economy of the BVT-1000 doesn't mean you sacrifice quality.

Far from it. The BVT-1000 incorporates unparalleled

technological excellence. Excellence demonstrated by a unique A/D converter that expands the effective number of bits per word, resulting in a higher signal-to-noise ratio than theoretically expected in an 8-bit system. Which leads to transparent picture quality.

With the Sony Broadcast BVH-1000 1" recorder, the BVT-1000 provides locked recognizable color pictures from still-frame to seven times normal speed. And to greater than thirty times normal speed in monochrome. So your editing techniques are faster and more critically accurate than ever before possible.

And for use with U-matic format recorders, the BVT-1000 offers special advantages. A wide 4H window and special anti-gyro circuitry compensate for wide errors and maintain both color and luminance stability.

Advance sync control allows phase correction using LED indicators at the TBC, for system integration. And the video level can be monitored by LEDs that show at a glance high or low level relative to one volt peak-to-peak.

**3. The logic of a systems approach.** If you are into electronic news gathering, or if you're part of the new revolution in 1" high band machines, the chances are very good that you're already using Sony recorders.

The BVT-1000 gives you an opportunity to add new logic to your broadcast equipment. The logic of an all-Sony system.

For full information about the BVT-1000 or any of the other professional video products in the Sony Broadcast family, call your nearest Sony Broadcast office.

## Sony Broadcast

Sony Corporation of America, 9 West 57 Street, New York, New York 10019  
New York: (212) 371-5800 Chicago: (312) 792-3600 Los Angeles: (213) 537-4300 Canada: (416) 252-3581

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**Circle 108 on Reader Service Card for literature**  
**Circle 109 on Reader Service Card for demonstration**

## News

there?"; "How is it possible to estimate ultimate cable penetration in entire service areas of broadcast stations?"; "What is the predictable long-term rate of growth in demand for TV advertising time, and to what extent will . . . (it) be affected by increased cable penetration?"; "What effect, if any, will improvements in signal transmission or television receivers have on future cable television growth?"

Solid data on these and more than 20

other questions of comparable weight would obviously put the FCC in a far better stance to handle the increasing heat in the cable broadcasting controversy.

### FCC Releases Cable Revenue Figures

The FCC has already gathered at least some "solid data" on cable economics (see preceding story), as is evident in the release of totals on cable revenue for the year ended October 30, 1976. Tabulated from the first 12 months of the

recently revised Cable TV Annual Financial Reports (Form 326), the data show total revenues for the period exceeding \$894 million including about \$16 million from pay cable. Expenses exceeded \$560 million, to leave an average operating margin before interest and depreciation charges of 37%. Pre-tax net income was \$27 million; total assets, about \$2 billion. About 6000 communities had cable service, supplied by about 2500 systems. Total subscribers nationwide on October 30, 1976, were estimated at about 9,800,000.

### ACT Seeks Ban on General Foods Cereal Ad

Action for Children's Television (ACT) filed a formal complaint with the Federal Trade Commission alleging that a General Foods Corp. television commercial for "Cocoa Pebbles" contained misleading advertising practices directed to children.

The complaint seeks a ban on television commercials for the pre-sweetened cereal, asserting that the promotion of the product as "part of a balanced breakfast," may imply to young children that merely because the cereal is "chocolatey," it is nutritious.

The complaint charges that the advertisement does not comply with the NAB Code which calls for such foods to be presented "in accord with the commonly accepted principles of good eating" and "within the framework of a balanced regimen." The main appeal of the Cocoa Pebbles ad, according to ACT, is its chocolate flavor and "delicious feeling" of the cereal.

Peggy Charren, president of ACT, said, "only the NAB code could imagine that adding the phrase 'part of a balanced breakfast' to a commercial for a sugared chocolate cereal would teach proper nutritional habits to children."

### FCC Briefs

The FCC refused to expand its CP for domestic satellite operations to **Satellite Business Corporation (SBS)** to include a written prohibition against joint or cooperative enterprises between SBS and International Business Machines, one of the sponsors of SBS: the FCC said that SBS fully understood the spirit of the prohibition, and that any infringement judged anti-competitive could be dealt with through established channels.

**A Federal Appeals Court refused to review a District of Columbia Court decision**, which threw out the FCC's ruling that the famous George Carlin monologue on WBAI was "indecent" and prohibited by law (See *BM/E*,

continued on page 19

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# The new RCA TFS-121 Synchronizer alone is great.

## With freeze frame and picture compression, it's unbeatable.

**"Superhighband" video.** The TFS-121 Digital Video Synchronizer is designed and manufactured by RCA. It starts with state-of-art sampling and storage technology that positions it ahead of competitive offerings.

The video sampling is at four times subcarrier frequency, resulting in "superhighband" video performance which translates into excellent picture quality.

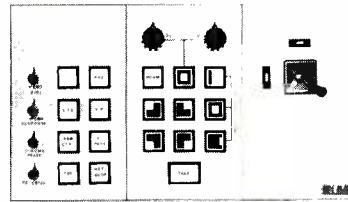
That's only the beginning of the TFS-121's high value/performance rating. It is the most versatile stand-alone synchronizer around, and works beautifully without a switcher. It eliminates the need for genlocking and/or rubidium standards. And switches smoothly between non-synchronous sources without disrupting sync.

**Forget the old problems.** With the TFS-121, you can accept network feeds, ENG and other remote pickups, or satellite transmissions, without disturbing in-house operations—live programming, production, recording. The TFS-121 accepts and matches those signals to station sync, so you can forget about the old problems of glitches, picture rolls and tears, or drop-outs.

**A production tool, too.** Freeze frame and picture compression add new performance dimensions. With these options, the TFS-121 is far more than a synchronizer—it's a valuable production aid. Consider freeze frame. With it, you can present a still picture, up-date it at the push of a button, or create strobe-like effects such as "animation". Stop the action whenever you want, or at a rate you can vary.

Picture compression on the TFS-121 opens a whole new range of production possibilities. The full-size

picture is reduced to 1/4 size and can be positioned in any raster quadrant or in any desired pre-set position on the screen. With joystick control, the compressed picture can be placed in any part of the raster, or can



be made to slide on and off anywhere. (The joystick control can also be used to move the full-size picture on and off the raster in any direction.)

**How to be convinced.** The TFS-121 Synchronizer is ready now. You can investigate the many benefits of this new RCA-developed product by contacting your RCA representative. Or clip and send the coupon. The facts about the TFS-121 can be convincing.

RCA Broadcast Systems  
Building 2, Front & Cooper Sts., Camden, N.J. 08102

Dear RCA: I'm ready to be convinced that your new TFS-121 is the best synchronizer around. Please send literature.  Have representative call

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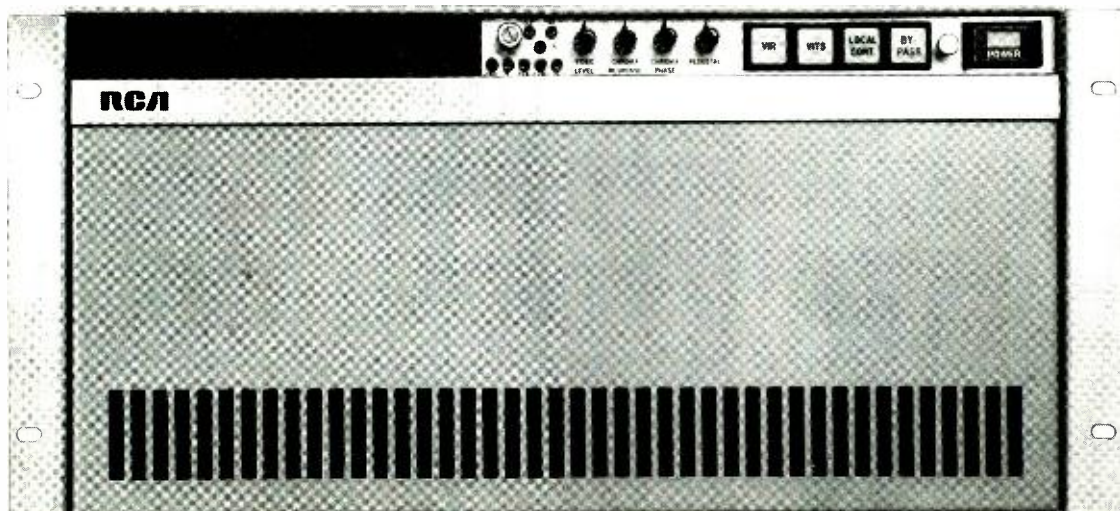
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**RCA** Broadcast Systems



"YOU KNOW THIS NEW 3M SWITCHER IS REALLY PERFORMING BEYOND MY WILDEST EXPECTATIONS."



Sorry, our switchers really can't pop a super lady out of your tube...yet. But they can sure help you make better lookin' programs.

On our economical compact **Model 1114 Production Switcher**, you can make almost all the moves the network guys do. You can preset your wipes to any vertical or horizontal level in any effect pattern, joystick position them, modulate, soft wipe, spot light, or fade to any color or black. Preview and Program output switching lets you set up your effects before they go on-line. The Model 1114 is 100% vertical



interval switching on all four busses and fourteen special effects, and includes eleven inputs and an optional Chroma Keyer.

Our new, low cost **Model 812 Production Switcher** includes three busses, twelve effects, eight

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inputs, and many of the standard features of the Model 1114. Special features of the Model 812 include a Digital Event Timer and a Non-Sync warning light.

With either the Model 1114 or the Model 812 you'll switch up to quality video for a lot less money.

For more information about our full line of 3M Production Switchers and a frameable 11" x 14" full color reprint of the illustration in this ad, write: 3M Mincom Video Products, Bldg. 223-5E, St. Paul, Minnesota 55101 or circle our number on the reader service card and return.

**3M**  
COMPANY



## News

June). . . . The FCC waived some of its rules to allow **Blonder-Tongue Broadcasting Corp.**, licensee of WBTB-TV, channel 68, Newark, NJ, to put a 1 kW translator on channel 60 atop the World Trade Building in New York: this did not mean, said the FCC, that final decision was reached on putting the WBTB transmitter there.

## News Briefs

More than **8 million people now listen to car radio** during the average quarter-hour of the combined weekday drivetime periods from 6 to 10 AM and 3 to 7 PM. This and other statistics are part of a summary of the new RADAR 15 study, prepared by Statistical Research, Inc. In the past five years, the in-car share of the total radio listening audience has grown from 17.6 percent, in 1972, to 21.2 percent in RADAR 15.

The first section of a new transmitting tower for WSFA-TV, Montgomery, AL, has been put into place. The new "**Tall Tower,**" will eventually reach 1935 feet into the air, some 481 feet taller than Chicago's Sears Tower, the tallest building in the world. . . . A spokesman for the **Christian Broadcasting Network (CBN)** said that the installation of its new transmit and receive earth station in Virginia Beach, VA, marked the starting point "for a **true fourth television network.**" The new earth station will carry CBN's programming to 13 cities across the country from where it will be further distributed to CBN's 140 TV affiliates and 120 radio affiliates.

**Heavy imports of video equipment** pushed audiovisual imports to \$490 million, more than twice that of exports, according to Hope Reports' year-end analysis of Bureau of Customs data. The U.S. imported some 30,000 video cassette recorder/players, valued at \$28 million, up from the previous year's level of 20,000 units. . . . The Radio Information Office Committee expressed **serious concern over record lyrics** which unnecessarily reference sex and/or drugs. The committee called for closer scrutiny of lyrics by individual broadcasters.

**Channel 100 Pay TV** and its parent company, Optical Systems will **appeal a recent court decision** which permitted American Television and Communication Corporation's Southwestern cable system to terminate a contract it had to carry Channel 100 programming in the San Diego area. The CATV system claimed that Optical Systems failed to supply "suitable equipment."

**NRBA reports** that its fourth annual

Conference and Exposition, scheduled for October 9th through 12th, in New Orleans, is shaping up to become its largest exhibition yet. As early as July, there were only about 9 of the 125 available booths still unsold. . . . SMPTE reports that exhibit space for its **119th SMPTE Technical Conference Equipment Exhibit** is going quickly. At last report, early June, 57 major companies had already signed up for space at the Century Plaza Hotel in Los Angeles, where the exhibit and conference will be held October 16th through 21st.

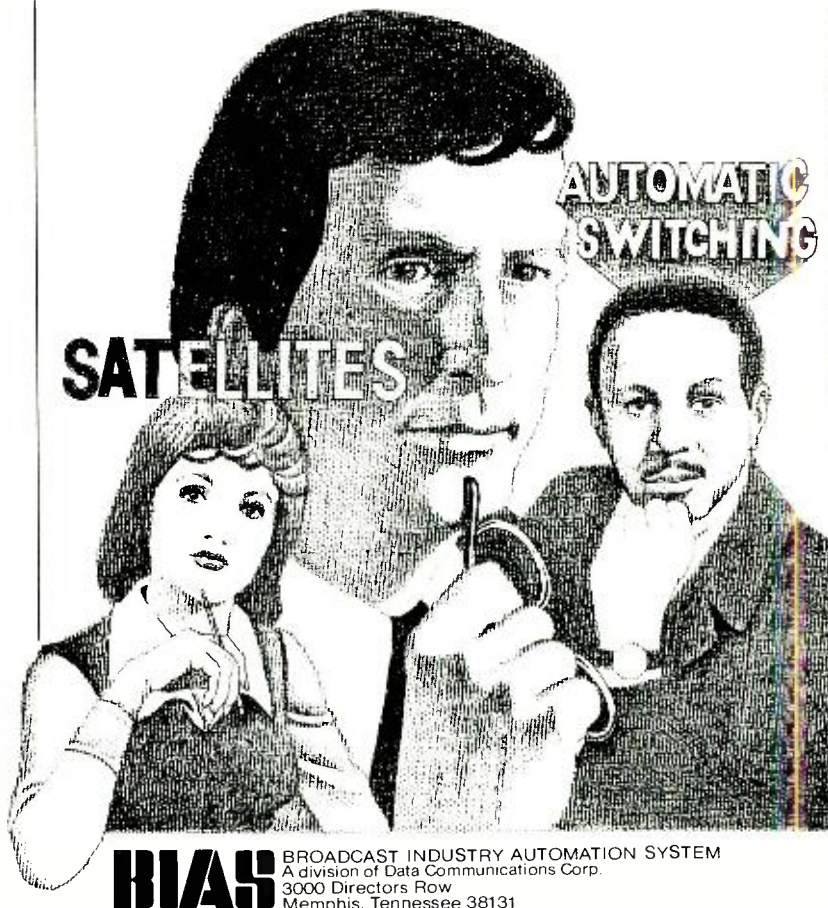
Daniel Aaron, chairman of the NCTA, told a Senate Subcommittee, headed by Sen. Ernest F. Hollings, (D-SC), that an **identifiable public harm standard may be the only rational approach** to regulating cable television. The notion of identifiable public harm is getting ever more fervent support from cable interest but so far, it seems to be nearly as vague as are the present criterion for regulating cable. . . . Russel Karp, president of Teleprompter warned members of the Senate Communications Subcommittee not to embark on a "**second wave of**

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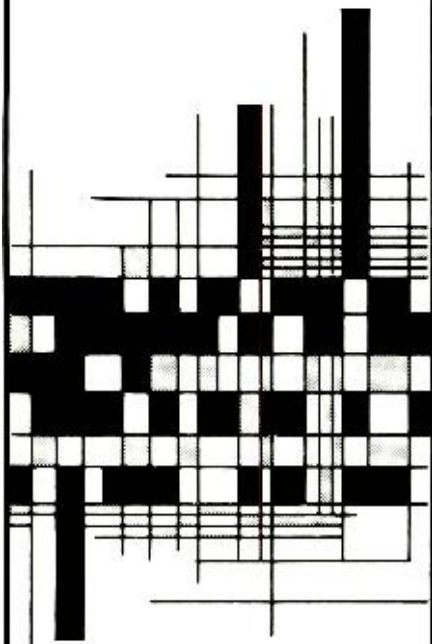
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## News Briefs

overregulation." Typifying the current regulatory scheme as "a major mistake," Karp suggested that it would be better "to see what actually happens" before initiating any new regulations.

The Southwest Region of the International Industrial Television Association (ITVA) will hold a conference on non-broadcast television October 14th through 16th, in Austin, Texas . . . Exhibit space for ITVA's 1978 national conference due to be held March 27 through the 31st in Kansas City, MO is now being offered. . . . The San Francisco Chapter of ITVA has scheduled its annual Video Faire for September 23 and 24 at the Holiday Inn in Belmont, CA.

## Business Briefs

Ampex announced the signing of new loan agreements for \$55 million of unsecured credit with its present financial institutions. The loan provides \$30 million of ten year funds at 9 percent and a \$25 million three year revolving credit at the banks' prime lending rate. Ampex also reported its net earnings had increased in fiscal year 1977 by some 77 percent.

KOPO Radio, a CBS affiliate in Tucson, has been purchased by the Family Life Broadcasting System. Family Life Broadcasting System is a non-profit corporation which broadcasts religious programs of a non-denominational nature. FCC approval is pending . . . Outlet Company agreed to sell WNYS-TV, Syracuse, NY, for \$11 million to a group headed by Larry H. Israel, former president of the Washington Post Company. The sale is subject to FCC approval. . . .

Willi Studer America has changed its name to Studer Revox America to reflect Studer's recent takeover of USA distribution for Revox brand tape recorders and other products.

Audiotechniques has announced the formation of a new company, Audio Marketing Ltd., set up to supply the professional recording industry and the growing areas of sound reinforcement and semi-pro audio markets. Audio Marketing has several exclusive U.S. distribution agreements for such products as Allen & Heath mixers, Brenell tape recorders, H/H amplifiers, and others . . .

Pierce-Phelps, Inc. has expanded its representation of Ikegami broadcast products to include New Jersey and Pennsylvania. Service and parts for Ikegami equipment are now available in Philadelphia from Pierce-Phelps, at (215) 879-7182.



## Cameraman's Headset... Keeps the crew in touch

A professional TV Cameraman's Headset series specifically designed to interface with existing Western Electric circuits. Single side unit receives intercom only. Dual side, binaural unit receives intercom and monitors program. Carbon boom mike with optional push-to-talk switch. Designed for comfort and rugged dependability in every day use. Keeps the crew in touch — in or out of the studio. For complete information please write:

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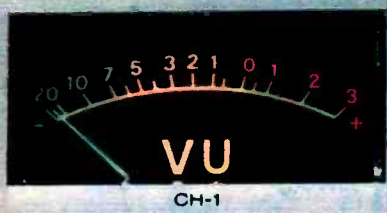
AUGUST, 1977—BM/E

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# VIDEOCASSETTE EDITING. MADE FOR SPEED. MADE FOR ACCURACY. MADE FOR QUALITY. MADE by JVC.

MODEL VC-1000 | RECORDER



AUD-1    AUD-2    VIDEO

CH-1    CH-2  
AUDIO REC LEVEL  
LIMITER  ON  OFF

INSERT  
ASSEM    ASSEM  
EDIT MODE  
AUTO

REC

FF    REW    PLAY    F    PRE ROLL

FF

PLAY

STOP



# JVC INTRODUCES THE CR-8300U FULL EDITING VIDEOCASSETTE RECORDER...

## FOR FASTER EDITS

Now you can significantly cut the time you spend editing 3/4U-format tapes, thanks to JVC.

The unique bi-directional search control of the CR-8300U Electronic Editing Recorder lets you fast-forward at 7 times normal speed. Reverse at 10 times normal.

And you can do it while the tape is threaded on the head. You don't have to stop to rethread.

The unique preview feature lets you pass the signal from a second source through the CR-8300U while it's playing, without erasing the tape. You'll cut down on false starts by knowing what your edit will be like.

## FOR MORE ACCURATE EDITS

Accuracy is what the JVC CR-8300U is designed for.

The unique built-in Pre-Roll rewinds tape for about 4 seconds from the actual editing point, and puts the recorder in stand-by mode. When you push "Edit Start" the CR-8300U first plays back about 4 seconds of rewind program, then goes automatically into the recording mode at the edit point. You're assured of the highest accuracy.

When you assemble edit, video and audio signals are edited simultaneously. When you insert, you can edit video and either audio channel independently or in any combination. Either way, accuracy is  $\pm 5$  frames.

You want still frame and slow motion? You've got them. The forward speed can be adjusted from 0 to 1/15th normal speed. You'll always find the exact frame you want.

And the tape counter doesn't just count. It has a memory. When you know you'll want to find a particular point again you reset the counter to "000". Then when you rewind, it will automatically stop the CR-8300U right there.

No other moderately priced videocassette editor has this combination of features to give you the accuracy you're looking for.

## FOR THE HIGHEST QUALITY PICTURE

But speed and accuracy are nothing without quality. And quality is what the JVC CR-8300U has most of. It has everything you need for NTSC-type color video built-in.

Automatic Phase Control and patented Color Dubbing assure generation after generation of duplicates with stable color lock and highest quality.

There's a built-in Dropout Compensator. There's a video S/N ratio

of better than 45dB (unweighted) on the Rohde & Schwarz noise meter. An audio S/N ratio of better than 45dB. Independent Audio VU Meters and Controls for both channels (which can be operated either automatically or manually) help you upgrade the quality of low-level audio recordings.

Black & white resolution is better than 320 lines; color, better than 240.

And if "flag-waving" turns you off, all you have to do is turn on the CR-8300U. The frame servo locks on the odd field, so every edit is smooth and clean.

## JVC WORKS WITH YOU

JVC has worked with broadcasters and producers to give you what you want, what you say you really need. Speed, accuracy, quality. And the features you need to get them.

Features like an external sync input for V-locking other sources. A built-in capstan servo mechanism for jitter-free, stable tape speed. An internal time-lapse meter to make

regular maintenance easier. And a new remote-control system you can learn about by reading the next page.







# AND...TO TIE IT ALL TOGETHER... THE JVC RM-83U REMOTE AUTOMATIC EDITING CONTROL UNIT.

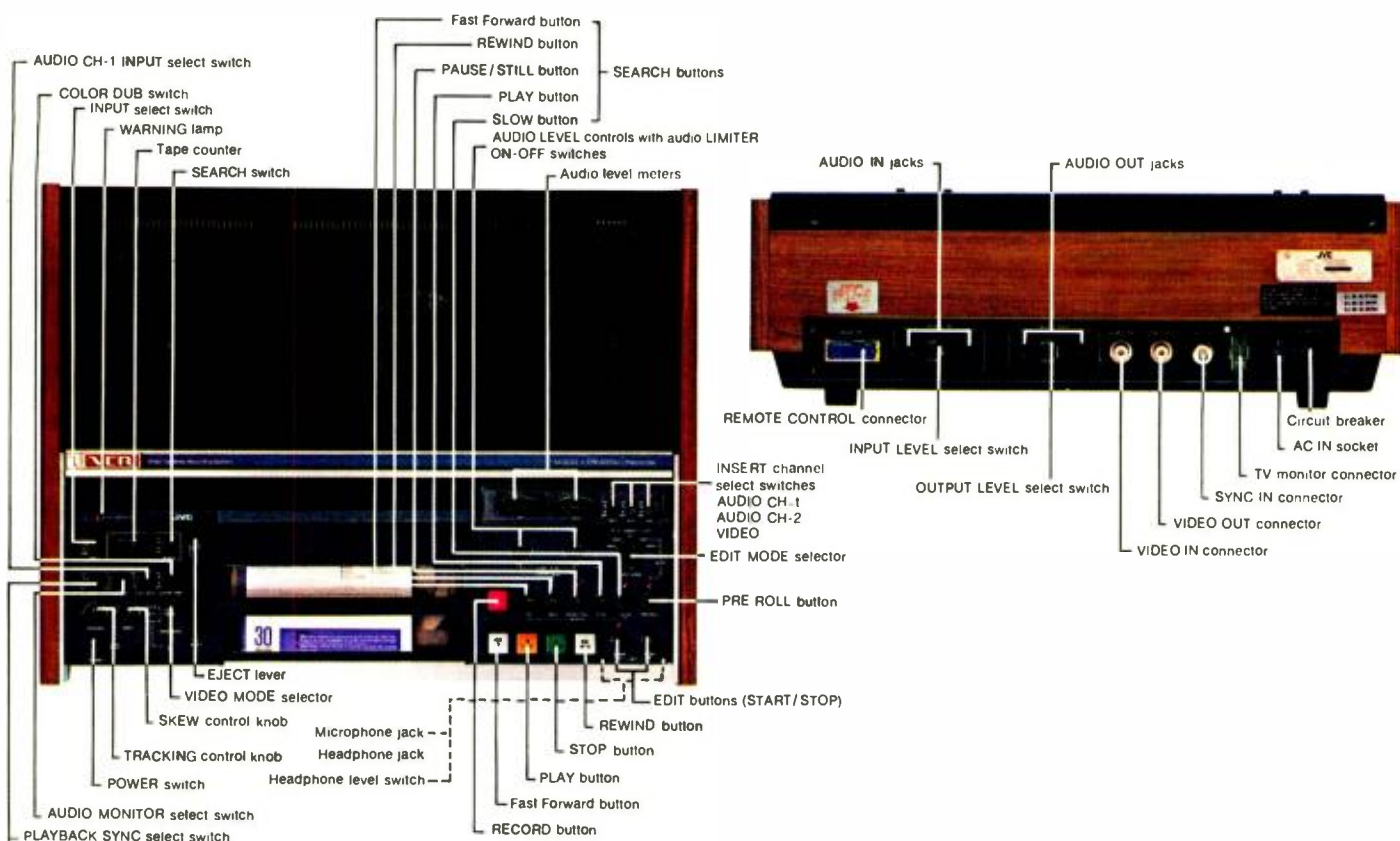
The RM-83U completely controls two JVC CR-83C0U recorders for fast and accurate insert and assemble editing.

Its two independent LED timers (indicating minutes, seconds, and tenths of seconds) can be put on "Hold," so you can precisely identify the edit point. They then return to real time. "Hold" again at the end of the edit, and you've timed the length of your insert. Both clocks memorize the edit point—for fast and accurate review, you quickly return to it by touching "Search".

Not only can you *review*, you can *preview*. A unique rehearsal editing feature lets you see your edit without putting a signal on the tape. You can be sure you've got exactly what you want, exactly where you want it. After you've previewed, both machines go back to the edit point automatically. If you like what you saw, just push "Start" and you have it.

There are many more great features, such as the automatic safety device that shuts off both recorders if a tape is left in still-frame for 10 minutes. Get all the details on both the RM-83U and the CR-8300U by writing today to the address listed on the back page.

# SPECIFICATIONS OF THE CR-8300U EDITING COLOR VIDEOCASSETTE RECORDER



## GENERAL

Video Recording System : Rotary two-head, helical scan system  
 Luminance : FM recording  
 Color Signal : Converted subcarrier direct recording  
 Video Signal System : NTSC-type color signal  
 Power Requirement : 120 V AC, 60 Hz, 120 watts  
 Temperature Operating : 41°F to 104°F (5°C to 40°C)  
 Storage : -4°F to 140°F (-20°C to 60°C)  
 Operating Position : Horizontal only  
 Weight : 67.5 lbs. (30.6 kg)  
 Dimensions : 24-1/16" (W) x 7-11/16" (H) x 17-3/4" (D) (610 mm x 195 mm x 450 mm)

## Tape Transport

Tape Speed : 3-3/4 ips (95.3 mm/s)  
 Fast Forward Time : Less than 6 min. for 60 min. tape  
 Rewind Time : Less than 5 min. for 60 min. tape  
 Wow & Flutter : Less than 0.2% RMS

## Video Signals

Input : 0.5 V to 2.0 Vp-p, 75 ohms unbalanced  
 Output : 1 V p-p, 75 ohms unbalanced  
 Signal-to-Noise Ratio : More than 45 dBs (Rohde & Schwarz noise meter)  
 Horizontal Resolution : Color 240 lines, Monochrome 320 lines

## Audio Signals

Input : Mic -70 dBs, 600 ohms unbalanced  
 : Line -20/0 dBs, 10k ohms unbalanced  
 Line Output Level : -20/0 dBs (600 ohms unbalanced load)  
 Headphone Output : -28 dBs/-37 dBs, (8 ohms unbalanced)  
 Signal-to-Noise Ratio : More than 45 dBs (@ 3% distortion level)  
 Frequency Response : 80 Hz to 15 kHz

Be sure to write today to JVC for more information on the CR-8300U Electronic Editing Color Videocassette Recorder and also for a copy of JVC's new Glossary of Video Terms.

# JVC

JVC INDUSTRIES COMPANY, a division of US JVC Corp., 58-75 QUEENS MIDTOWN EXPRESSWAY, MASPETH, N.Y. 11378 (212) 476-8010

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 Circle 116 on Reader Service Card for a demonstration



# RADIO

PROGRAMMING & PRODUCTION FOR PROFIT

## Successful Radio Programs Are Not All The Same

IN THE FOLLOWING are just a few stories that show there is often still room to make your own kind of programming. It depends, of course, on your market situation. Maybe what your market lacks is highly professional music programming, now available from many sources. But maybe what the market and your station need is your imagination, a fresh approach, a different, more personal music, much more work with the community.

### **An opportunity: quality programs for blacks**

In Baltimore a new black-oriented station is succeeding in a way that may have lessons for other communities. For a long time black newspapers, community leaders, intellectuals had complained that the several black-directed stations were too routinized, with rip-and-read news, stereotyped disc jockeys playing Top 40 rock tunes over and over, flip-of-the-hand Public Affairs that was restricted and reactionary.

Then in early 1977 Morgan College went on the air with WEEA, a new FM outlet. As a non-profit station, affiliated with National Public Radio, WEEA has an initial lead over commercial stations in freedom to use varied programs. But the kinds of programs developed, and the response to those programs from listeners in Baltimore, are full of meaning for commercial stations directed to blacks. After five months of operation, WEEA had grabbed sizable chunks of the audience. An invitation to "write us if you like us" pulled more than 11,000 letters.

Here are some main elements of the WEEA success.

As an FM station, WEEA has much greater coverage than the several dawn-to-dusk and low-power AMs. The music is a changing mix of Top 40, easy listening vocal and jazz, often using black greats from the past and also contemporary blacks of high achievement who may not be on the charts at the moment. This gives the music programming a far wider, more interesting, more significant scope than chart-restricted formats have.

Most news segments are 30 minutes long, with much of it locally produced, including news analysis and commentaries by black leaders and intellectuals who are familiar personalities in the black community. WEEA also is quick to serve in imaginative ways. When the book "Roots" was selling in huge quantities at \$12 apiece, the news staff read it on the air chapter by chapter for the blacks who couldn't afford that. There are programs on books, poetry, family problems, etc., all by black leaders in the respective fields. "Discrimination Is," for example, regularly focuses on areas of discrimination, and what listeners can do about them.

WEEA also has training courses for aspiring broadcast operators; according to Manager Al Stewart, it is the only station in Maryland that gives this training. Stewart and the others responsible for WEEA see it not as a competitor for the commercial stations, but a stimulus to their improvement. Altogether, there is nothing really revolutionary in the WEEA program mix: they are simply doing very well, with dedication and imagination, what the others were too often doing badly. Good formula for success anywhere.

### **Jazz as alternative—exciting too**

Suppose you were fighting several other Top 40 stations with Top 40 and coming out near the bottom of the ratings. So a new disc jockey persuades you to try jazz from midnight to 5:30 AM and after a few weeks, it starts to build an audience.

That was the situation at WBBY in Westerville, Ohio, which has to compete with the Columbus stations. The new dj was Paul Norman Grant, with experience on several San Francisco stations, a jazz enthusiast who believes that the variety of jazz gives the dj the ability to meet the city's mood as it changes, from day to day and hour to hour.

His style is described as relaxed conversational, a deliberate contrast with the "smiling, happy image of the AM disc jockey" and the "laid back"

quality of progressive rock personalities. Enough listeners like it to make the management of WBBY consider putting on a lot more jazz. Kenneth Bates, general manager, told *BM/E* that listener response was "excellent" with 25 to 30 letters a week, high for the 1 AM to 5:30 AM slot. The management also says WBBY can afford to do it more easily than "downtown" Columbus stations because WBBY, on the outskirts of the city, has a lower overhead.

This story leads to the hope that there are more low-overhead stations near large cities—where jazz has a fair chance of finding a viable audience—with managements looking for new variety and excitement. Maybe some can be persuaded to try jazz. The more jazz we can keep on the air, the more radio will have to offer to a broad range of musical tastes.

### **Another alternative—"Hit Men" on the street**

The situation at KIQQ-FM (K-100) was different: Top 40 success, but trapped somewhere in the middle of the other Top 40's in Los Angeles' "ocean of rock and rollers." Pat Shaughnessy, general manager, wanted out of this "comfort zone" that seemed to have no upward path: he decided to go for a really far out "alternative." He brought in Billy Pearl and Tom Greenleigh, two on-air operators who had dubbed themselves the "Hit Men" at KRLA and stirred up a storm by roving the streets, asking rock questions and awarding prizes for right answers or wrong, getting requests for music, having the audience introduce numbers, working with a kind of zany cunning to get the listenership involved with the station, and to learn from the listeners, too.

This hot interchange goes on not only on the street, but also via telephone: Pearl and Greenleigh take requests by phone, then call numbers culled out of the telephone book to ask for requests, opinions on the station, any significant reaction they can get. They also stress honesty with listeners, saying they won't make promises they

continued on page 26



Daniel Lee, President, discussing Stylius Replacement Policy with Howard Williams, Chief Engineer and Ken Rasek, Audio Engineer.

## "Not the loudest sound in town, but the best quality" claims WXRT, Chicago, longtime Stanton user. . .

WXRT is a progressive rock, FM station, unique in many ways. Its whole operation, Administration, Sales, Engineering, Programming, Broadcasting, Transmitting (even the tower), is located in one place . . . an unusual set-up for a major market.

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## Radio Programming

can't fulfill.

Pearl is also interested in technical quality, spending what free time he has at the K-100 transmitter, working to improve the signal. He said (as reported in the Los Angeles Times): "Technically, I want to make this station a showcase."

They see the music format as much more: "free form" than standard Top 40, with the informal audience research and street contact having strong influence on the choice of music. Their "hurricane" method worked marvelously for KRLA, which shot up to near the top in the city. They, and the management of K-100, think the method will take longer in this FM station, but they are relying on it to build well over that longer period.

### A specialty news item: solar fallout

To get your news operation lined up now for the anticipated heavy listener demand in 2001 (only 24 years

ahead!), consider adding a daily report on *total solar energy fall-out*. The figure is becoming available from government agencies around the country. In Cleveland, the National Aeronautics and Space Administration, last February, started supplying to WJW-TV, each day, a figure for the total sun energy falling in Cleveland that day. Made a part of the regular twice-a-night weather report, with the figure prominently displayed on the weather board along with the other important weather facts, the solar energy report stirred strong viewer approval. NASA therefore has made the figure available to all news media in Cleveland, via a special telephone circuit that can be dialed to get the figure every night starting at 9 PM. The two or three digit figure represents the total of kilowatt hours falling on a square-foot surface facing south and inclined at an angle of 37 degrees (this would be different, of course, in cities at other latitudes). This service is soon coming in a number of other cities: check with your local National Weather Service. **BM/E**

## BM/E's Program Marketplace

# Syndicators For Radio

### The FM 100 Plan

John Hancock Center, 175 East Delaware Place, Chicago, Il. 60611. Tel. 312-440-3100

Starting at zero about 2½ years ago, the subscriber list of the FM 100 Plan has grown to 90 stations, for one of the steepest growth rates in the history of national syndication. So *BM/E* asked Darrel Peters, founder and president, how he accounted for such a rise in such a short period of time.

He pointed out first that he has a continuing inside view of a radio station's day-to-day necessities as vice president and general manager of WLOO, Chicago, a job he holds simultaneously with operating his syndication business. WLOO is one of the most successful stations in the knock-'em-down Chicago radio market using (hardly incidentally) "beautiful music" which is also the format on which FM 100 has grown to national stature.

Being a double or triple threat player has been characteristic of much of Peters' career in radio. From 1959 to 1962 he was program director, an on-air personality, and also a top salesman for WAIT. Later he made up his own shows, went on the air with them, and sold time for WGN in

Chicago. He combined programming and sales again at WMAQ, then at WEBH (now WLAQ).

It was in 1969 that he came to WLOO as vice president and general manager. He took over programming there, too, three years ago, developing the beautiful music format that he shortly launched nationally as FM 100. His long-term combination of programming, sales, and management has given him a special insight, he believes, into what stations need and audiences want.

He put the objective of his programming as attracting listeners and holding on to them. FM 100 is, he said, not interested in high cumes with high turnover, but wants a lot of listeners who stay with the station. The spring 1977 Arbitron sweeps, the results of many of which were just being announced as this was written (late June), indicate that FM 100 is reaching its goals. Peters reports that of the FM 100 stations covered, 100% improved position since the last ratings, with a high proportion at or near the top in their markets.

This success, says Peters, comes mainly from the very careful and complete choice and sequence of music that FM 100 lays out for every subscriber (with a few exceptions to be noted). The programming is specified



for every hour of the operating day. The station gets a complete manual on how to use the programs, with the day-part scheduling laid out in detail.

The programs are delivered on 10½ in. reels, on 1½ mil. 3M tape. FM 100 has its own \$250,000 mastering and duplication plant right at headquarters in the John Hancock Building. (It is also the location of WLOO, with antenna on the roof). Each subscriber initially gets 280 hours of music, one of the largest volumes of music supplied in the syndication business. The music is updated each month with anywhere from four to 30 new reels of tape.

Peters and his staff choose new material for the monthly update based on the new music coming on the market, the needs of the program as laid out, and other factors. For both the original program choices and the updates, Peters and his programming associates depend on what he describes as "our gut feeling about the music." This focuses attention on the factor that is basic to syndication success with beautiful music and which cannot be specified in instruction form for ready use. It is the musical taste of the programmers. The presence of a viable taste can be attested by careful, extended sampling; but most importantly, of course, by long-term audience reaction. Every one of the successful beautiful music syndicators covered in this department since it started in *BM/E* in January has given strong evidence of a special affinity for the music itself.

Naturally the situation is different with formats based on the high-popularity music; by its very title, the "Top 40" format tells us that sales charts are the primary guides to selection. But even here various amounts of personal selectivity may get mixed into the formula, a topic which *BM/E* wants to return to in future syndication profiles.

In the case of FM 100, Peters further characterizes the programming objectives as including both freshness and consistency. He thus acknowledges the demand of radio audiences today for an unvarying, specific quality in a radio station they give long-term attention to, a particular musical image which does not get fractured by non-compatible music.

Both the consistency and the freshness result from careful selectivity and planning over long spans. Peters says that the program as laid out does not repeat any combination of music numbers for 286 days. Individual numbers are spaced to avoid any feeling on the part of the listener: "Oh, there's that one I heard just awhile ago." However, there is a separation period, again a determination of musical taste, which changes a repeat from

a negative to a positive factor. A cut that is familiar, brought back in a new sequence with other cuts, gets added force from the familiarity.

### The formats

FM 100's rise so far has been mainly on "beautiful music." Of the 90 subscribers now on the rolls, 84 use that format. *BM/E* spoke with station managers or program directors of a few of those stations chosen at random.

The repeated judgment on the FM 100 beautiful music can be capsulized: "highly consistent, but also very fresh, bright, more *foreground* than some of the other beautiful music formats." One program director pointed out that the FM 100 use of a fairly large proportion of vocals was a main source of this lift, vocals fitted into the sequence with great skill and taste. The avoidance of repeats for long periods was also praised as adding to listener-acceptability.

Peters says that, although in most cases the subscriber uses his tightly patterned 100% scheduling, he will "customize" the programming if the station management wants to keep some other program elements—several personalities with big followings in the area, or a particular approach to news or drive-time or whatever. The FM 100 music can be delivered in carefully designated segments, which the station's program management then fits in as needed. A number of the FM 100 stations are using this plan.

FM 100 has recently put on the syndication market a second format called "Beautiful Country," with six subscribers at the time of writing. This, says Peters, combines country stars with pop stars singing country music, for another approach to consistency and freshness.

In the works is a third format, an MOR series, due later this year. Peters says it will not be just a grab bag of variegated music, but will be just as carefully planned for consistency and freshness as the other formats, with long-span control of repeats, and total scheduling for stations that want that.

Like other major syndicators, FM 100 also supplies promotion material for subscribers, adapted to each station's particular needs. Finally, throwing emphasis on the up-dating of the various formats to keep them alive, Peters pointed out that FM 100 is deeply into making its own music. Recordings are being made under FM 100 contract both in this country and abroad, with this "customized" music being added to the FM 100 library for use as needed. The prospect is that FM 100 listeners are going to get plenty more of what they have shown they like. **BM/E**

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# TELEVISION

## PROGRAMMING & PRODUCTION FOR PROFIT

### Alternate Networks: The Robert Wold Connection



Robert Wold, Robert Wold Co.

WHILE SPECULATION ABOUT "The Fourth Network" has been going on, The Robert Wold Company and a few others have arranged 4th, 5th, 6th, and many, many more networks to bring television audiences some very significant programming.

For four evenings this past spring, the big three networks had some stiff prime-time competition for audiences from a fourth network of 160 stations. These were, of course, the evenings when the Nixon-Frost interviews were broadcast. And, many of those 160 stations were network affiliates pre-empting regularly scheduled network offerings.

This "occasional network" was the most complex interconnection ever attempted by The Robert Wold Company. The massive job involved some eight common carriers: three satellites and five terrestrial common carriers. Some four months prior, The Wold Co. had been contracted by Syndicast to handle the distribution of the Nixon-Frost interviews produced by David Frost's Paradine Productions. Wold worked with Syndicast during station clearance to assure that any station taking the program could actually, or rather practicably, be connected to the network.

The key to the Wold connection and others is the use of satellites. The complexity of such networks, however, stems from the scarcity of satellite uplinks and downlinks. As of now, only eleven cities have satellite transmit and receive facilities of sufficient quality to carry broadcast quality color

television signals. As a result, the satellite is used as the main "long haul" connection and once the signal is transmitted back down to one of the available earth stations, terrestrial methods, telco and/or microwave are used to make the final station connection.

In the case of the Nixon-Frost interviews, KTTV, Los Angeles, was selected as the network originating point. The signal was carried from the station to the Western Union uplink in Los Angeles via AT&T. The uplink transmitted the signal to Westar, the Western Union satellite where it was transmitted back down to earth stations in Dallas, Chicago, St. Louis and Seattle. The earth stations in these cities became the "hub of the wheel" from which terrestrial carriers formed the spokes, reaching out to the stations in their respective regions.

The Wold Company negotiated terrestrial connections for each of the various regions. Added to the complexity was the requirement to reach Canada, Alaska and Hawaii. The Canadian connection was made by Bell of Canada at two U.S. border points. The Alaska connection was made via the RCA Alascom satellite and Hawaii was brought on line via the Comstar satellite fed from San Francisco.

Wayne Baruch, assistant to the president for Robert Wold Company, points out that "anyone can purchase satellite time" but the expertise of the Wold connection is making the numerous arrangements between various common carriers. The most important of these arrangements can be the planning of "protection circuits" as back-up to the primary link. If anything goes wrong, the telecommunications experts on the Wold staff must be able to suggest alternative routes. The provision of such protective circuits is by and large the responsibility of the common carriers, but the knowledge of just who to talk to in any contingency is part of Wold's experience. Bob Patterson, vice president, sales and operations for Robert Wold, Co., is the person mainly responsible for supervising such networks from the technical end and he

points out that the crush of communications traffic is making "protection" increasingly difficult to come by.

What makes the Nixon-Frost interviews such a landmark from a broadcasting standpoint, is not only that it was a large network but also that in terms of audience, its numbers were easily comparable with the best offerings of the big three. Occasional networks of this type are by no means rare. The Wold Company, in the first 120 days beginning January 1 of this year, interconnected some 226 individual networks. Most of these did not get the national attention that the Nixon-Frost arrangements received, but in their own right, are just as significant an indicator of a new trend in program supply.

Wayne Baruch explained that there are about four types of networks that Wold arranges which can be identified by their level of complexity. The first level is point-to-point. Point-to-point is the least complex of the interconnections since it involves just a sending station and a receiving station. But even point-to-point can get quite complex. Typically, this type of service is used by an individual station to provide programming of distinct local interest, such as broadcasting the away games of the local major league team. If, for instance, a client station in Los Angeles wanted to carry the Dodgers' away game in Chicago, the connection would be rather simple since both LA and Chicago have the necessary transmit/receive earth stations. If, on the other hand, the client station was in San Diego, and the away game was in Cleveland, neither of which cities have the necessary earth stations, the interconnection can be complicated. It would involve terrestrial lines from the stadium to the nearest uplink, which might involve both telco and/or microwave, and similar terrestrial arrangements from the downlink to the station. One such arrangement for point-to-point interconnection is handled by Wold for KING-TV, Seattle, which carries the away games of the Mariners. In this instance, Wold not only handles the interconnection but also books the production facilities and

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## TV Programming

crew at the distant locations.

Beyond point-to-point, there are the regional or limited networks that may take any number of forms. In providing interconnection to the NCAA Baseball World Series, Wold was asked to set up mini networks to the hometowns of the various competing teams. The games were not of sufficient national interest to merit major network attention but for many American cities that were represented, the games had tremendous importance. In the case of the NCAA Basketball play-offs, some of the key games were carried by NBC but some of the less important contests were carried to the affected markets via a Wold connection.

The third level of complexity is when Wold not only performs the interconnection but also clears the stations. A recent example of that was the Sam Snead Golf Tournament, a Metromedia production. In this instance, it was necessary to clear numerous stations for a Sunday afternoon "live" telecast.

Another example of this third type of network may have even greater import for the way broadcasters conduct their business. With the tight

availabilities existing in network schedules, numerous advertisers have been looking for alternative methods of gaining a national audience at a reasonable CPM. Moreover, in this particular instance, the advertiser, U.S. Tobacco Co., had additional concerns. U.S. Tobacco sells so-called moist tobacco or smokeless tobacco, commonly associated with what used to be called snuff. The major brand names are Skoal and Copenhagen. The company had bought network and spot commercials in the past but was looking for something more efficient.

The product traditionally did better in the West and Southwest and the marketing people decided that with the proper vehicle and a regional network they could get the most out of their advertising dollar. U.S. Tobacco came up with the idea of producing the "Skoal Calf Roping Contest" and contacted Wold to set up a regional network in the target areas of some 70 stations. Wold not only made the interconnections but also negotiated with the stations for U.S. Tobacco's purchase of all the internal local advertising time. As network avails become more expensive, Wold expects a significant increase in this type of business.

The fourth level of networking for the Wold Company is a nearly com-

plete involvement in the production, sales and distribution of programs. Again this year Wold will produce and distribute to an independent network of an estimated 125 stations, the 53rd Annual Shrine East-West Football game and pageant. This game is America's oldest all-star collegiate football classic and was carried last year by some 110 stations to nearly 10,000,000 television households.

This year, Wold expects the game to reach nearly 85 percent of the U.S. households. The program is available to local stations on a barter basis with 12 commercial one-minute availabilities. Network sponsors will be handled by Syndicast Services, Inc., of New York, based on an agreement with The Robert Wold Co.

The Wold Company, based in Los Angeles, began operations in 1970 and handled just \$150,000 in sales its first year. Sales have now grown \$4.9 million in 1976 and are projected to reach \$5.5 million in 1977. The company has bulk-leased some 1800 hours of satellite time from Western Union and is thus in a position to sell that time at a rate lower than that which an individual station could buy transponder time on a one-shot basis. INTA, which is Wold's largest customer, reportedly gets the service for \$300 an hour.

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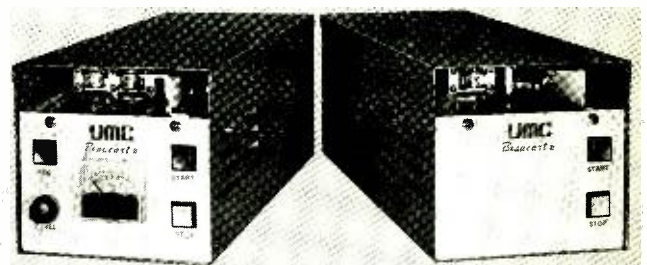
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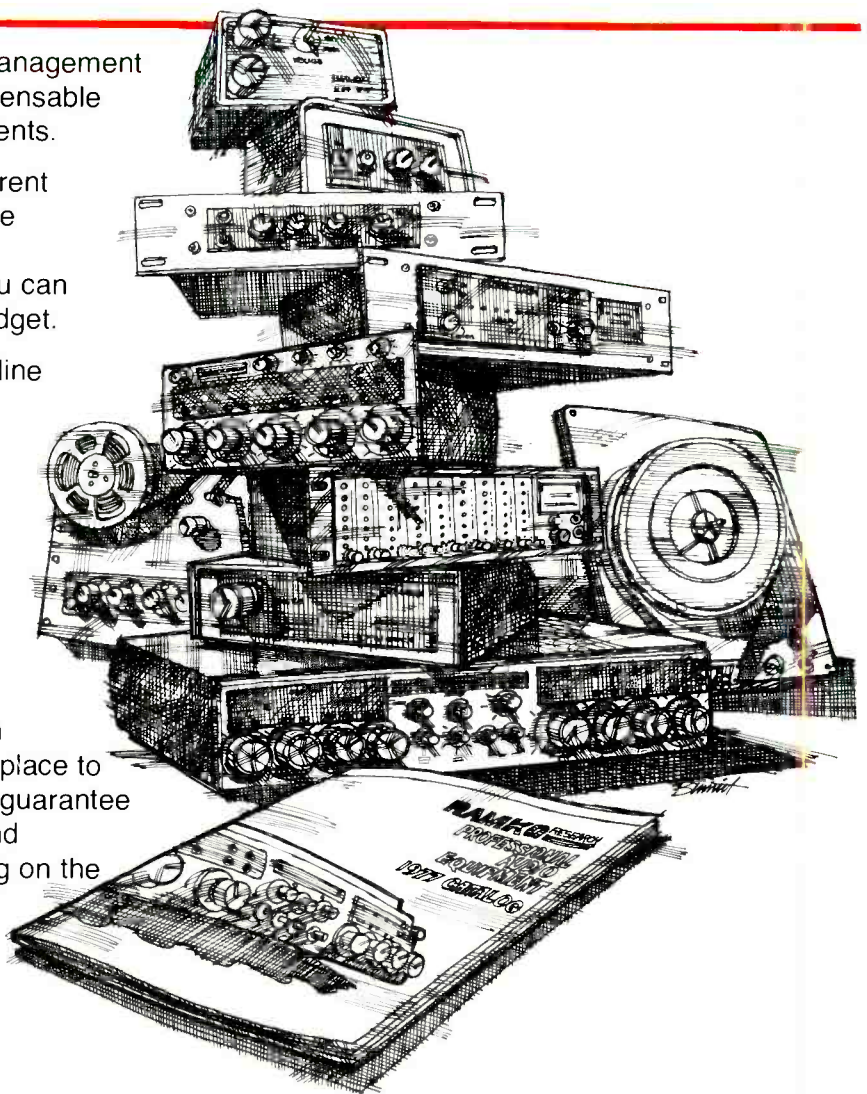
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## TV Programming

which is what Wold pays for it. INTV uses Wold for a nightly news feed to 11 stations. A user of comparable terrestrial communications services such as those provided by AT&T would pay \$550 for just 30 minutes in a similar hook-up.

Wold and similar companies expect major increases in demand for the types of service they offer in the coming months. Not everything is as rosy as it might appear, however, and a quick spate of demand could lead to some measure of congestion at the various uplinks and downlinks.

Currently there are two major satellite systems available for domestic broadcast-quality television transmission: Western Union's Westar with two satellites and seven cities equipped with uplinks and downlinks and RCA Americom's two Satcom satellites with seven cities equipped for satellite transmission and reception. In addition, there are several television stations either with transmit and receive earth stations or planning their construction shortly. At present, however, there is a shortage of these type earth stations, forcing extensive use of terrestrial means to complete hook-ups to most stations. Numerous receive only stations exist for CATV companies

and television stations and many more are planned. Add to this the potential of the small 4.5 meter earth stations already approved for CATV and getting the signal down begins to look like less and less of a problem.

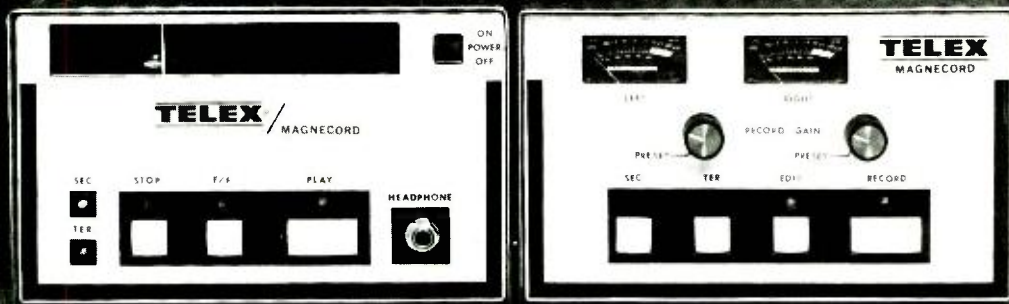
Getting the signal up, however, may become increasingly difficult if demand outstrips the capacity of the various uplinks. Now only a single video and associated audio signal of broadcast quality can be transmitted up at a time from a single uplink. This means that if a given uplink is carrying a baseball game, for example, no other program can be transmitted using that uplink until the game is completed. (The same is true of the downlink: it can receive only one broadcast quality program at a time.) Western Union, for example, has transmit/receive stations in just seven cities: Atlanta, Dallas, Chicago, Los Angeles, Seattle, Washington, and New York. Many of these cities do have multiple stations alleviating congestion to some degree. Bob Patterson of The Wold Company said he would like to see transmit/receive earth stations in 30 or 35 cities eventually. Another alternative, and one that is actively being examined, is developing the ability to multiplex uplinks and downlinks, for this type of transmission. The international class satellite systems, like Comsat, are already capable of carrying two televi-

sion programs simultaneously using just one uplink and downlink.

The proliferation of earth stations will eventually drop the cost of satellite transmission. As Wayne Baruch said, "Satellites are distance insensitive." That is, satellite transmission could be competitive with land lines over the short haul as well as the long, provided earth stations existed at both ends. The trade off distance is probably somewhere around 600 miles, which means once a signal needed to go farther than that, satellite transmission would probably be cheaper. Interest among broadcasters in satellite usage is running high. A recent seminar in Atlanta on this subject, conducted by Scientific-Atlanta, drew some 176 registrants, of which the largest single group was broadcasters.

The future, which at one time seemed so distant, is closing quickly. There is a proliferation of firms specializing in interconnection for broadcasters, both radio and TV, and the firms that own satellites are working to increase the number of earth stations they operate. The fourth network may be de facto before it is ever established under some single corporate entity and it may have such a variety of programming available to it that the Big Three might have to worry more than ever before. **BM/E**

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# Digitized Audio Will Bring A Packet Of New Capabilities To Broadcasting

By Gordon Rudd

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An expert surveys the digital audio hardware available to broadcasters right now and then jumps 25 years, to 2002, when digital techniques will have profoundly enlarged the capabilities of audio, radio, recording, electronic entertainment in the home.

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THIS AGE, AS WE GET FURTHER ALONG, will be known as the "Computer Age." Computers are fast becoming the most powerful tool known to man, invading every walk of life, including broadcasting.

Already computers operate broadcast stations, compile sales reports, keep the station's log, bill customers. Now, with the advent of large scale integrated circuitry, we are getting into the computer manipulation of the signals themselves, digitized telecommunications, beginning with such devices as digital delay lines, digital time base correctors, and digital frame stores. And much more, as projected here, is to come.

Why are digital techniques moving in? Authors in *BM/E*'s February and June special issues on digital techniques described some of the excellent reasons. One of the most profound advantages offered to the broadcaster by digitizing is high efficiency of transmission. This efficiency is possible because the "bits" of information can be rearranged to fit the maximum number of bits into the information channel. This provides substantial savings, and is already in widespread use, for example, by the phone company to maximize the loads on telephone equipment. As an example of the potential for great further improvement Nippon Electric Co. of Japan has recently experimented with combining three PCM color video signals, each with stereo audio, into one ordinary TV channel. This is accomplished using digital multiplexing and digital bandwidth compression, which reduces the bandwidth requirements by eliminating redundant information from the signal.

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**Mr. Rudd** is president of GBR Associates, audio consultants of Sherman Oaks, CA

Once the signal is converted to a stream of binary numbers, the receiver, of course, need only detect the presence or absence of signal. As long as noise and distortion products are less than the signal itself, they will have no effect: there are never any transmission losses. Signals can now be sent across the street or around the world with no loss in quality at all!

Capitalizing on that freedom, the BBC, with much of their audio distribution in a digital format, has found that costs are considerably lower in spite of the added cost of converters. Since several channels are multiplexed together, the problem of matching stereo lines is also eliminated.

This same principle can be applied to the other weak links in the chain, such as the tape recorder, of which there will be more presently.

Another paramount advantage of digitizing the signal is that it becomes compatible with powerful digital computers. This combination can perform complex processing functions which are otherwise not possible.

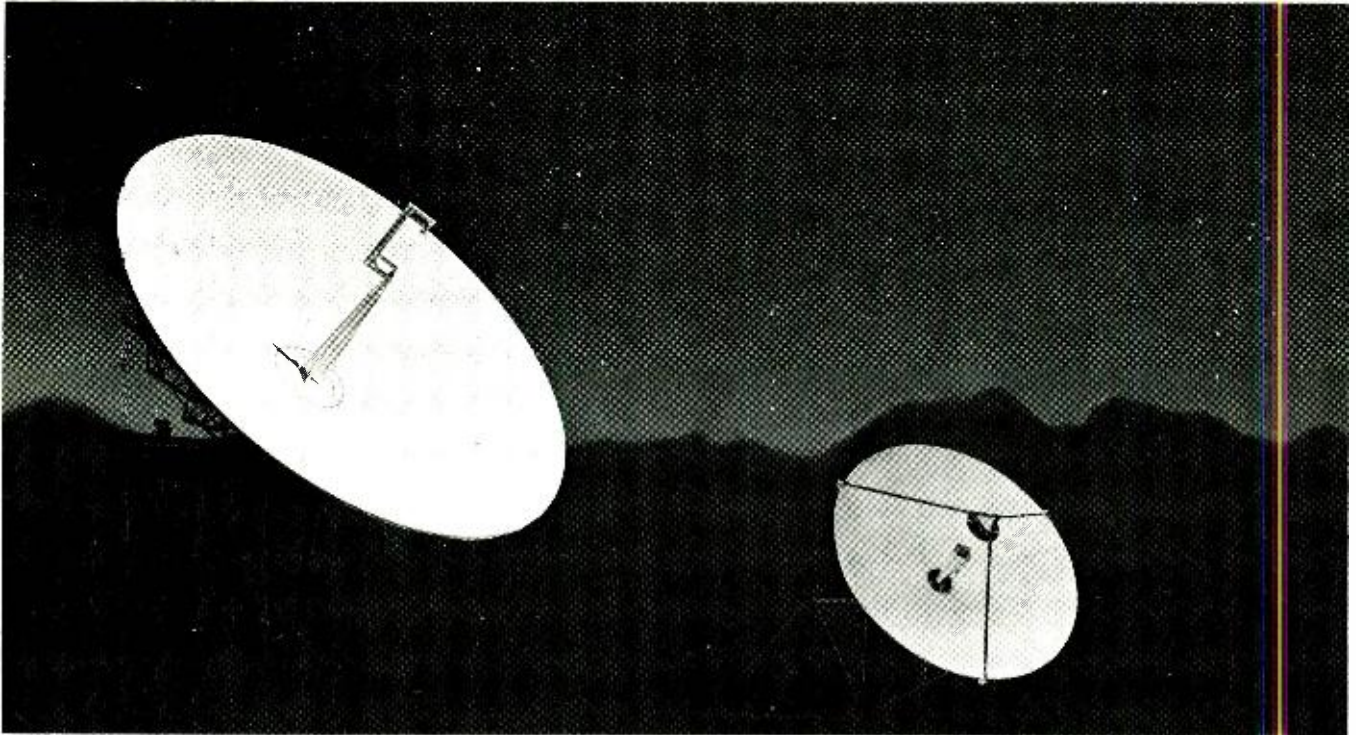
In the future, digital signal processing will develop faster in audio than in video. The proverb "One picture is worth a thousand words" has a special truth here. A high quality audio channel requires about a half-million bits per second, whereas a broadcast video signal requires at least 50 million bits per second, about 100 times as much information.

This wide bandwidth of digital video makes real-time processing a problem. At a sampling frequency of 8 MHz, there are only 125 nano-seconds to perform whatever operations are desired. In addition, audio is a one dimensional signal, whereas a picture is two dimensional.

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## Digitized Audio

sional, making processing a much more complicated matter. The lower cost and much easier techniques of digital audio are the main reasons for its earlier entry.

### Digital audio hardware: what we have now

The first digital product to move out to the audio market was the digital delay line, introduced in 1971. The digital delay line provides a time delay usually variable from about 5 ms to 300 ms. Depending on the amount of delay used, a very wide range of effects can be obtained, many of them not producible with older equipment (Editor's note: See "Digital Techniques For Varied Special Effects," *BM/E*, February.)

The first digital delay lines used shift registers to achieve the delay. Each sample of the input signal is passed through a series of memory elements at the sample frequency rate. Taps at fixed distances along the shift register enable you to pick off the signal after specified delay times. Normally, there is one digital-to-analog converter (DAC) which is switchable to any of the available taps. Some units have multiple DACs so that multiple simultaneous delays are possible.

The new generation of digital delay lines utilize random access memories (RAM) instead of shift registers. The input samples are read into successive addressable memory locations at the sample rate. A separate controller reads the samples out of memory in sequence. There are several advantages to this scheme: for one thing, since every memory element is addressable, very fine resolution in the amount of delay is possible. This also makes for a much wider range of delay, especially at the short end of the range. Since the read-out rate is controlled separately from the input sample frequency, it can be varied to provide effects such as pitch shifting, vibrato, and automatic double-tracking.

An interesting variation on the digital delay line is the charge-coupled or "bucket brigade" delay line, which is actually an analog delay line. The input is sampled and each sample is stored as a charge on a capacitor, which is sequentially switched down a row of capacitors, much like water is handed down a bucket brigade. This device has some advantages over the digital delay line. For one thing, no analog-to-digital or digital-to-analog converters are necessary, which are a large part of the expense of a digital delay line. In addition, only one memory element is required per sample, versus 12 or more for the digital delay. So the bucket brigade provides audio delay and all of the associated effects such as flanging and pitch shifting at a low cost.

The tradeoff is that since the signal is not digitized, it is subject to degradation going through the delay line. Unlike the digital delay line, the degradation increases with longer delays, so the present charge-coupled delay lines are limited to relatively short delays. But future generations may use integrated-circuit companders (compressor/expander) to improve the signal-to-noise ratio and make longer delays practical.

### Reverb takes sophisticated design

The kind of reverb produced by simple delay lines is very limited. Real reverberation is extremely complicated, and is normally produced by a statistical rather than an analytical process. Recirculating a few delays

creates a spatial effect, but it is optimistic to call it reverb.

But at least one manufacturer has created real electronic reverb. The EMT 250 is a digital audio processor which performs all the usual delay line effects and provides very effective reverberation. It utilizes 19 separate delays, each recirculated to different degrees.

There are several unique advantages of such digital reverb. For one, it's not affected by the weather, or mechanical vibrations. It's relatively compact, and you have complete control over parameters that are normally very difficult to control, such as decay time as a function of frequency, and initial delay time. If interfaced with a microcomputer, many settings can be stored and recalled at will. In addition, programs could be contrived to vary the parameters in real time, perhaps even correlated with the music.

### The tape recorder: great beneficiary of digitizing

It is generally acknowledged that the tape recorder is one of the weakest links in the audio chain. This makes it a prime target for the digital revolution. Although continued improvements in noise reduction systems and tape formulations have improved the performance of analog tape recorders, the improvement in quality with digital tape recording is a big leap further. Not only is 90 dB of signal-to-noise ratio possible, but there is complete absence of distortion, crosstalk, dropouts, modulation noise, tape hiss, flutter, and wow.

There are also production advantages. For instance, since there is no generation loss, much more elaborate productions are feasible. You can take a track from a videotape, for example, transfer it to multi-track tape for sweetening, and transfer back to videotape, all without any loss of quality. Since you can ping-pong without losing anything, fewer tape channels are needed.

It turns out that the tape cannot be spliced so it must be electronically edited like videotape. But this can be an advantage because you can program edits, and do much more precise editing with the elimination of costly errors. In addition, there is no waste of tape, because it is never spliced and is therefore reusable.

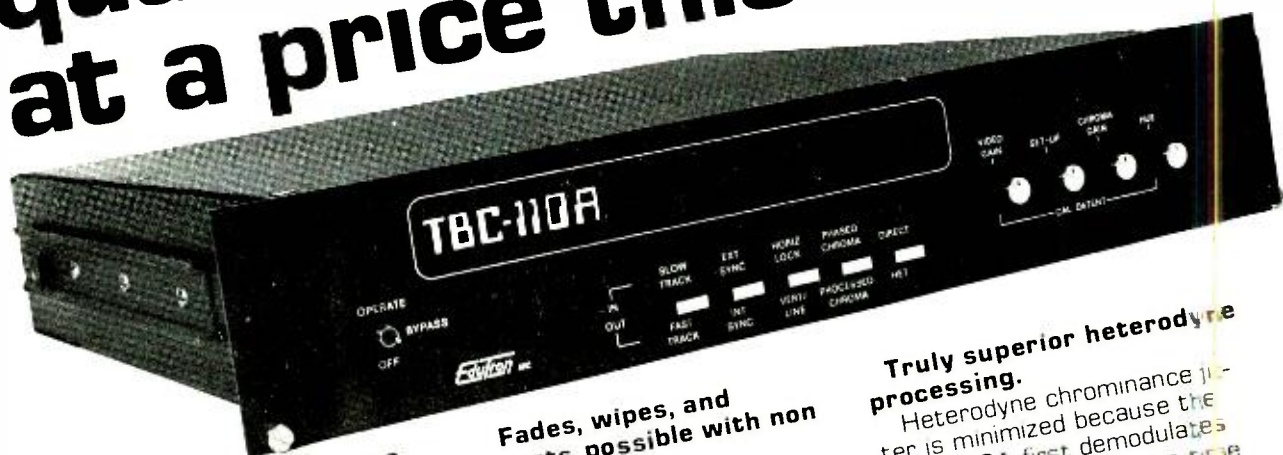
Some of the earliest work on digital audio tape recording was done by two major broadcasters: NHK, the Japanese national broadcast agency, and the British Broadcasting Corp. in England. Long recognized for technical and programming excellence, the BBC has been working for a decade on the digitization of all audio transmission. At least five Japanese, and a few American companies have built experimental PCM audio recorders. In one experiment, Nippon Columbia multiplexed 8 channels of audio onto a VTR, and they produced about a dozen LPs with it in the early '70s. On that machine, though, all the channels are multiplexed onto one track so it is impossible to overdub.

Two more advanced digital machines which do allow all the usual professional recording operations were recently demonstrated at the Audio Engineering Society convention in Los Angeles; one produced by Mitsubishi of Japan, the other by Soundstream, Inc. of Salt Lake City. (Editor's note: see *BM/E*, February, "Tape Machine Delivers Digital Fidelity," for description of the latter machine.) These machines are due on the market within a fairly short time, several months to a year.

continued on page 38



# How can we offer digital TBC quality and flexibility -- at a price this low?



## Simply by designing a better time base corrector.

For example, the single most complex and expensive part of a digital TBC is the analog-to-digital converter. The TBC-110A eliminates the A to D converter through the use of a charge-storage analog memory. By sampling and storing the video signal at 14.318180 MHz, the TBC-110A provides the same sampling speed and video bandwidth as the competition's highest priced model — **without** the expensive A to D converter.

## A true time base corrector that does it all.

The TBC-110A will remove all high frequency jitter, water-fall, skew, and geometry error (S banding) from any type of non-segmented helical scan recorder. H lock VTRs can be corrected to house sync and FCC specifications by locking the TBC-110A to EXT sync. Other types of VTRs, such as line lock models, can be locked to the center of the floating window in the INT sync mode.

## Fades, wipes, and inserts possible with non H-lock VTR's.

The internal digital sync generator provides a full complement of pulse outputs that are locked to either the internal oven-controlled crystal or a VCO that is tracking the video input. The tracking mode (floating window) can be used to lock cameras to the sync outputs of the TBC so that fades, wipes, and inserts can be accomplished with non H-lock VTRs.

## Complete video processing.

The TBC-110A provides complete video processing, including such features as separate luminance and chrominance processing in all modes, so that negative black spikes below sync are removed without clipping negative chroma. Chroma Gain and Chroma Phase are also adjustable in all modes (het and direct).

## Exceptional skew error correction.

The TBC-110A is capable of removing step errors within one line after they occur, thus providing total and almost instantaneous skew error correction.

## Truly superior heterodyne processing.

Heterodyne chrominance jitter is minimized because the TBC-110A first demodulates chroma — then removes base error in parallel luminance and chrominance memories. The result is superior heterodyne processing — minimal color error.

If your studio operates one or more helical scan recorders, a time base corrector is a virtual necessity. The TBC 110A has the credentials to satisfy the most demanding studio requirements, while maintaining a price that is comfortable even for small distribution systems.

The TBC-110A is now available at \$4,990.00. Slide rails are an optional extra.

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## Digitized Audio

And Sony has recently announced a PCM adaptor which may be available in late 1977. This adaptor will enable you to record two channels of PCM audio onto a standard video tape recorder. The anticipated price of the unit is \$800, which means that including the cost of the VTR, you can soon be making digital 2-track recordings for somewhere around \$3000. Of course, to edit the recordings, you'll need two machines, two PCM "CODECs" (COder/DECoder), and an edit controller.

### 2002: a look ahead

Although digital audio, as noted, has already begun to move in, this is the merest beginning—the major effects on broadcasting are yet to come. So let's jump ahead 25 years, to 2002, and survey radio and audio technology (as well as we can foresee it now).

The major broadcasters, such as the Federal Government, and the 10 major networks, are now broadcasting directly to virtually every home in America via satellite. One relatively low power transmitter in stationary orbit 22,300 miles above the equator broadcasts several channels to every home via microwave in the 10 GHz region. Low-cost rooftop antennas receive directly from the satellite, giving every citizen perfect reception regardless of location or terrain.

The audio and video are digitized and multiplexed for maximum efficiency. This also means that there is no loss in signal quality despite the 45,000 mile distance the signal must travel!

Only a limited number of broadcasters can get on the satellite, because the satellite spectrum is limited. These broadcasters will enjoy the biggest market ever, but not necessarily dominate broadcasting because the proliferation of wideband fiber optics cables opens up many additional channels for local and network programming.

Again, audio and video are digitized in order to make best use of channel space: PCM signals have been found to be ideally suited to wideband fiber optics links.

Many of the cablecasters derive income from direct payment from the subscriber as well as from advertising. Once again, PCM encoded signals are well suited to the application because they can be "addressed," making them receivable only with a special decoder.

Virtually all studio recording is now done on multi-track digital tape recorders, which, thanks to continued development of integrated circuits, are even smaller than the machines of the '70s. The most popular format records 24 tracks on ½-in. tape contained in a cassette, and moving at 15 in. per second.

In many studios, the whole chain is digitized, from microphone to speaker. *A high-speed digital computer has replaced the recording console and all outboard processing gear.* Other recording formats have become practical for short programs, or as intermediate memories used for editing or short-term use. The magnetic bubble memory, first introduced commercially in 1977, has come to be used much like the present cart machines, and has now replaced virtually all other forms of medium-scale memory (although still not as efficient as tape for large amounts of information).

### 2002: one-unit home entertainment

The home entertainment center is now an integrated

audio-visual unit centered around the optical videodisc. The separate functions of TV, video-player, record player, and radio are all integrated into one moderately-priced unit. The clear plastic videodisc has all but completely replaced the familiar black plastic record, as the major vehicle for music distribution. Capable of recording 40 billion bits of information, these optical discs are now available in several formats.

Of course, there's the original format introduced in the late '70s which combines video and stereo audio, for the distribution of movies, concerts, and special interest features. But now there are also multi-channel discs. These discs are formatted just like the original 24-track studio recordings, but also carry two (or four) additional tracks which are the final mix. So, the consumer can listen to the mixed tracks only, just like a normal record, or—when he feels creative—can playback the 24-channel original and mix it himself through his home mixer. Since the music is a digital copy of the original PCM multi-track master, each disc is indistinguishable from the original recording.

Since the photographic discs are not erasable, or easily recorded without elaborate equipment, some alternate medium is still necessary for recording at home or in the studio. And so, video and audio recording in the home, just as in the studio, will be done on PCM multi-track magnetic tape. In the early days of tape recording it was often predicted that records would become obsolete. It is now clear that a stamped disc is still supreme for lowest cost mass distribution of audio and video programs. In a similar way, since the advent of PCM audio, many have predicted the demise of magnetic tape, usually in favor of monolithic memories. But, for tremendous volumes of data, magnetic tape is still the most cost-effective recording medium for the foreseeable future.

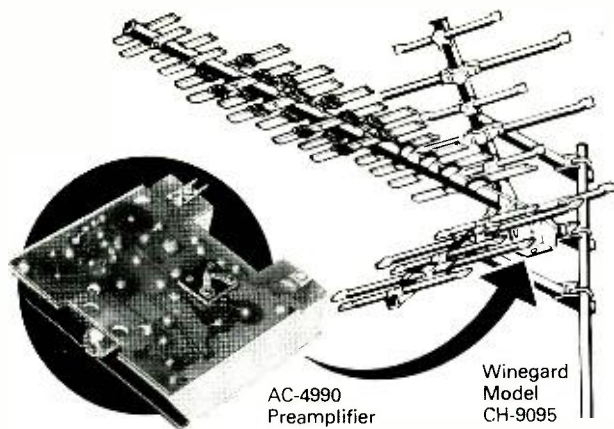
### 2002: digital processing

By now, many radio and TV broadcasts are digitally encoded, and digital signal processing is also coming into use by broadcasters. Aside from the fact that you can do elaborate processing without degrading the signal, there are several other advantages. For instance, all of the separate processors such as equalizers, limiters, and reverbs, are replaced by a single processor, which performs all these functions. In addition, it is programmable, so that any or all parameters can be changed at will. It may even have some built-in intelligence, so that it can continuously monitor the program signal and automatically adjust for changes in program material, and atmospheric conditions.

### 2002: new broadcasting services

PCM audio recording and transmission offers plenty of opportunities not only to improve present services, but to offer a whole series of new and better services. For instance, the BBC offers a service called "Teletext" which digitally encodes several pages of written news information into the blanking interval of video transmissions. A decoder at the home TV enables the viewer to select and display any one of these pages at will. In a similar way, broadcasters could encode multi-channel, high-fidelity audio into the video. Everybody knows that a stronger, clearer signal means more listeners. Extremely high fidelity multi-channel programs will give these broadcasters a competitive advantage. This in turn





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*"CUB (Council for UHF Broadcasting) members who have tried the new combination say that it has excellent characteristics. It seems to be another worthwhile aid to the improvement of UHF broadcasting. It seems likely that many UHF fringe-area viewers will be willing to make the fairly large investment—\$65.95 list for the antenna and \$78.50 list for the preamplifier—for what will give them in many cases a very substantial improvement, lifting them out of the "fringe" category."*

Actual home installations, presently in use, have brought about significant results with good reception of UHF stations extended up to 30 additional miles, nearly doubling the stations' effective range.

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## Digitized Audio

will force the others to upgrade their services in order to compete.

### 2002: recordings delivered via radio

With PCM audio, broadcasters may be part of a worldwide record distribution network. For instance, record companies could transmit their product over PCM links to disc manufacturers in the market centers, saving time and reducing transportation costs. Eventually, they could transmit direct to the consumer, where he would record the program on a consumer-type PCM cassette recorder, and be billed through his home credit terminal. This would drastically reduce the cost of manufacture and distribution, and make distribution virtually instantaneous. It might be fun to imagine what this would do to an already volatile market. For instance, it's not inconceivable that records might then sell a million units per hour in the first hours of release!

Digitized audio should have some pretty profound effects on production and talent as well: With the elimination of tape generation loss, and the advent of automation and electronic editing, talent can start to concentrate on the dynamics of the performance. There's some money to be saved here too, because of the speed of editing and the reusability of the tape.

### 2002: the digitized engineer

The engineer and the maintenance man will be most intimately involved with the new digital technology. Will today's engineer be "obsolete"? I believe that PCM technology will actually tend to reduce engineering obsolescence. Instead of constantly replacing equipment with new and different equipment, up-dating will become software oriented. Programs will be replaced or modified instead of hardware. Engineers will have to learn to de-bug computers and trace complicated digital logic. A certain amount of re-training may be necessary, and managers should encourage their engineers to keep up with the latest technology, but they needn't worry that they won't be able to find anyone to fix the stuff either.

All engineering students nowadays have some experience with computers, and in the future, virtually every college student, and many high-school students will be familiar with either computer technology or computer programming. Actually, the hardware is simplified, in a sense, by replacing our present racks of specialized processors with one "generalized processor," which does everything all at once.

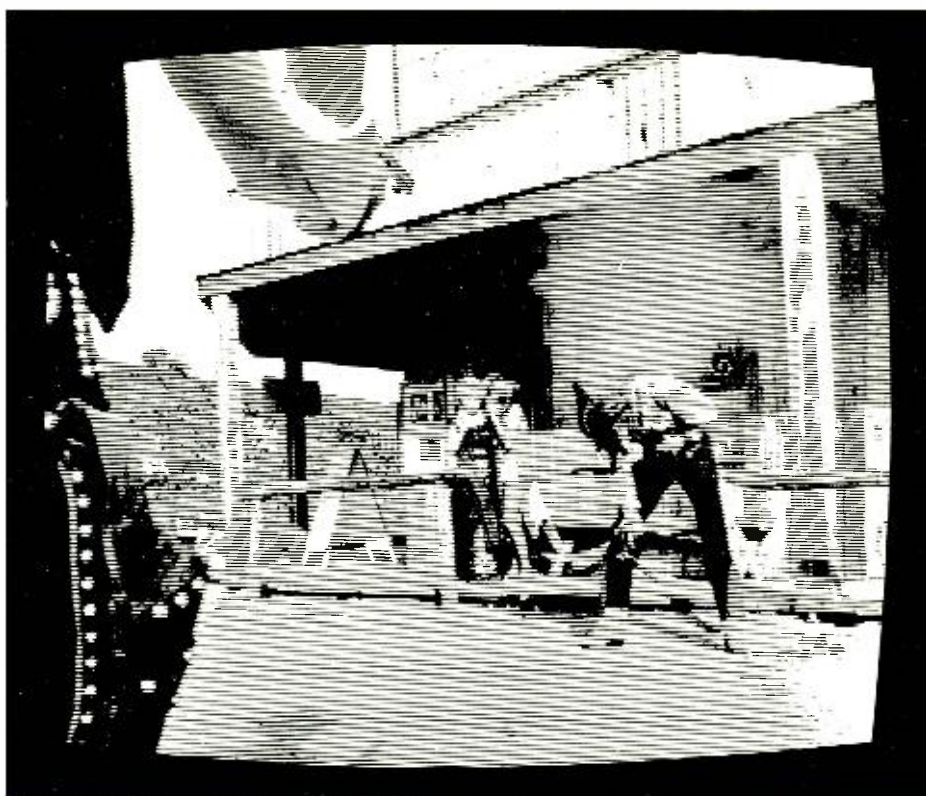
Additional simplification is achieved by combining audio and video. Eventually, this will mean higher system reliability and reduced costs too. For example, a digital tape recorder needs no high frequency bias, or record and playback equalization. It also needs no erase heads, no erase electronics, and no critical periodic alignment. And it can probably all be integrated onto a single chip!

### 2002: it's 25 years ahead

Moreover, none of this will happen overnight. Who's going to run out and replace 120 million TV sets? Or 100 million record players? It won't happen overnight—but it's already started, so the broadcast engineer should learn which way the winds are blowing, and begin to get ready for his digital future.

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this modular A/D is ideal for use in time-base correctors, electronic frame stores, synchronizers and other video applications.

The MATV-0816 is the latest addition to Computer Lab's specialized equipment for digital video. Other recent products include the MATV-0808 (8-bit, 8-MHz A/D), MATV-0811 (8-bit, 11-MHz A/D), and the MDD-0820A (8-bit, 20-MHz "degitched" D/A).

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# Digital Video Effects Offer Optical Effects On-Air

Based on information presented at the 10th International Television Symposium, Montreux

Effects previously achievable only through the use of optical techniques using film are now possible electronically. The technology presented here is an extension of that ushered in with frame synchronizers.

*Editor's note: The material in this article is extracted from two sources: The Grass Valley Group (Tektronix) and NEC America. At the Montreux Symposium, GVG demonstrated digital video effects as controlled by a GVG 1600 series video production switcher interfaced with the NEC DVE system (essentially the same demonstration given at NAB '77 Convention, Washington, D.C.). Dennis Fraser, manager of the Broadcast Equipment Div. of NEC America, Inc. provided details of the DVE system in a paper read at the Symposium. Listed as co-authors with Mr. Fraser are M. Inaba, K. Kashigi, A. Sugimoto, and H. Takahashi.*

NEW DIGITAL VIDEO EFFECTS systems produce a range of visual effects heretofore possible only through optical techniques using film. Effects possible as shown by the Grass Valley Group in conjunction with their switcher include continuous compression of the image, image expansion, picture splits and flips, push-on/push-off, and hall-of-mirrors. Another feature permits operation of the chroma key mode in such a way that the keyed-in foreground picture can be zoomed or panned while maintaining the correct perspective in the background.

The system uses a new NEC FS-15 frame synchronizer (much smaller in size, weight and power consumption than its FS-10 and FS-12 predecessors), the new NEC DVP 15 digital video processor, a GVG 1600 series video production switcher and a GVG-developed DVE interface. (The latter also permits digital video effects to be added to existing 1600 switchers already in the field).

The DVP 15 utilizes the two-field-memory and other circuitry in the FS-15 to perform a variety of picture manipulations. Processing operations are achieved in the digital domain and are then converted to analog. Most of the effects are under the control of a built-in micro-computer system. Input selection and system control is housed in the mixer control panel and has been kept simple for operator convenience.

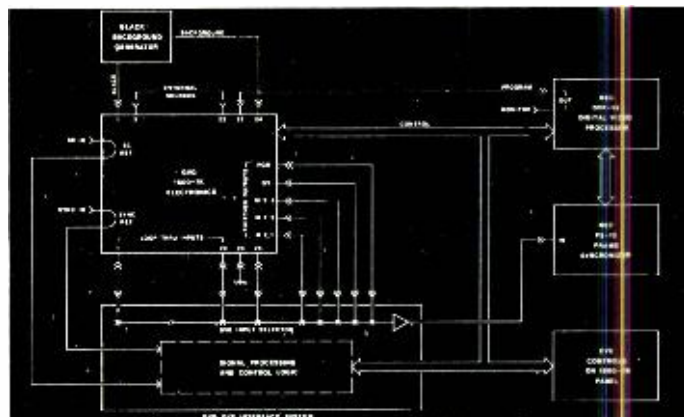
With the GVG/NEC digital video effects system, all effects can be accomplished with either synchronous or non-synchronous signals. While the special effects can be entered quite simply through a keyboard as desired, they can also be committed to a preset memory and recalled at will by the GVG E-Mem studio mixer option which incorporates microprocessor control.

## Role of the frame synchronizer

It is the options introduced to frame synchronizers that

have led quite naturally to new digital video effects. The freeze frame feature actually stores the last frame in memory for continual readout or manipulation. Via write clock manipulation, the size of the raster can be quartered (compression) and repositioned with the normal frame. This option has, of course, been offered in frame synchronizers.

Many more possibilities exist and they were set forth



Simplified diagram showing organization of the DVP-15 digital video processor.



Standalone control panel (incorporates an A/D converter) interfaces the digital video processor to the switcher.

## Digital Video Effects

as broad goals for the NEC DVE system.

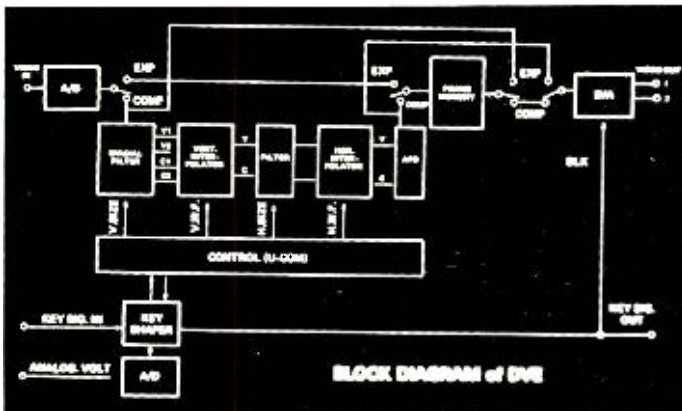
- The user should have complete real-time control of both size and position of the television frame.
- Vertical and horizontal dimensions should be controlled independently.
- There should be a smooth transition in zooming the television raster from the full size down to infinity.
- One should be able to zoom into the raster for enlargement of the image.
- The system should accurately track both chroma key and normal pattern effects.

As mentioned, the frame synchronizer and its memory is used as a basic component in the total system. The FS-15 frame synchronizer incorporates 16K MOS RAM chips which located on six plug-in cards form the 2.36 megabit frame memory of the synchronizer. The RAM used for this application was the NEC UPD-416D specifically developed by NEC's semiconductor division. The architecture of the FS-15 permits a single card TBC plug-in option as well as a two card freeze frame option. Since a frame synchronizer must be transparent in its ability to handle a picture, the sample rate was maintained at 10.7 MHz using 8-bit PCM data. An additional feature of the FS-15 design is data rotation which allows for reversal of most significant to least significant bit position in event of a memory failure (which effectively remedies such a failure visually). Data rotation also provides a rapid completely self-contained means of analyzing the memory LED indicators showing row and position of a defective chip. Conservation of size was pri-

marily effected by greater memory density and use of a DC switching power supply. It is important to realize that the FS-15 is a completely self-contained synchronizer and only becomes a component of the DVE system when it is integrated with the DVE-15 video processor.

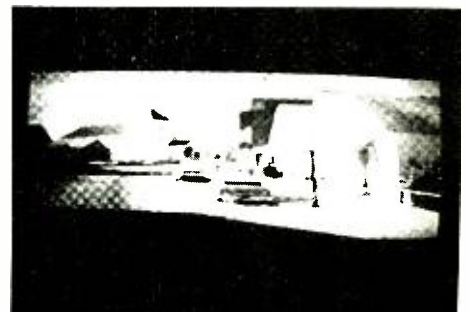
The DVP-15 digital video processor is the working heart of the digital video effects system. Housed in a 10-in. high rack frame, the DVP-15 provides all the control necessary to mathematically manipulate digitized video. The DVP-15 has considerable power to accomplish optical-type effects while using the basic frame synchronization ability of the FS-15 to perform these effects with either synchronous or nonsynchronous signals. Interface of the DVE system to video switching equipment (new or existing) is accomplished via connections to the DVP-15. The DVP-15 has been designed to accept direct digital word flow from a specifically-tailored switcher interface or to operate with an optional analog converter. The necessary connections from the switching equipment to the DVE system include video, position and size tracking voltages from the special effects generator and chroma key generator output signals. NEC manufactures a stand-alone control panel for the DVE that incorporates an A/D converter.

A simplified block diagram of the DVE reveals the basic frame synchronizer components including the A-to-D, D-to-A and frame memory blocks. The design has provisions for additional A/D converters and multiplexing should a customer require multiple asynchronous inputs for effects such as quad split. The entire DVP-15 circuitry is effectively bypassed when the unit is used as a basic frame synchronizer.



Simplified block diagram of the overall DVE system shows frame synchronizer, converter and frame memory blocks.

The DVE system provides tracking key operation. As the foreground camera zooms in on commentator (left), the inserted picture automatically tracks in size and position (as shown in the right hand picture).



Two basic modes of the DVE system are compression and expansion.





Hall of mirror effect is readily achieved (see text).



In the split screen mode, picture can be opened horizontally or vertically and a second picture (not shown) can be inserted in the void. Pictures can be pushed on or off.



Magnifying glass effect is possible in expansion mode.



Curtain effect can be achieved in split mode (see text).

The two basic modes of operation for the DVE system are represented as 'expansion' and 'compression.' In following the logic illustrated, note that compression techniques are accomplished prior to storage of the signal in the frame memory while expansion manipulations are performed on the output of the frame memory. Luminance and chrominance are handled separately in the system as they flow from spatial filters for horizontal and vertical components to vertical and horizontal interpolators. Microcomputer logic provides the 'traffic control' function of the system as it translates key signal and/or analog voltage control signals to the filters and interpolators. Functions such as picture split require the microcomputer to perform literally millions of data readdressing computations in real time to effect horizontal or vertical linear displacement of video. It is well to note that the blocks described as spatial filters are, in fact, the key, unique ingredients to performing the effects with smooth, well-defined motions. The system microcomputer is at the heart of the system's future capability for additional patterns and effects.

Certain advancements in basic video switcher technology, such as memorized effect sequences add even further capability to the DVE system. A well designed interface for the DVE system, designed and manufactured by the Grass Valley Group, provides a good indication of the interface simplicity: one 50-conductor cable and seven coaxial cables terminating with BNC connectors.

#### DVE visual results

The various modes of the DVE system can be classified as compression, expansion, mirror effect and split mode. It is important to remember that the key patterns dictating placement and size of the DVE effect will cause

the unit to track squares, circles, triangular as well as more complex patterns.

**Compression**—Used in the 4:3 fixed mode, this operation allows for zooming away from the fixed full size of the raster and positioning it at any fraction of the original size anywhere on the raster by tracking a normal key pattern. This mode, using data from the chroma-key generator, permits chroma key tracking thereby freeing the camera which incorporates the chroma-key as part of the frame. The use of compression in the variable ratio mode permits a complete horizontal compression of the raster while maintaining vertical size and vice versa. Using a normal key wipe with independent aspect control permits ready use of a picture transmission at the zero point which appears to be a card-flip to the viewer. Many optical stretch effects are possible in the independent ratio mode.

**Expansion**—Using the fixed 4:3 aspect ratio in the expansion mode allows for a zoom-in to the raster permitting highlighting of certain raster areas. Dynamic positioning from the pattern generator permits positioning of this enlarged material for center screen weighting. The development goal for the DVE system allowed for a 4X zoom of the raster material but due to the rather coarse appearance of the scan lines at 4X the function was subsequently limited to 2X. Both horizontal and vertical components of the picture may be expanded independently but the effect is more likely to be used in compression rather than expansion.

**Mirror effect**—The DVE system performs a multiple mirror effect via simple re-entry of the original image to the input of the system with constantly reducing images via the rate of compression selected in the original set-up

continued on page 45



Quantel DFS 1500 Digital Fieldstore Synchronizer

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**The digital video people**

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## Digital Video Effects

of the effect. A control for this effect would include a thumbwheel switch for selecting the number of reflections desired.

**Split mode**—The split mode effect, of major interest

to commercial and variety production personnel, permits the opening of the raster either vertically or horizontally to permit a second signal to be seen through the void of the two halves. The effect is accomplished by modifying the write address left and right or upper and lower respectively. Push-on and push-off full frame effects are ac-

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# Other Digital Video Effects Systems

In this emerging field of digital video effects, manufacturers are gearing up to provide a number of approaches to suit the demands of broadcasters.

Unlike some areas of production, where identifying the needs of the broadcasters can be rather straightforward, the demand for special effects can be more difficult to pinpoint. Which effects? How many? At what cost? What spin-offs from the design of such systems can prove attractive to the individual producer?

Though the Grass Valley Group's DVE system is, at present, the only system on the market, other manufacturers either have systems in search of a market or are developing systems.

At NAB in March and again in Montreux this past June, digital video effects systems garnered a good deal of attention. At NAB, Vital Industries stole some of the limelight with its Squeezezoom, still in the developmental stage. Digital Video Systems' John Lowry, a pioneer in this field who has delivered any number of papers on the subject at SMPTE confabs, spent a good deal of his time cloistered with switcher manufacturers interested in exploring the use of his system for digital effects in conjunction with their equipment. Private showings of the

MCI/Quantel DFP-5000 system had broadcasters and switcher manufacturers buzzing about the possibilities of applying their technology.

Details on the DVS system were not received in time for publication so all we are really able to say at this time is that Digital Video Systems has a digital video effects package and that marketing plans are actively being discussed.

The next system likely to be available will be the MCI/Quantel DFP-5000. An announcement of the availability of this system will probably have been made by the time this issue goes to press.

The Vital Industries Squeezezoom, based on the latest information, should be on the market by spring of '78. With all systems "go," Vital should be a strong contender for the spotlight at next year's NAB.

Though the DVE system from GVG is being marketed initially as part of a switching system, earlier GVG 1600s can be retro fitted. Depending on how the market develops, the DVE package might eventually be marketed as a stand-alone. Vital is planning to offer their system both as an option for Vital switchers and as a standalone that they will fit to any appropriate switcher. The DFP-5000 will be marketed strictly as a standalone although any attractive OEM deal should one come along, has not been ruled out.

Briefly then, a description of the Quantel and Vital systems follows:

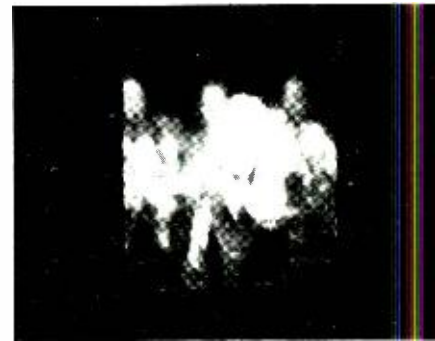
### The Quantel DFP-5000

When the announcement is made, the DFP-5000 will probably sell for \$125,000 complete. The unit will fit into a standard 12.25 inch rack space and its overall size and weight are suitable to mobile operations.

Unlike the other systems being discussed, the DFP-5000 works with synchronous video signals only. It is, however, designed to interface with the DFS-3000 frame synchronizer if the customer desires such an option. The theory here is that frame synchronization is, by itself, an expensive piece of technology.

The marketing people seriously question whether a broadcaster would want to tie up a frame synchronizer at his switcher when, in

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Late word at press time indicated that the DFP-5000 would be redesignated Digital Picture Effects DPE-5000 and that order is currently being accepted. The above sequence demonstrates a "Zoom-Out."

## Digital Video Effects

complished in the split mode using conventional vertical or horizontal wipe patterns. An additional effect in the split mode is called 'curtain.' This option provides an actual offset of video which has the appearance of folds

in a curtain being horizontally opened or closed. The number of folds are thumbwheel selectable.

To realize the maximum potential of the DVE system a thoughtful interface to video switching equipment is required. When this is done the maximum flexibility in pattern control as well as a proper re-entry configuration is achieved.



*The above sequence is a "Zoom-In." Each effect is achieved with "real-time arithmetic" in which the precise location of each pixel as well as the number of pixels are computed. These interpolation techniques permit infinite variations for both rate and size of compression. Expansion as used in the "Zoom-Out" is limited to 4 times original size.*

## Other DVE Systems

most instances, inputs to the switcher are already synchronous. An MCI spokesman points out that if a particular instance requires the handling of a non-synchronous source, a DFS-3000 or other synchronizer can provide synchronization to the incoming signal prior to its introduction to the switching environment.

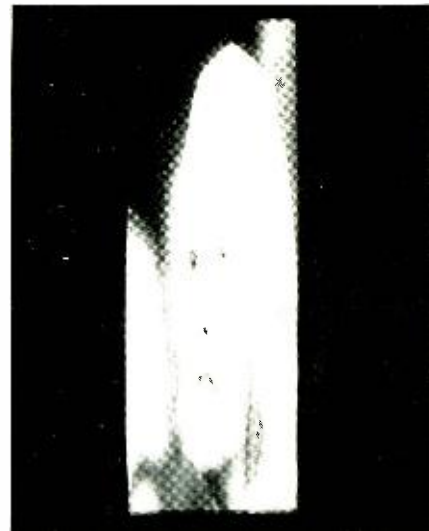
Microprocessors have been utilized in the "Smart Control Panel," which houses the switcher interface. The microprocessor assisted control permits extremely smooth operation of the joystick positioner and provides a degree of programmable transitions between the numerous special effects.

Noise reduction in a fully equipped DFP-5000 provides a number of benefits to each special effect automatically. Since noise is removed from the signal prior to its entering the frame store stage (where most of the effects are achieved), all effects are achieved with a picture of the highest quality.

Picture freeze has no flicker in luminance or chrominance (due to the noise reduction). It is at this point that Quantel claims its superior real-time arithmetic functions come into play. Using interpolation techniques developed for their standards conversion equipment, the DFP-5000 delivers "resolution on stop motion fields far beyond that previously expected of this function."

Pan and tilt effects are extremely smooth as a result of the microprocessor assisted joystick positioner. A picture can be inched across the screen at a rate that varies from instantaneous to as long as several hours. The same is true if the "tilt" feature is used to move the picture along the vertical axis. Since a new source can be selected to fill the pictured area vacated by the previous compressed picture, it is this function that provides the "push-on, push-off" effect.

Zoom out is, in effect, compression of the picture. Compression is variable all the way down to zero. When used in conjunction with positioning, the picture can be taken down to zero and made to reappear in any new part of the frame selected. From there the



*This series shows compression in the vertical axis. Compression in the horizontal axis is also available. Combinations of this effect and others permit "flip-overs."*



## First applications

The NEC digital video effects system was first used on-the-air in late September, 1976, for a news and special program on TBS in Tokyo.\* The United States first

\*Tokyo Broadcasting Systems, which NEC also credits for cooperation and assistance during the course of research and development on this equipment.

saw use of the DVE system in horizontal compression and zoom modes on a post production editing of the Carol Burnett Show in February, 1977. A subsequent use of the system occurred in late March of this year for commercial production on NET in Japan. NEC will have commenced formal deliveries of the system in July of this year. **BM/E**

picture can be expanded, not only to its original size but to four times its original size. This feature is usually termed "Zoom-in" but when used in conjunction with the pan and tilt functions it permits the operator to re-frame a picture regardless of how it was framed by the camera operator. The resolution is remarkably good even at four times the original size provided the original picture was of high quality. Even poor quality pictures, however, can be expanded to two times the original size with quite passable resolution.

The expansion and compression functions are able to operate independently in either axis to permit "squeezing and/or stretching" of the picture. Switching sources when the picture has been squeezed to zero permits "flip-overs" as another form of transition. These functions also permit infinite variation of the normal aspect ratio which might be useful in achieving a "Cinemascope" appearance.

Another useful function is Auto-Key Tracking which is able to compute both the position and the size of a chroma key area. The machine automatically fits the compressed picture into the chroma key slot and maintains it there in proper perspective regardless of camera moves.

The programmable nature of the DFP-5000 will probably permit Quantel to offer some degree of customized effects packages to clients desiring such features.

## The Squeezezoom

The Vital Industries' Squeezezoom was developed on the idea of "unshackling production . . . for the ever tough struggle to obtain the viewers attention, effect retention and overcome complacency."

At the outset, Vital's R&D engineers believed that for this struggle, production people would need to be able to use not only asynchronous channels, but multiple asynchronous channels.

The Squeezezoom features compression, expansion, pan and tilt, positioning, automatic key tracking, picture freeze and frame synchronization. Perhaps its most distinctive feature is its ability to conduct all of these operations on synchronous or asynchronous signals on any one or all four of its channels, simultaneously or independ-

ently.

Squeezezoom is designed modularly. In its basic configuration it will handle one channel, either synchronous or asynchronous. All special effects are achievable on this channel. The cost is expected to be approximately \$80,000. Each additional channel will cost about \$18,000. Once the maximum number of channels has been reached, up to four non-synchronous sources can be manipulated. The four sources can be displayed in a quad split within the same picture and each of the elements can be manipulated individually or in combination. In addition, the operator has full use of the other sources coming into the switcher which can be used in conjunction with the external sources coming through Squeezezoom.

Vital sees numerous applications for the special powers of Squeezezoom. In sports, cameras could be located at distant vantage points and locked into the main switcher through low power microwave or other asynchronous links. Live ENG stores could be conducted from various locations with little difficulty. For instance, typical reports from candidates headquarters on election eve could be displayed simultaneously in the same picture. In studio, signals can be mixed and manipulated in any fashion with outside signals.

With the power of PSAS (Program Switching Automation System), intros to news of other programs can be extremely complicated and always fresh. PSAS permits the switcher to "learn" a large number of transitions on an initial run through or rehearsal. Once the desired sequence of events is learned, the entire sequence can be repeated with a single initiate stroke.

The possibilities for applications of this device and other digital special effects devices are infinite. Ideas run from spectacular to mundane practical notions. One idea that Vital has for its Squeezezoom is use by any network, station or other entity that traditionally uses multiple monitors at numerous locations to keep any eye on the competition. With the Squeezezoom, it would be possible to use just one monitor at each location, displaying up to three competitors' output along with your own station's programming.



*This series depicts the "pan & tilt" capabilities of the DVC-5000. In combination with expansion, the operator would be able to reposition the picture and "Zoom-In" to accentuate a particular element.*

# FEEDBACK

READ SOME LETTERS TO MCI REGARDING THE REMARKABLE JH-110A SERIES OF TAPE RECORDERS

I thought you may be interested in learning of some of the benefits this company has derived since we changed to MCI JH-110 tape recorders.

As you know, both stations are heavily automated. Several times during the day and night we are required to record spots from the NBC Network. One of the first "tricks" our production staff learned was to record the network on two recorders. At the beginning of spot No. 1, they punch the reset button of recorder No. 1; at the beginning of spot No. 2, they punch the reset button of recorder No. 2. Then, at their leisure, they punch the RTZ button on both recorders, and there are the two spots already cued.

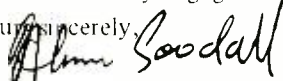
The cue facility allows us tighter "drop-ins" on beginning and end tags, and in compiling programs generally.

The calibrate/variable play and record level controls, and variable speed, are useful in that we have to process tapes received and from many different sources. The 3-speed capability also allows us to high-speed these dubs—saving valuable time.

Apart from the tremendous improvement in recorded quality (we were able to align the recorders to better than factory specifications) since installing the recorders we have not had one case of stretched or broken tape.

We have been able to design and build relatively simple units to interface with the control logic to enable us to—for example—pre-time record start and multi-recorder start and stop.

In closing, might I just say that original alignment and installation was very quick and simple, and maintenance has been virtually negligible.

Yours sincerely,  


H. Graeme Goodall,  
WVCG-WYOR, Coral Gables, Florida

It's been nearly a year since I purchased an MCI JH-110, and it's been a year of pleasure! I am (at least I consider myself to be) one of the best production persons in the country, and your machine puts all the others to shame!!!

I must tell you that I bought my machine by chance. I was not satisfied with our Ampex and ITC's, and Scully just couldn't handle it. I read a tiny ad in the trades and called your chief engineer for details on performance. Never having seen nor heard of your machine before, I



WNEW  
Radio office memo:



was impressed with his recommendations and therefore purchased one.

I have found several uses which were not listed in the Manual, and it seems we discover new ways to use the machine every week—and we do some pretty complicated production!

I assure you that when the money and the opportunity (and in that order) arises, I will purchase a 4-track and perhaps another 2-track and, hopefully, have you add a few more production aids which I feel could be of great value to our production load.

Again, I am totally satisfied with my MCI JH-110. It's a shame everyone has not had the good fortune to work with one.

Very truly yours,  


Larry Ryan, General Manager,  
KBCL, Shreveport, Louisiana

After using the MCI for a couple of weeks I'm greatly impressed by its improvements over traditional tape machines and its innovative features.

The machine is incredibly quiet—one reason being its motor does not idle but engages only during the play mode. Undoubtedly this feature will give the machine far greater mechanical life than its counterparts.

The machine's constant-tension transport feature is a plus in news situations where a mixture of small and large reels are used.

One of the more remarkable features is the machine's ability to time tape. At present, completed 60-minute shows are

timed by running them through a conventional recorder at 15 IPS and the elapsed time doubled for an accurate reading of 7½ IPS programming. This MCI machine actually times the programming while in the fast-forward mode—reducing a 30-minute job to a 3- or 4-minute job and greatly reducing machine tie-up time.

Though the advantages of 2-deck electronic editing are obvious and ultimately the best state-of-the-art engineering for news producers, the MCI "tape return" feature by itself is quite helpful. I reset the mechanism while dubbing cassette material to reel-to-reel for quick and accurate recall of key segments.


The time saved in hunting material is valuable, but perhaps more importantly this is the first tape machine I have ever encountered that actually "assists" the operator. All other machines are neutral in their attitude to the job—they'll go when the right button is pressed, stop when another is pressed . . . but THIS machine actually is *positive*. It's a great device—too many engineers ignore the human engineering factor. These people have explored it and created a machine with a valuable accessory.

Other benefits: the machine is extremely easy to thread—and the proximity of the reels to the actual operating deck is an advantage over the Electro Sound transport system which is raised and creates the possibility of tape fall.

The machine is incredibly quick-starting, even at 15 IPS, which is the speed I most often use. I have often started the transport in mid-sentence on the air, where on other machines I have had to edit leader into the tape to account for slow-start wow.

The manual velocity control is another device which gives quick access to material on tape. I can audition material at variable speeds from a slow crawl to the speed of fast forward—slip into reverse direction with a minimum of mechanical effort—and locate key segments at three to five times the speed of conventional decks.

*I intend to chain this demonstrator model to the wall when its test period is over. Congratulations to its manufacturer and designer for creating a machine with the human factor in mind.*

  
Mike Linder,  
WNEW Radio, New York

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# You Can Ask Radio Automation To Do What You Want

Last month *BM/E* surveyed a sampling of radio stations that have fairly recently installed some form of automation. Here are four more that add to two main conclusions: station managements can now ask automation to do whatever they want; interfacing the traffic/billing computer to the program switching computer is now a cost-effective idea for a wide range of situations.

THE VERSATILITY OF RADIO AUTOMATION is the outstanding characteristic that emerged from *BM/E*'s two-month survey. The technology is now fully developed, adaptable to many different operating situations in stations of various market sizes. Further, the connection of the traffic/billing system to the program system is a steadily spreading procedure. Consider WERE, Cleveland; CHNL, Kamloops, British Columbia; CKLW, Windsor, Ontario; WBNS, Columbus.

## **WERE: all-automation for all news**

In the August, 1975, *BM/E*, Robert Groome, chief engineer of WERE, Cleveland, described how their Gates (Harris) automation system backed up their all-talk format, which was built on a variety of interview, news and local documentary-style shows, with the interviewer or newscaster in full control. Since that time, WERE has gone to an all-news format; the station was an NIS subscriber, is one of the large group that has stayed with the idea after the demise of NIS.

WERE now has a very large local news operation with a full-scale editing room into which reports are sent or brought. Here an editing staff prepares on-air copy. This is usually put on live by one of the corps of newscasters. For 5 minutes of national and international news every half hour, WERE uses Mutual and NBC.

The newscaster is now the man in control of the on-air period. At the proper times, the automation system takes over to run the commercials, PSAs, IDs, etc. These are set up on the carousels. The system also automatically provides the network join. This scheme is somewhat like that of Mutual, described in the March *BM/E*.

Early this year, WERE installed a PSI BAT automation system for traffic/billing. Manager Paul Neuhoff told *BM/E* it has met the management's objectives, which were mainly those usually motivating computerized accounting: instant availabilities, management reports, as well as sweat-free billing, payroll, etc.

About the time this issue appears, WERE will connect the BAT system to the Harris system; chief engineer Groome told *BM/E* in June that the interface equipment had been installed and checked out. When this goes operational, the BAT system will set up automatically each day's scheduling of commercials and other non-news, recorded material based on the original input from the traffic department. This material is set up in carousels. Each morning the full day's sequence will be "dumped" into the Harris memory which takes about

five minutes. Last minute changes can be made at any time before airing.

The whole system will apply computer power to do smoothly and fast just what WERE wants.

## **CHNL: fast sequencing for DJs**

At this station in Western Canada we get another demonstration (a number of others have been reported in *BM/E*) that the DJ has nothing to fear from automation. The station uses an IGM Marc VII (not strictly automation, says IGM, but "manual assist remote control"; as CHNL uses it, the general automation classification is proper).

The Marc VII allows the DJ to set up a sequence of events from his own input keyboard at the operating position. The system has up to 1k bytes of RAM memory for the sequence. Another memory holds up to 2000 read-only bytes for the operating instructions.

CHNL puts on the air during the day a diversified music mix of about 50% current hits, the rest contemporary adult music and golden oldies. Music director Jeff Bourhas makes up the list of current hits each day; they go into the 48 slots on the IGM Instacart. The rest of the music is set up on turntables and open-reel decks. Commercials and PSAs go on ITC single-cart playing machines.

The DJ is in full control of the actual music sequence during the day, following the general scheme outlined by Bourhas. He knows when to break for commercials, etc. He can change the music sequence at any time up to seconds before airing. With up to 18 events set to run automatically, he can walk away for about 50 minutes, for consultations with Bourhas on the programming, etc.

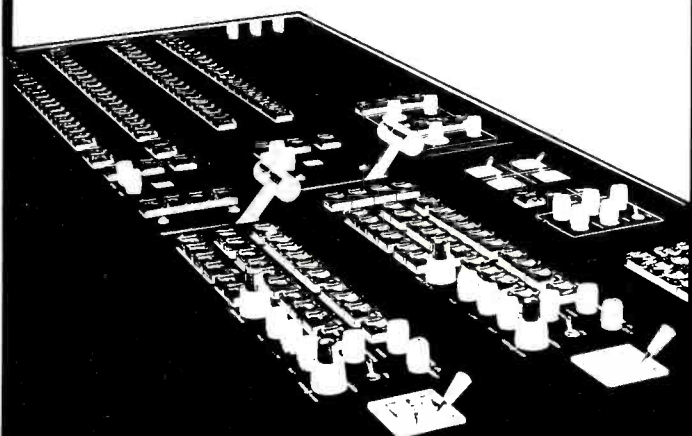
CHNL is on the air 24 hours a day; and in the period from 1 AM to 5 AM, another kind of operation goes on, to further show the versatility of the system. CHNL alternates between numbers on the syndicated Jim French show from Broadcast Programming International set up on a reel-to-reel machine, and other material set up on Instacarts. The station runs totally unattended, (legal in Canada), and the Marc VII is directed by a paper tape system, optionally available. The tape is punched up each day for the night's operation. The overall result is an operation that sounds just as "live" as the daytime show.

Manager Dan McAllister points out (as reported by IGM): "Hardly anyone is willing to work nights, every

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night." But the paper tape reader and the Marc VII are always ready. CHNL gets exactly the mix of automation and individual control that the station management wants.

### **CKLW: the sales department is in a foreign country**

Windsor, Ontario, is just across the border from Detroit, and American advertisers who want to reach the Detroit market on CKLW's powerful signal make up a large part of the station's customers. As manager Bryan Punchard put it to *BM/E*, "We are a station with our main sales department in a foreign country 30 miles away." Another complication is that CKLW is running both an AM and an FM station (contemporary music on AM, country and western on FM), with the obvious difference in demographics that have to be kept straight for advertisers.

And a third major complication is the necessity for clearing many ads with various Canadian government departments in Ottawa. Thus when CKLW recently added the FM operation, and at the same time found the general volume of sales rising sharply, the earlier accounting and traffic system was obviously going to be seriously overburdened in a short time.

The management decided on a PSI BAT system, with refinements to take account of their special needs. This included, of course, instant availabilities on both AM and FM for the sales staff in Detroit, which they can call up by dialing a special telephone number. It includes a system for keeping track of the status of material forwarded to Ottawa, so that not only the station but the advertiser can be kept on top of it. The clearance operation is an unavoidable customer relations headache, and speed in handling it is essential to reduce the strain as much as possible.

Punchard says that the BAT system is keeping CKLW's sales, billing and traffic departments in position to do their jobs with reasonable efficiency. Without the system, the operation of the station would be slowed by friction of a very expensive kind.

### **WBNS: success leads to automation**

The story of WBNS in Columbus is more typical of many stations, and it emphasizes the fact that, while automation often truly aids a station to success, the converse can be just as true: success leads to automation. When a station's business doubles in a fairly short period, which happened at WBNS, the management may find that the kind of reports and projections needed for intelligent control are coming in too slowly to be of any use. Enlarging the accounting department for a faster flow would be very expensive, and would end up with management material still coming in far slower than it does with a computerized system.

So WBNS, in December, 1976, went to the new BCS 100 computer system. They like having the whole system in house, so the general ledger is fully there at home. Now the management is getting the reports they want, practically in "real time." The system is doing so well that WBNS is looking ahead to an interface with the SMC DP-2 used on their FM station, to automate switching for the Schulke beautiful music programming. Automation, again, fitted into a station's requirements.



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# Digital Developments, Production Trends, Satellite Progress Highlight 10th International Television Symposium

During the week-long conference at Montreux, June 3 to 10, over 150 papers were read and discussed. In the first of a two-part report, *BM/E* focuses on exhibit highlights and digital trends.

THE INTERNATIONAL TELEVISION SYMPOSIUM, Montreux, Switzerland, is both a technical conference and a technical exposition. As a technical conference its hallmark is that it looks ahead—five and ten years hence. For that reason and because it is truly international in character—drawing some 4200 delegates from 56 nations and manufacturers from 15 countries—the International Television Symposium is significantly different than most other gatherings of broadcasters.

The Montreux conference is different in other respects: its setting and its style. Montreux is a city of flowers bordered by a lake on one side and quick rising mountains on the other; in this setting, the conference and exhibition, sprinkled with social events, runs leisurely for seven full days. From all this, it could be expected that Montreux provides a unique outlook on broadcasting and indeed it does.

Mostly the different perspective comes from the technical sessions, organized by international panels. The equipment shown imitates, to a considerable degree, that seen by most Americans earlier in the year at NAB. Thus, a lot of what was displayed was already described in the May issue of *BM/E*. There were some qualitative differences though. Robert Bosch Gmb was one of the largest exhibitors, for example, and spared no effort in impressing upon delegates that it was *the* major company at the exhibition. Not only did Bosch provide the liveliest entertainment (The Jane Palmer Show), it catered to oversized crowds by projecting its spectacular action on a large Ediphor projection screen. In the process, it advanced the notion that one-inch BCN tape recorders were the wave of the future through forceful demonstrations of editing capability, freeze frame, jogging, still projection and special digital effects all as part of the BCN package. The first working model of a BCN 5 portable recorder which sports a cassette was shown.

Bosch and its BCN were not without keen competition. Ampex and Marconi surprised the international market

with the announcement that Marconi was licensed to produce the VPR-1. And in the Thomson-CSF booth, under its own label, was the Sony BVH 1000

playing in PAL and SECAM.

In terms of impressions formed in the minds of visitors, the big manufacturers internationally are not necessarily RCA, Ampex and Harris but Thomson-CSF, Robert Bosch, Philips and then RCA and Ampex, with Marconi also a strong contender. Harris has to take its place further down the line with companies like Siemens, EMI, Rank, Eastman Kodak, Tek-

## Wanted—And Coming—By 1985: Lighter Weight, More Flexible, More Rugged, And More Efficient People-Oriented Equipment

The Montreux Symposium offered a rare opportunity for broadcasters to state their needs and equipment manufacturers to respond. Lead off speaker W.G. Connolly, director of research for CBS, succinctly articulated the challenge: equipment should be designed to serve producers, directors and writers. Creative people no longer want to be confined to a studio, said Connolly, and the trend is more on-location production for "more natural story lines." But creative people will be frustrated in this move unless there are improvements in lighting, cameras, lenses, switchers and recorders. Lighting equipment must be improved from the present efficiency of 20-30 lumens per watt to 100 to 1150 lumens per watt, said Connolly. Camera lenses must have a greater zoom range (with both wider and narrow angles of view) and they must be smaller and faster than they now are. TV producers need cameras with increased dynamic range (to shoot both at nighttime and on cloudless days) but sensitivity, size and weight must not be sacrificed to reach this goal. Better temperature stabilization in cameras is needed and the ideal camera would have no cables, said Connolly.

The recorder in 1985 should be capable of higher density recording (90 minute reels, at least), Connolly continued. Ideally the recorder will be integral with the camera. Recorders should have increased S/N ratios for multiple generation editing. Connolly also asked for time code and some form of swift picture identification code signals to be laid down during recording not as a linear track but along with video. This would make computer-

assisted post production work easier.

Lighter-weight cameras and more sensitive cameras with smaller lenses were also called for by Peter Rainger of the BBC. He hoped that noise reduction schemes would lead to increased sensitivity and/or smaller lenses (hopefully both). But Rainger was not optimistic about the much talked-about ideal solid state camera being ready by 1985. And he predicted there would be a strong role for film in the future if film cameras incorporated electronic viewfinders to be more competitive.

Rainger foresaw the need for recorders for archival purposes and he predicted that digital recorders would fill this role: By 1985 Rainger thought digital recorders with a resolution of 625 lines and capable of operating at 34 Megabits per second would be a reality.

Herbert Fix of the Institut für Rundfunktechnik looked for simpler editing systems for more on-line work and suggested that digital recorders would be useful. He saw the need for large screen theatrical projection equipment operating from video signals.

P. Hansen of Denmark also called for simpler post production equipment and T. Miura of NHK asked for better sound pickup. M. Remy, TDF, saw the need for more computer usage to avoid operator errors. He thought time code should be used more extensively for both video and film post production processing.

What the broadcasters sought seemed quite modest in the face of the onslaught of new semiconductor devices promised by Richard Stewart of General Electric.





Marconi and Thomson-CSF are two large exhibitors at Montreux.



Bosch Fernseh used Eidiphor projector to increase audience.

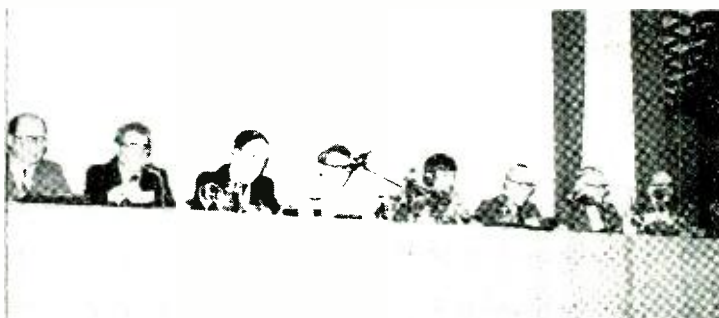


Continental-look styling was reflected by Siemens and others.

There seems to be no end to the number of components that can be put on a single chip—more than an order of magnitude improvement over today's microprocessor chip, said Stewart.

Solid state image sensors of broadcast quality are easily imaginable by 1985, said Stewart. Signal processing of all kinds will be improved since charge-coupled devices can be used in parallel to rapidly rework analog signals. Memory devices will undergo large changes. Today, said Stewart, memories have a storage capacity of 65,000 bits per chip. By 1985, over one million bits per chip seems likely. Bubble memories will develop rapidly from here on in. Already today 10 to 12 seconds of audio can be stored in such a memory. By 1985, Stewart predicted 30 minutes of audio being stored on a solid state recorder—i.e. a recorder with no moving parts. By 1990, perhaps 30 minutes of video could be stored without the use of tape mechanism. Stewart predicts both CCD and bubble memory being used extensively by broadcast equipment manufacturers. Computer-generated graphics and scenery will also be possible in the near future, said Stewart.

John Hillier of RCA, buttressing Stewart's remarks, said several generations of new memory devices would evolve by 1985 and that the challenge facing designers is to know how to allocate cost and effort to new systems. Hillier predicted major advances in solid state frame storage devices but surprised the delegates by offering the opinion that the optical video disc would be the likely successor to magnetic tape. Optical discs, said Hillier, offered two orders of magnitude improvement in density over tape and one order of magnitude reduction in media cost.



Part of futures panel. Left to right: Connolly, Fix, Rainger, Polonsky (moderator), Stewart, deVrijer, Hillier, McMann.

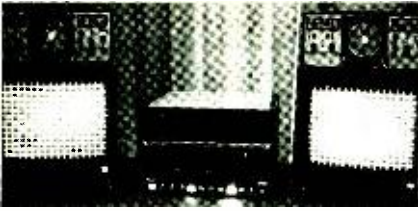
Advances in LSI could logically lead to signal processing improvement being added to the home receiver said F. deVrijer of Philips. This possibility was viewed as quite significant by the delegates since it is the home set that is now the weak link. In the meantime, the Philips authority said, noise reduction schemes will be used more and more in cameras. Color correction circuits, better color matrixing schemes, etc. will be other advances. Such improvements will give a tube camera the edge over solid state pick-up devices and the tube camera will still be the standard in 1985, said deVrijer. Renn McMann of Thomson-CSF was inclined to agree although he once thought the CCD camera would come early. However, built-in microprocessors will simplify the task of tube camera operators. McMann said, and the inference could be drawn that Connolly's and Rainger's demands can be met by tube camera manufacturers.

Once CCD devices offering broadcast quality are available in quantity, a genuine breakthrough in sensitivity will be achieved, said McMann, since CCD devices do have a tremendous linear range. Until that time, however, don't expect more than a 2 to 1 improve-

ment in sensitivity. He did predict that fiber optics would replace wire cable coming out of the camera. This would cut down on a lot of RF interference, said McMann.

By the time all manufacturers had their turn to speak, some of the expectations of wondrous things yet to come that were set off by Stewart's LSI projections, began to scale down. M. Morizono of Sony declared reservations about the digital VTR as not the economical way to go. He saw higher magnetic densities possible with analog systems. Chuck Anderson of Ampex reminded the audience that a product has to have a reasonable life and he asked whether the industry can afford to design a new piece of hardware every 2-3 years. Hans Groll of Bosch-Fernseh raised the same question and further pointed out that complex products (such as a new VTR) require about five years in development before they are ready for market. Thus if CCD-equipped systems are to be on the market in 1985, experimental products must be operating in labs no later than 1980. There will be plenty of progress without the CCD, however, coming out of today's large effort in digital processing. This assessment was reinforced by all panelists.

## TV Symposium



In center is Quantel's new miniature digital standards converter. Its capability is shown by ability to convert 525 line NTSC convergence pattern (right) to perfect 625 line PAL pattern (left).

were in the forefront. Digital video effects were highlighted on the exhibit floor only by the Grass Valley Group as part of the Tektronix exhibit. Bosch did demonstrate some special effects as mentioned but they described their efforts as experimental. (Vital was an exhibitor but did not demonstrate SqueezeZoom.) As at NAB, Quantel showed its standalone digital video processor by appointment only. It could thus not match GVG's impact but the company did announce that it had firmed the specs for the DVP 5000 and was going into production.

Despite the disadvantage in that it could not exhibit its products on the floor, Quantel did score a coupé at the Symposium. It announced at its stand—and demonstrated privately—one of the exhibition's true advances in the state-of-the-art—a new extremely compact digital standards converter. Not only was the unit small in size (rack height 12¼ in. compared to 35 inches for the unit shown at NAB) but the quality was impressive! Because of its unique digital movement synthesizer and a digital noise reduction system, resulting pictures were quite brilliant with both spatial and movement interpolations being outstanding. Price was announced as being much less than that for existing units.

ENG or electronic field production was a major topic at the technical sessions at Montreux and was stressed on the exhibit floor. Although there were fewer choices exhibited inasmuch as Hitachi, Asaca, and others were not present, ENG was promoted with great flair—Thomson-CSF sent the Microcam up a long firetruck ladder extension to demonstrate its light weight and ease of handling. Ampex hired a helicopter and chased speed boats. Philips stressed heavily the flexible Video 80 system. RCA held its own by putting the TK-76 through its paces. And there were some strictly European ENG developments. Grundig showed a new light weight camera coupled to a Grundig-made ½-in. VCR tape recorder. And both TRT and Thomson-CSF showed some man-portable omni range microwave gear

for relaying field pictures. Sony did much to hush the European criticism of its ¾ in. format by unveiling a line adapted to work well with the higher resolution 625 line systems. Sony's product line was included nine items. Consolidated Video Systems scored well by showing a brand new time base corrector, the 517, which could cope with both PAL and SECAM standards.

Editing equipment was of keen interest to delegates and although there was no new equipment unveiled (except for an experimental computer controlled unit by Sony), traffic was heavy for all those showing editing equipment. The products of CMX and Convergence were sought out for close inspection since these companies have been less well known in Europe than in the U.S. (Over 40 Convergence systems have been sold in Europe since the IBC Conference in London last year, however.) RCA, Ampex, CDL and Bosch were among those companies that stressed their new editing systems shown earlier at NAB.

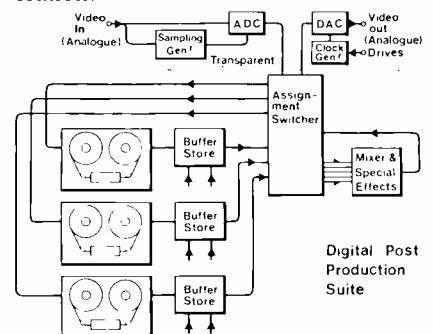
Production techniques were discussed in technical sessions and demonstrated on the floor. *BM/E* will report on trends in this area in part II. We will comment here only that American-made character generators dominated the exhibits. Chyron units were part of the Ampex display and the Vidfont was a feature of the Thomson-CSF stand. TeleMation impressed visitors with the capabilities of Compositor I, seen for the first time at Montreux. Knox was there represented by Furrier Marketing. 3M showed its full line but stressed the D4000 disc memory system which stores 1000 pages on a disc (but with ½ sec. access time) and the D8800 system which includes 4 fonts. 3M stressed that the software for this system can be changed so that keyboard and system will never become obsolete. In terms of capability for a small price, System Concepts captured a great deal of attention. The relative newcomer showed how it uses a microprocessor to get the most out of a 1024 memory. (High resolution is needed for large display type only; if you use smaller sized type, you can have an increased selection in the choices. If you limit a program to 192 lines, you can have features such as absolute centering, tabbing, etc.) Company also stressed that its digital cassette is the practical way to file an extra 8 pages since information can be transferred between system RAM and cassette in less than 10 seconds.

### Digital Video major topic

There is keen interest in Europe in digital video both as to how it can be used in the studio and as a preferred method of distributing video signals—

transmission via satellite would likely be in the digital mode. And unlike the situation in the U.S., there is keen interest being shown in digital video recorders. The European Broadcasting Union and CCIR committees are eager to tie down loose ends in digital video so that standards might be established.

The possibility and desirability of digital video recorders popped up several times during the week long Symposium. Just how a suitable digital video recorder might be built was outlined by J.L.E. Baldwin of the Independent Broadcasting Authority of the U.K. (Baldwin was something of a celebrity at the Symposium having won a Montreux Gold Medal for his work in developing DICE, the Digital Intercontinental Converter Equipment.) Some remarkably clear pictures captured by an experimental digital VTR were shown by Baldwin. It is the "transparency of a digital VTR which makes its development so interesting," said Baldwin. "In a digital post production scheme (see illustration), there would be no degradation of the signal even after the 100th generation!"



Baldwin's digital VTR post production scheme would not degrade picture since VTRs are "transparent."

In exploring the prospects for a feasible recorder, Baldwin assumed sampling would be done at 2x fsc and that 8 bits per sample would be necessary. Thus a 70.94 Mbit/sec. bandwidth (or 79.81 Mbits/sec. if an error protection bit per word is added) is necessary.

Further assuming that a linear bit density of 25 to 30 kilobits/in. is necessary for satisfactory performance, approximately 3000 track inches/sec. are required. Baldwin foresees two approaches to solving this problem: 1. use of moving heads, e.g., two heads in contact with tape, each head traveling at 1500 ips or 2. use of a large number of static heads such as 100 with tape moving at 30 ips. A track width of 0.003 in. with a guard band of 0.0015 in. gives an adequate S/N ratio for binary signals.

If the moving head approach is taken, a 2-in. wide tape traveling at a speed of 7.5 ips would work. At the same tape width and speed, a static

continued on page 56



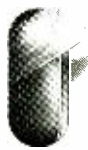
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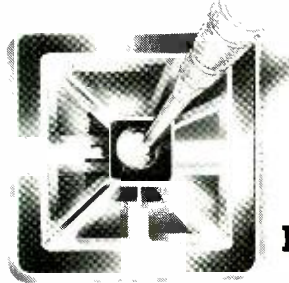
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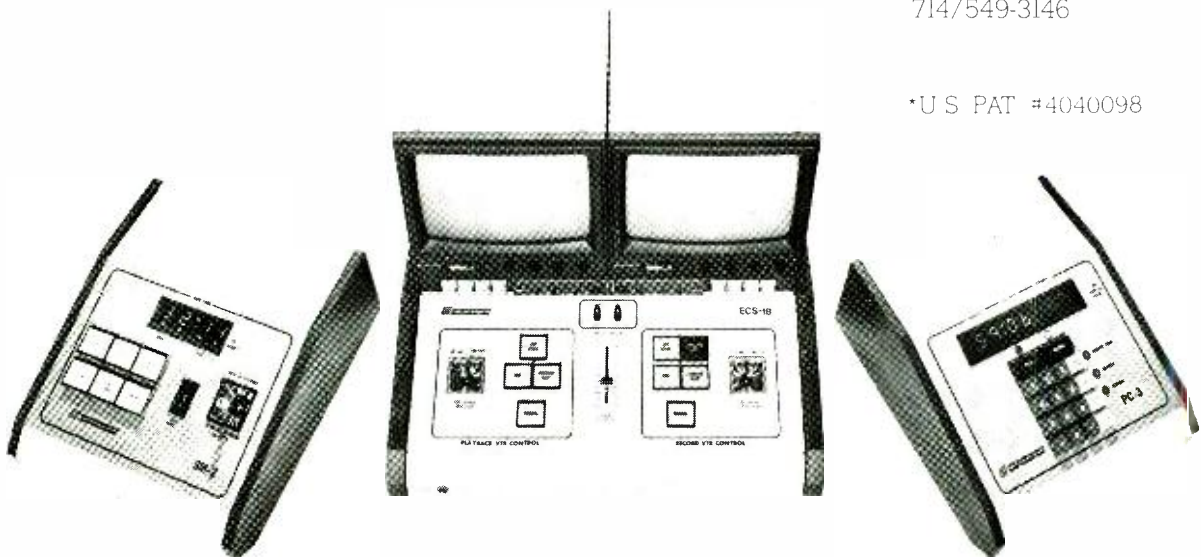
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## TV Symposium



Lightweight Thomson-CSF Microcam handled by frail frame.



New Grundig ENG system is lightweight.



TRT omni-range ENG portable microwave on rear of motorcycle.

head machine would require 400 heads. This would be too expensive both regarding the heads and associated amplifiers. Thus Baldwin feels 100 heads is a more reasonable figure, using 1/2-in. tape traveling at 30 ips. Disadvantage of this approach, however, is shorter playing time and tape rewind time.

Since the ability to produce pictures at any speed is a desirable feature (for editing purposes), Baldwin is inclined to favor the rotating head machine approach. Coding would be a delay modulation type used in digital instrumentation recorders or a Miller code.

Both Baldwin and the director of engineering of the IBA, Howard Steele, feel a practical digital video recorder is achievable in the near future using one-half the tape now required by standard (15 ips) quadruplex recorders.

In a lead paper on digital coding techniques, H.G. Musman of Hanover said that there was no problem in getting excellent pictures in digital TV if the bit rate is 50 to 60 Mbit/sec. However, a bit rate of 34 Mbits/sec. is attractive for reasons of economy in bandwidth requirements and transmission power. (If satellites are to be used for transmission—a European goal—power is a big factor.) The 34 Mbit/sec. rate (34.368 to be precise) is the goal of the EBU because it fits into the 3rd-order PCM hierarchy. Musman said the ideal coding scheme for this low rate has not yet been found but that there are ideas about on how to solve the problem.

There was a clear trend in evidence at the Symposium that the best way to go is to split the TV signal up into separate luminance and chrominance components rather than to treat the signal as a composite (as was done in early TBCs). This is because bit rate schemes for composite video seem to require 60 Mbits/sec. to hold color. Further, it is not possible to reduce a composite encoded SECAM signal due to the fact that chrominance is frequency modulated.

The most commonly applied bit rate reduction method is DPCM (Differential Pulse Code Modulation), said W. Zschinke of Stuttgart. In contrast to PCM where the actual sample is transmitted, in DPCM it is the difference between the actual and a predicted signal that is transmitted. This difference is usually small because of the statistical properties of TV picture signals and thus it can be encoded with fewer bits than the actual sample.

In a system described by Zschinke, the luminance signal is sampled at 10 MHz, converted to an 8 bit PCM signal and processed in a DPCM system as a 3 bit DPCM signal. Details on this system will be available in a special issue on picture coding to be published by IEEE Transactions on Communications scheduled for publication later this year.

Another DPCM method of achieving a bit rate lower than 34 Mbits/sec. is called COMET. It used a 4-bit encoding and an edge detector in the luminance DPCM encoder. This scheme adapts to the characteristic of the human eye and attempts "irrelevance reduction," said Jurgen Heitman of the Robert Bosch company in describing this method. The chrominance bit rate was reduced by transmitting only every second color field.

Repetition of every first color field by the receiver means no interframe encoding is necessary. Yet another approach to reducing TV signal bandwidth requirements was described by Messr. Adler and Steidel of Stuttgart. The authors do time multiplexing of up to six audio signals during the vertical interval.

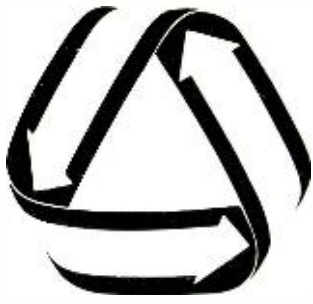
Despite the extensive work going on the solutions presented, the European Broadcasting Union is hardly ready for standardization. J. Sabatier of the CCETT (France) outlined the problems for the 34.4 Mbit/sec. rate. They relate to just how to multiplex such items as digital framing (line and field), an error correcting code, test signals, sound signals, teletext and the picture signal itself. The question is what is the optimum way to divide up the bit rate to handle all of these elements. Sabatier pointed out possible interference between coding schemes and multiplexing techniques.

While the best way to encode for a minimum bit rate stream has yet to be found, there were many papers at the Symposium describing how digital techniques can be used as they related to TV programming production and control in the studio. Dennis Fraser described the NEC/GVG digital video effects system (which is covered in a separate article in this issue). Renn McMann provided details on the Thomson-CSF digital noise reducer. Byron Barney, speaking for Consolidated Video Systems, described a new PAL time base corrector, the CVS 517. This unit, in keeping with the trend described earlier, encodes luminance and chrominance separately. A higher resolution is achieved since no bits are given over to encoding the sync porch, lower half of burst, and chroma info below black level. Frame store synchronizers suitable for PAL and SECAM were described by Richard Taylor of Quantel. Taylor also touched on special effects—freeze frame, compression and picture positioning—possible with frame synchronizers and he described variable picture expansion and positioning (equivalent to camera pan and tilt) and noise reduction that is now possible with the effects system, the DFP 5000. F. P. Maly of Bosch-Fernseh, described how the frame synchronizer and effects unit built for the BCN works.\* J. Diermann of Ampex described the Ampex-CBS electronic still store system and Charles Rhodes of Tektronix discussed Answer II, an all-digital measuring system.

Next month, more on production techniques, satellites and future broadcast equipment developments. **BM/E**

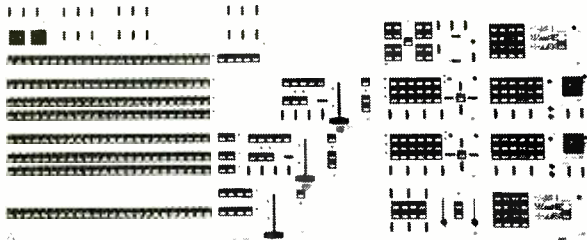
\*One of the effects appears on this month's cover of *BM/E*. A fuller description of this equipment will appear next issue.





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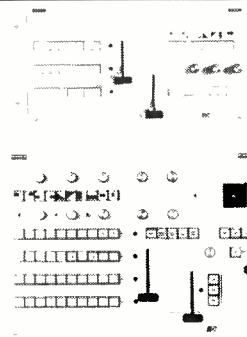
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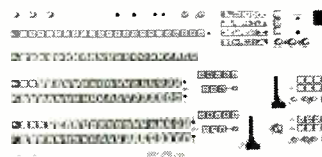
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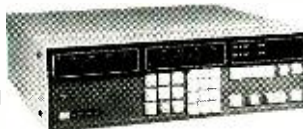
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# INTERPRETING THE **FCC** RULES & REGULATIONS **Public Inspection File**

By Frederick W. Ford and Lee G. Lovett; Pittman, Lovett, Ford and Hennessey, Washington, D.C.

An uncommonly large number of license renewal challenges (and petitions to deny license renewal applications) have included allegations that the broadcast licensee has maintained an *inadequate* public inspection file. Virtually none of these renewal challenges and petitions to deny are filed solely because of public inspection file deficiencies. However, the deficiencies constitute violations of the Commission's rules and are not taken likely by the Commission.

For this reason, broadcasters should be especially careful to comply with the letter and spirit of the Commission's public inspection rules. "An ounce of prevention" will protect the licensee from defending against a possible hearing issue at license renewal time.

The important public inspection file rules for commercial broadcast licensees<sup>1</sup> are reviewed below.

## Applications and Related Documents

The licensee must include a copy of each application that it has tendered to the Commission for filing which has required (pursuant to the provisions of Section 1.580 or 1.594 of the Rules) local publication (or broadcast) of notice of its filing. In addition, all exhibits, letters and other documents tendered for filing with such applications must also be included in the public inspection file. The same goes for amendments and any correspondence between the Commission and the licensee-applicant relating to the application after it has been tendered for filing. This goes for copies of any Initial Decision by an administrative law judge and any Final Decision in a hearing case. When the licensee has been served with a petition to deny its renewal application, it must file a statement in its public inspection file that the petition to deny has been filed. This statement must include the name and address of the party filing the petition to deny.

Documents incorporated by reference into an application must be included in the public inspection file *unless* (1) a copy is already in the file and (2) the data is current.

A copy of each and every *written* citizens agreement must also be included in the file. The Commission defines such an agreement as:

... a written agreement between the broadcast applicant, permittee, or licensee, and one or more citizens or citizen groups, entered for primarily non-commercial purposes. This definition includes those agreements that deal with goals or proposed practices directly or indirectly affecting station operation in the public interest, in areas such as—but not limited to—community ascertainment, programming and employment. It excludes common commercial agreements such as advertising contracts; union, employment, and personal services contracts; network affiliation, syndication, and program supply contracts; and so on. However, the mere inclusion of commercial terms in a primarily non-commercial agreement—such as a provision for payment of fees for future services of the citizen-parties... would not cause the agreement to be considered commercial...

<sup>1</sup>The rules vary for applicants and holders of construction permits that have not yet begun station operation.

A licensee must also include in its public inspection file applications not included in the section above *if* they involve (1) changes in program service whereby a request for an extension of time is made to complete new station construction or (2) a "short form" assignment or transfer application (which may be accomplished by means of FCC Form 316—voluntary assignment or transfer not resulting in substantial ownership or control changes).

As with applications discussed in the preceding section, all exhibits, letters and other documents filed as part of these latter applications must also be included in the public inspection file. So, too, must correspondence between the Commission and the licensee-applicant if such correspondence relates to the application and occurred after the application has been tendered for filing. The same exception occurs for documents incorporated by reference: the licensee may note that the incorporated document is contained elsewhere in the public inspection file so long as the information contained therein is up-to-date.

A licensee subject to a petition to deny must include in the file a statement naming the party filing the petition and its address.

## Reports and Records

A licensee must include in its public inspection file a copy of each Ownership Report (FCC Form 323) filed with the Commission. The same ancillary documents must accompany the Ownership Reports: exhibits, letters and oth documents filed with the report, all amendments, all documents incorporated therein by reference (except if, as detailed above, the licensee notes that the referenced material is contained elsewhere in the public inspection file and is up to date), and copies of contracts listed in the Ownership Report.

The political file portion of a broadcast station's public inspection file must include the following documents:

(1) A record of all requests for broadcast time made by (or on behalf of) a candidate for public office; this must contain a notation indicating the disposition of the request, and the charge made, if any.

(2) A record of any free time provided to, or on behalf of, a candidate within 72 hours prior to election day.

The political file records must be maintained for a period of two years.

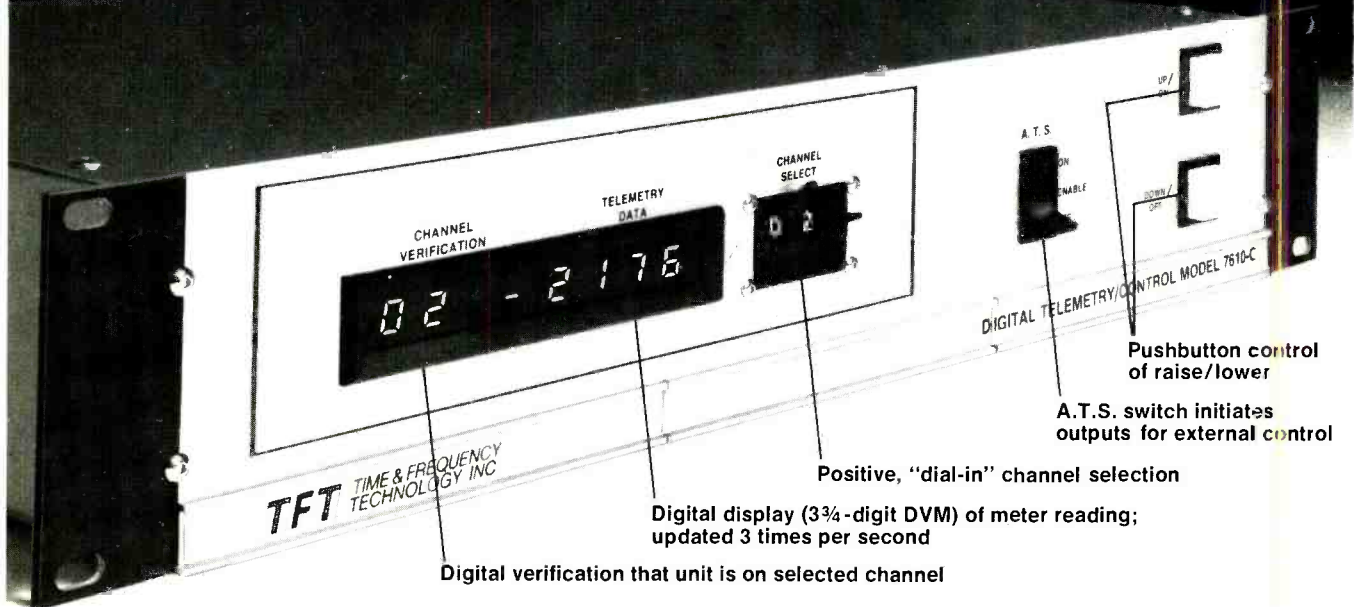
A licensee must maintain a copy of every annual employment report (FCC Form 395) filed with the Commission. In addition, all exhibits, letters and other documents filed with Form 395, and all amendments and correspondence relating to the report must also be filed in the public inspection file. The same exception made for documents that are incorporated by reference applies here: a statement may be inserted that the document incorporated by reference is contained elsewhere in the public inspection file, if the information is up-to-date.

The Public and Broadcasting Procedure Manual, published by the Commission, must be included in all broad-

continued on page 60



# Digital remote control, priced like analog



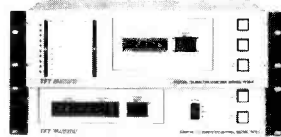
## \$2495

Now you can have ten channels of raise/lower and telemetry in a digital remote control system — the TFT 7610 — that costs only a little more than the most basic analog systems.

With the 7610, you don't have to twiddle calibration knobs or interpolate from meter scales. Instead, you get a positive, unambiguous data display. In addition, you get BCD (digital) outputs that make the 7610 compatible with computer and ATS systems. Most importantly, with TFT digital designs, you get increased data accuracy and fewer errors because of special closed loop data verification.

Along with a low price and digital convenience, the 7610 also gives you convenience features you'd expect to find only in much more expensive systems, if you find them at all.

Calibration, for example, can be done on site by one man. And unique, quick-disconnect barrier strip boards allow you to remove the equipment from the rack without interrupting any of the wiring to the transmitter or sampling points.



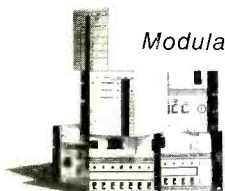
Model 7610 control point (bottom) and remote point modules.

You also have your choice of interconnect setups: telephone lines, STL and SCA or TSL. Data is transmitted via pulse code modulation (PCM), and data modems are built-in.

Modular versatility is another advantage, and a TFT exclusive. For example when and if you want, you can add up to 60 more channels of telemetry and raise/lower, in 20-channel increments. Or, mate the Model 7610 with our Model 7615 Status Monitoring and Direct Control unit. That will give you direct on/off control and status monitoring — up to 30 channels of each. You can add modules at any time in the field.

So, whether you're upgrading an existing system or starting from scratch, specify TFT for remote control. It could be the start of something big.

For details and a demonstration, contact your TFT representative or call the factory. In Canada Caldwell A/V Equipment Co., Ltd., Toronto (416) 438-6230.



Modular digitals for remote control.

## TFT

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## FCC Rules & Regs

cast public inspection files. A copy may be obtained from the Commission. It is surprising how many licensees either fail to realize that a copy of the Manual must be on file, or, when they check, find that the file copy is missing. The Manual must be retained in the file indefinitely.

### Letters From the Public

All commercial AM, FM and TV stations must broadcast periodic public notices of licensee obligations.<sup>2</sup> This statement invites members of the public to submit suggestions and comments regarding station operations and programming efforts by the licensee. A licensee must include all written comments and suggestions in its public inspection file. The only exception is for individuals who specifically request that their communications *not* be made public.

Such letters must be retained in the public inspection file for three years *from the date upon which they are received*.

Television licensees have an added duty. Letters received must be placed in one of the following subject categories: (1) programming or (2) non-programming.

### Annual Programming Report

Television stations must maintain a copy of FCC Form 303-A, the Annual Programming Report, in the public inspection file. This report contains information concerning the station's Composite Week. In addition, each licensee should include a copy of the Composite Week program logs.<sup>3</sup> Station personnel should consult with

<sup>2</sup>Section 73.1202 of the Commission's Rules

their communications counsel to determine the current Commission-designated Composite Week.

### Community Ascertainment

There are several items which relate to community ascertainment that a licensee must include in its public inspection file.

First, a list of *no more than 10* significant problems and needs of the licensee's service area should be placed in the public inspection file on the anniversary date of the date on which the station's renewal application is due for filing with the Commission. Calculating the correct date can be somewhat confusing. For instance, assume that a California station's license expires on December 1. The anniversary date of the license renewal application filing deadline is August 1. It is on August 1, of each year, not December 1, that the significant problems/needs list must be placed in the public inspection file. The problems and needs listed must relate to those ascertained during the preceding 12-month period. Next to each problem and need, the licensee should indicate typical and illustrative programs or program series which were broadcast during that preceding 12-month period that responded to those ascertained problems and needs. (The licensee should consult with Section 1.526(a) (9) of the Commission's Rules for details concerning the annual problems/programs list.)

Second, commercial radio and television stations must include "documentation"<sup>4</sup> of its community leader

<sup>3</sup>AM, FM and TV stations must make *all* program logs available for public inspection 45 days after the log date; these logs need not be maintained in the public inspection file.

<sup>4</sup>Stations in a city of license (1) with 10,000 or fewer residents and (2) located outside of all Standard Metropolitan Statistical Areas (SMSA's) need not undertake this documentation.

continued on page 62



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Sure the radio business is a jungle — a tough competitive battle to survive, to succeed, to excel. That's why we love it. And that's why we call this year's NRBA Convention and Exposition a survival course. As the only big all-radio gathering of its kind, NRBA is tuned in to radio and the challenges of radio today with a special emphasis on engineering.

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and AM stereo . . . the ins and outs of FCC inspection . . . much, much more, including a record-breaking number of exhibitors presenting the latest equipment developments just for you.

It's all yours in small give-and-take sessions. No windy speeches. No wordy presentations. No mutual admiration ceremonies. Just straight engineer-to-engineer talk about survival and success in a tough competitive business.

And when the strictly-business sessions wind up for the day, you'll owe yourself the delights of charming New Orleans, convenient to you from the headquarters location in the brand-new New Orleans Hilton on the Mississippi riverfront.

Mark your calendar: Oct. 9-12. It may be a matter of survival.

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## FCC Rules & Regs

surveys in its public inspection file. The data must be included within a "reasonable time" after each interview (not later than the filing date of the renewal application) and must include:

- (1) The name, address, organization and leadership position of the leader interviewed;
- (2) The time, date and place of the interview;
- (3) The name of the interviewer; all problems and needs discussed during the interview (unless interviewee requests that same be held in confidence); and
- (4) The date of review of the interview record by a station principal or management-level employee when a *non-principal* or *non-manager* conducts the interview.

Third, the licensee must include in its public inspection file documentation<sup>5</sup> concerning the general public survey conducted in the city of license, including:

- (1) The population of the city of license (including numbers and percentages of males and females, minorities, youth and the elderly); and
- (2) A statement of the sources consulted and methods followed in conducting the survey, including the number of respondents and the survey results. This material must be included in the public inspection file within a "reasonable time" after completion of the study. It must be in the file on or before the date that license renewal application is due to be filed.

### Location of Records

Most stations maintain their public inspection file at the main studio. However, it may be located at any accessible place in the community of license and must be

<sup>5</sup>See In. 4.

available for public inspection during *regular business hours*.

### Period of Record Retention

Unless otherwise specified above, applications and other materials placed in the public inspection file must be maintained for seven years from the date upon which the materials were tendered for filing with the Commission. There are two exceptions to this requirement. Engineering documents relating to a "former mode of operation" must be retained only for three years after initiation of operations under the new mode. Additionally, materials must be retained for the longer of these two periods: (1) "until final Commission action on the second renewal application *following* the application or other material in question," or (2) the Commission notifies the licensee in *writing* that it may *dispose* of material having a substantial bearing on a matter which (a) is the subject of the claim against the licensee, or (b) relates to a Commission investigation or a complaint to the Commission of which the licensee has been advised . . . Documents required to be included in the public inspection file that relate to private claims must be maintained in the file until (1) the claim has been satisfied or (2) it has been barred by the statute of limitations.

### Copies of Documents

Members of the public wishing to make copies of materials in the public inspection file may do so. However, the licensee may specify a location at which the copies must be made. Documents must be made available for reproduction within seven days of any request. Reproduction requests submitted by mail do not have to be honored by a licensee. Reproduction costs must be reasonable. **BM/E**



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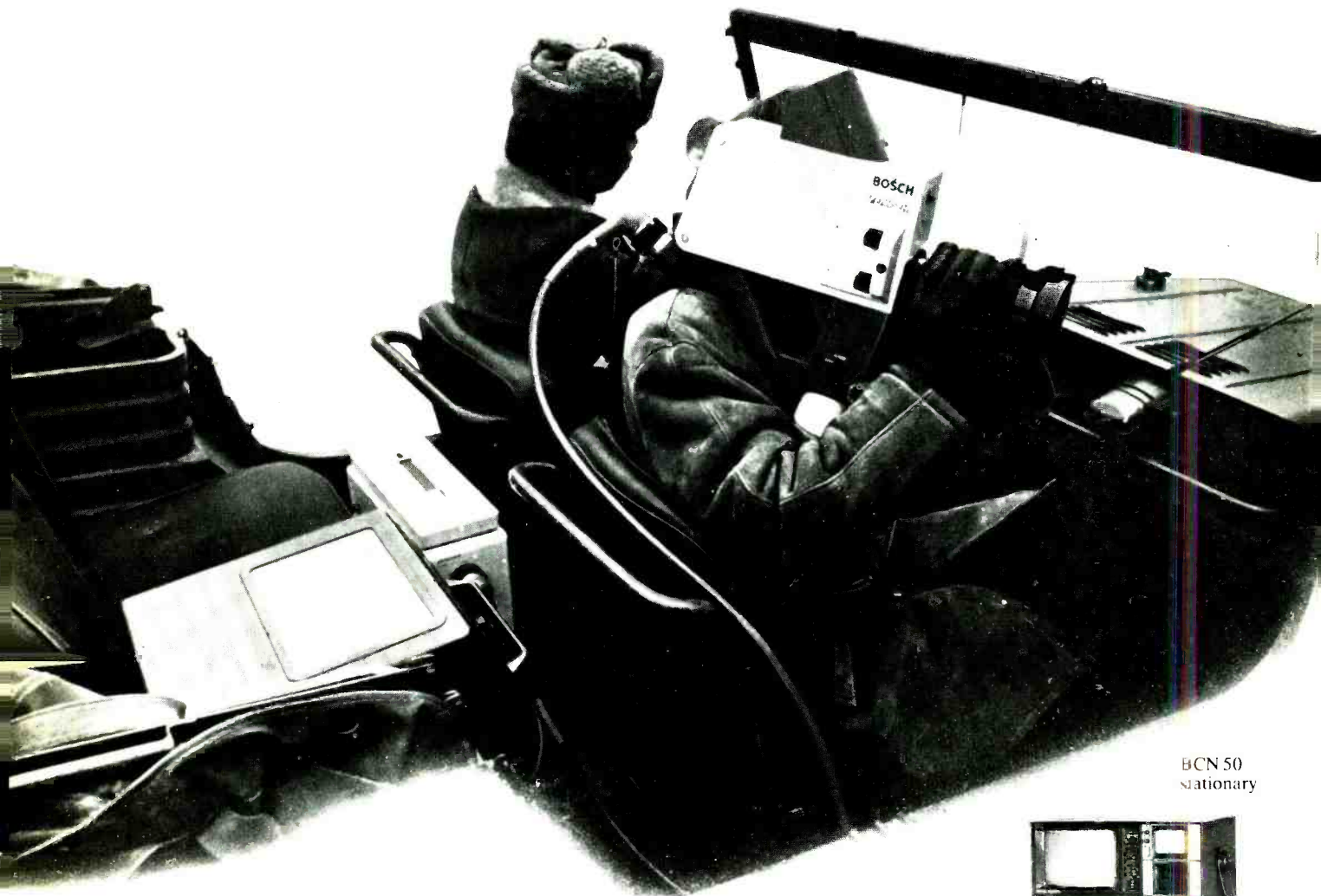
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# GREAT IDEA CONTEST

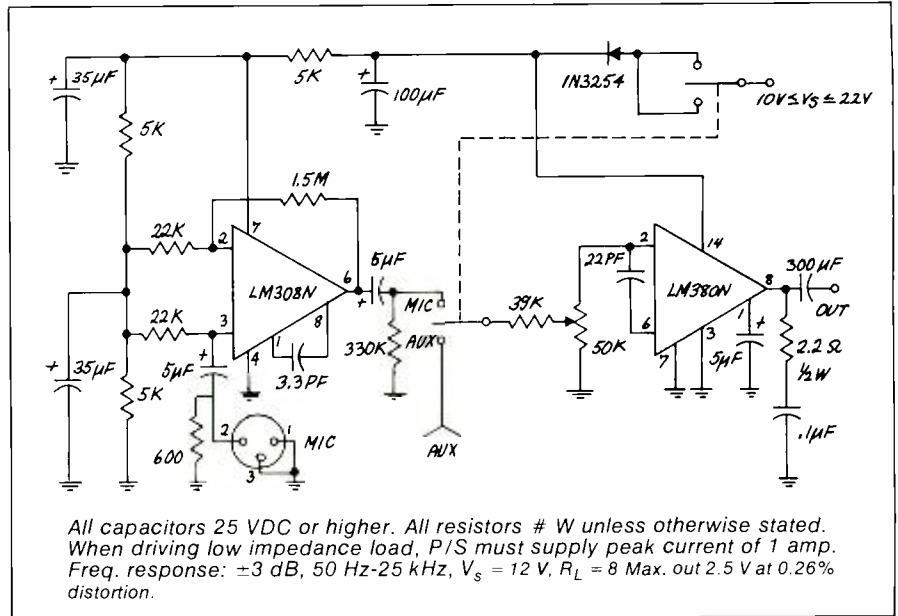
## 15. Amplifier For Checking Audio Quality On Lines.

Tom Schultz, Kernersville, NC.

**Problem:** Build small, battery powered, general purpose, audio amplifier for use with a low impedance, high fidelity headset when checking audio

quality on lines (project originally suggested by Ray Vogler, Assistant Chief Engineer).

**Solution:** The amplifier documented in the attached schematic was constructed in a 5¼ in. × 2⅞ in. × 2⅞ in. mini-box and is powered by an external 12 volt lantern battery or the bench supply. Due to the characteristics of the LM380, the output is current and thermal limited and has a low bat-



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MAXIMUM signal loudness and performance... minimum distortion...with Harris MSP-100 AM/FM/TV Audio Processor.

Extremely flexible, the MSP-100 optimizes your signal no matter what the format. A tri-band AGC processes separate segments of the audio spectrum.

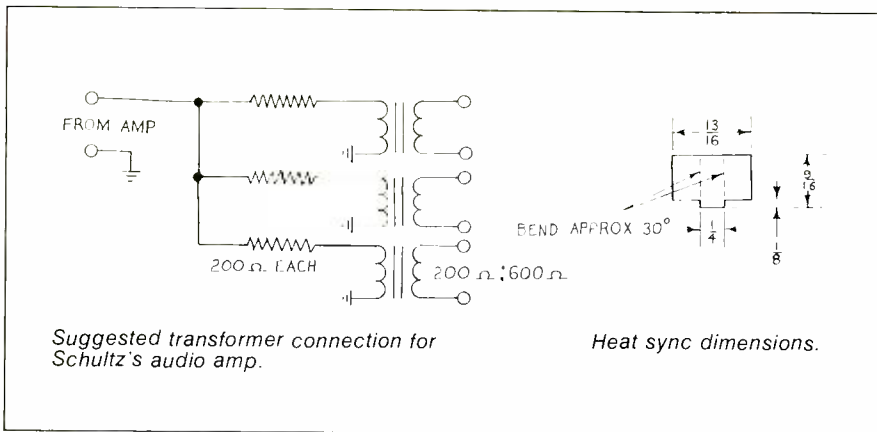
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The MSP-100 has it all, and packs a powerful sound. Write: Harris Corporation, Broadcast Products Division, Quincy, Illinois 62301.





tery drain with no input signal. As noted on the schematic, the frequency response and distortion (as measured on the original) are excellent. Maximum overall gain (assuming constant impedance) is 65 dB using the MIC input and 29 dB using the AUX input. Power output to a speaker is sufficient to be easily heard in a very noisy con-

trol room. Caution should be used when driving a headset as this amplifier can deliver too much power to a close coupled headset if a limiting resistor is not placed in series with the headset.

This amplifier can also be used to drive a 600 ohm line directly or through a transformer to increase isolation or the maximum available output level. It may be used as a D.A. by driving several transformers, each isolated by a resistor equal to its input impedance.

A small heat sink wing should be soldered to the center three pins on each side of the LM380. The originals were constructed from a flattened piece

of copper from 1/2" copper tubing and had the dimensions shown. AUX input connection on the original is by standard spaced five way binding posts to allow use of input cables such as are normally used on a distortion analyzer.

Construction of this amplifier is not critical, difficult or expensive, and the results obtained in terms of sound quality, portability and labor saved are excellent.

## 16. Telephone Record/Send, The Easy Way.

Fred Hildebrand, GM, KVOO Radio, Casper, WY.

**Problem:** The most used desk and wall telephones today, the pushbutton 5 and 10 line models, have a common "black-box" inside that has neat lettered marking of all its terminals but few, (if any), of us know what they mean.

**Solution:** Fig. 1 shows a simple hookup for receive (record) only. Fig. 2 shows hookup for receive and also to be able to send console output back down the line. Note the extra switch utility or whatever, prevents the possibility of feedback besides engaging

continued on page 66

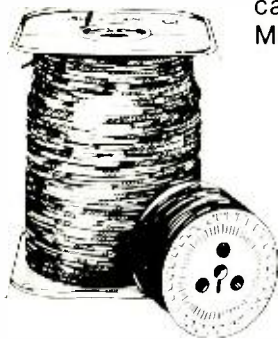
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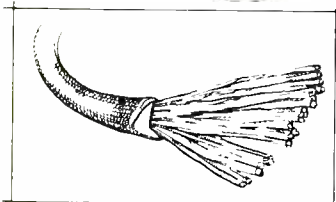
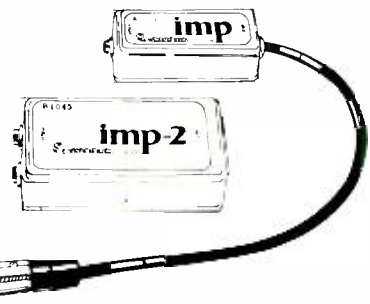
tough and versatile impedance matching boxes that make "direct" line access a snap. High to low and low to high. Splitter/Transformers.

## ALSO AVAILABLE

"Medusa" PA and recording snakes; custom built interfacing for all needs...

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the finest in electronic hardware technology. Positive contact and high cable strain relief from names like Switchcraft, Cannon, and Amphenol. Available in bulk, or as interfacing systems with cable.



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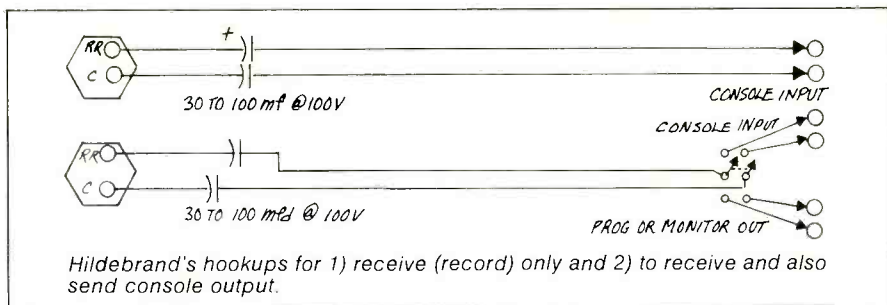
# whirlwind

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## Great Ideas

“feed” mode. Also it’s normally best to use unshielded twisted pair. No RF problems have been encountered with this set-up unless you try to use shields. Ungrounded shielded wire can be used for some runs but beware. Simply hook the pair to the “RR” and “C” terminals inside the telephone and follow the same schematics.

This method also works well for cassette in/out switching boxes in newsrooms, etc., as the levels are near

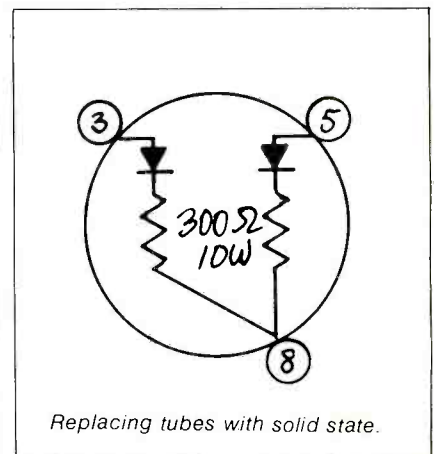


0 dB and no other amp or mixer is required beyond what is in the cassette.

## 17. Solid State Replaces Tubes.

Stuart A. Engelke, Chief Engineer, WMTR-WDHA, Morristown, NJ.

**Problem:** 6 × 5 tubes that continually fail, especially in Gates M02639 modulation monitors.



**Solution:** Replace them with solid state. Diodes 2.5 amp 1000 PIV. Using care with a glass cutter, the diodes and resistors can be built right inside the original tube and glued back together again. In series filament circuits, the filaments could probably be replaced with a 6.3 volt pilot lamp.

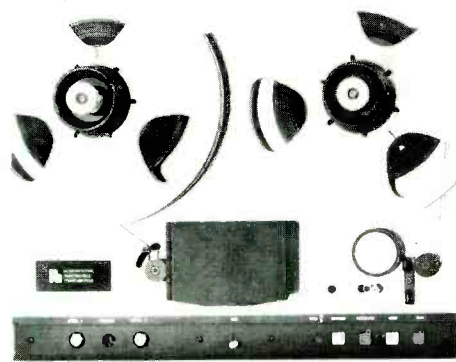
## 18. Unlimited Supply Of Note Paper In Controlroom

Howard L. Enstrom, Broadcast Engineering Services, Black Hawk, SD.

**Problem:** Need for unlimited supply of note paper in controlroom so announcer won't have to use record jackets, cigarette packages, match books, etc. Preferably, supply is out of way and ready for use when taking lost animal calls, telephone talk notes, requests, etc.

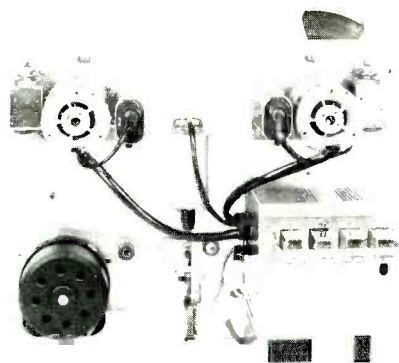
**Solution:** Use wire service paper, with box placed under control console desk. Cut slot in riser for console (if one is used) or cut slot in desk top. Provide friction against paper to keep

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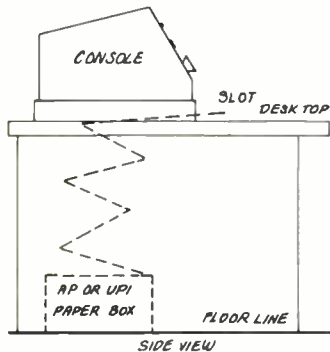
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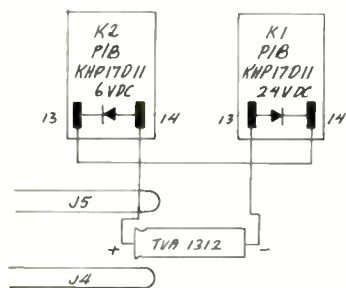
Setup for unlimited supply of note paper.

from sliding back down, and have metal strip for tearing off any length needed.

## 19. Timer Control For Music Cartridges

Cliff Graff, Chief Engineer, WSGW-AM, Saginaw, MI

**Problem:** Providing momentary relay closing to reset timer in conjunction with Criterion Compact cart players used for music playback.



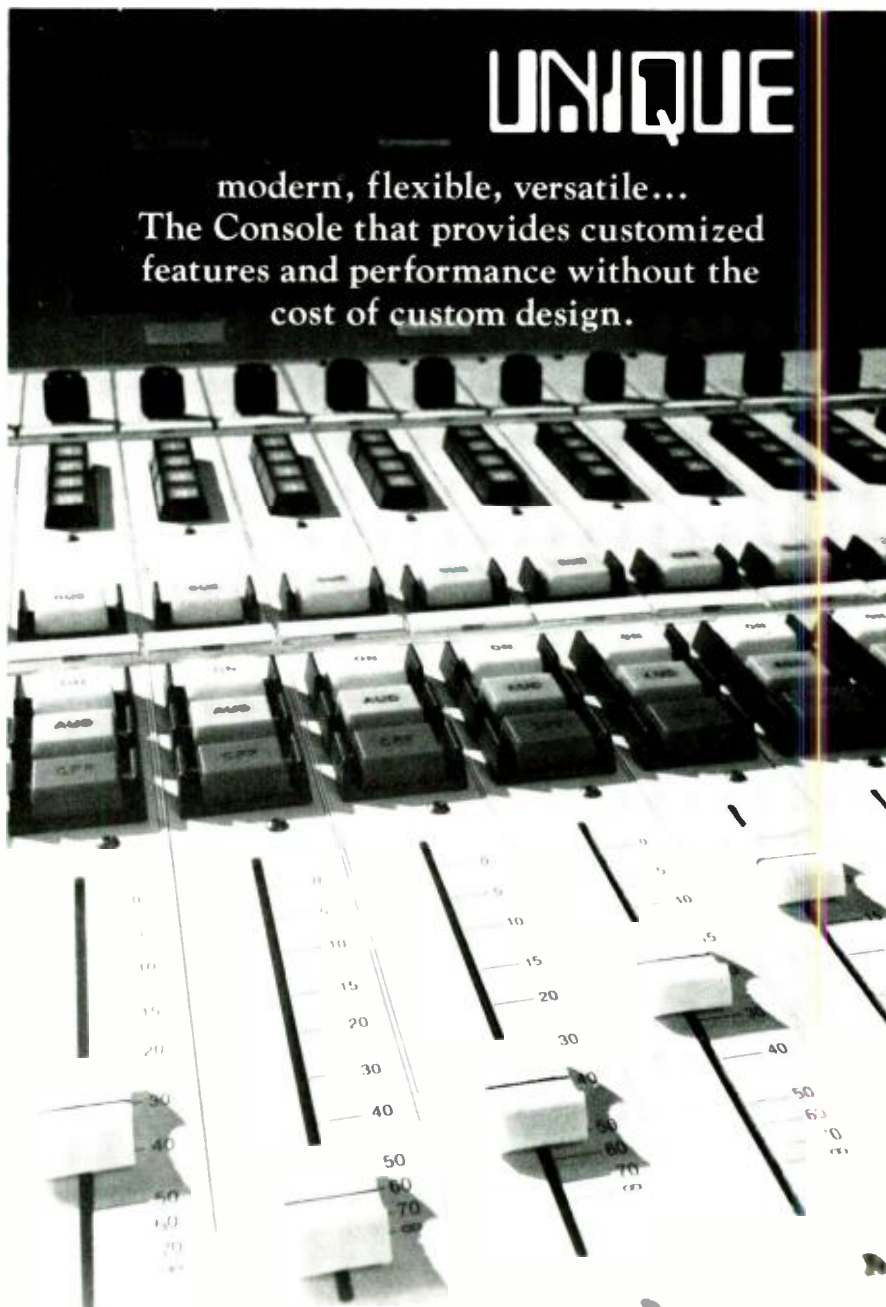
Conversion for timer control.

When first installed we used a recorded tertiary tone at the beginning of each musical selection to reset our ESE Model ES 400 timer which was installed over the console. The timer ran continuously and on reset would time out the selection playing to give in-

dication of time left on selection for accurate program timing. It was a time consuming nuisance to put the tone on cart. We wanted momentary relay to reset timer when run button was pushed.

**Solution:** By using the initial voltage applied to the K1 run relay and capacitive action of an electrolytic capacitor obtained a 6 to 7 volt DC pulse using a Sprague Type TVA 1312, 250 Mfd/50V capacitor. The former 24 V tertiary relay was then replaced with a P/B Type KHP17D11 4PDT 3A 6VDC relay.

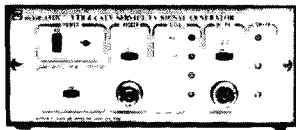
To make the conversion, remove both white wires on term. 13 and 14 of K2, put plastic sleeves over the ends and tie them to the wire cable. Then connect term. 13 of K2 to term. 14 of K1 with short insulated wire. Place capacitor parallel with term. 13 of K1 and 14 of K2. Solder positive end to term. 14 of K2 and negative end to term. 13 of K1. This completes the wiring of the Criterion Compact. To set off the timer, run two wires from term. 2 and 3 of J1 on the cart machine to term. D and E on connector ECI of the ESE timer. **BM/E**



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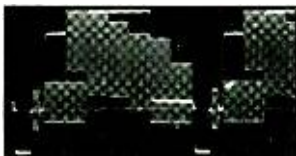
**Model 152N NTSC VTR & CATV  
Service TV Signal Generator**



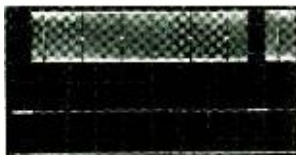
- Generation of sweep signal with color burst and color bar signal.
- Generation of perfect synchronization relation like interleave, interlace equalize pulse etc. With not only color TV and monitor, but also general equipment like VTR, CATV equipment etc. becoming complicated, a high signal source for service use has been demanded. This unit has been designed to fulfill this demand. With a perfect synchronizing signal generator built-in, sweep signal and color bar signal can be obtained as output. For the convenience of the user, HD, VD, and SC output for oscilloscope trigger use can be obtained. This unit can not only be used for service, but also as an auxiliary unit for adjustment of transmission equipment, for unity test of a factory, and for various other applications. Options are also prepared for external synchronization or for output of each synchronization system output. Not only video output, but by option also modulation of TV channels is possible. With a width of 20 cm, a height of 8.5 cm, a depth of 29 cm and a weight of 3.5 kg, the rated output is 1 Vp-p.

**Specification**

- ◆ Chrominance carrier and synchronizing signals are matched the broadcasting standard.
- ◆ Color bar part
- It generates the color bar signal encoded by the balance modulator.



- Switching can be done to FULL FIELD - SPLIT FIELD - (B-Y), (R-Y), W, B.
- Waveform:  
FULL FIELD: 75% luminance white, yellow, cyan, green, magenta, red, blue  
SPLIT FIELD: Lower screen part (B-Y), (R-Y), 100% luminance white, black (R-Y), (B-Y), W, B:  
Whole screen (R-Y), (B-Y), W (100%), black
- ◆ Video sweep part
- Most suitable for color use, as color burst signal can be added.
- As there are few high frequencies, video equipment and filters can be adjusted exactly.
- Easy to understand gated marker method.
- Marker frequencies: 1, 2, 3.58, 4.5 MHz
- Waveform:  
Sweep signal waveform from 50 kHz to 6 MHz, with 1V as period and including TV composite blanking and synchronization signal.



- Set-up: 50% - 20% variable
- ◆ Video output 1 Vp-p
- ◆ Trigger part
- Output switchable to the three types SC, HD, and VD.

**150 series service television signal generator list.**

Model 152N	NTSC, Color bar, Video sweep
Model 1521'5	PAL, Color bar, Video sweep
Model 155N	NTSC, Color bar, Crosshatch & Dot
Model 1551'5	PAL, Color bar, Crosshatch & Dot
Model 158N	NTSC, Staircase, Video sweep
Model 1581'5	PAL, Staircase, Video sweep
Model 158N	NTSC, Color bar, Video sweep Crosshatch & Dot
Model 15113	Video sweep, mainly used in VTR production lines.
Model 150111N	Synchronizing output unit (option)
Model 150112N	Synchronizing input unit (option)
Model 150113N	VHF TV channel output unit (option)
Model 150114	Standard rack panel (option)

**NTI America, Inc.**  
1680 North Vine Street LOS ANGELES, California 90028  
Phone 213 462 8945

Circle 144 on Reader Service Card

# BROADCAST EQUIPMENT

**Two top-of-the-list items shown this month are a new studio video camera with automatic control using a digital memory; and a computer-based system for processing digitized audio signals, allowing an extremely wide range of special effects, limited only by the computer programming and memory.**

**Video Camera 300**

New broadcast color camera has automatics with a digital memory that simplifies operation and minimizes oper-



ation error. The digital system in Model BCC-10 also has a readout which tells the operator when a command cannot be performed and why. System has "on demand" ACT to extend tube life. ACT can be switched off for non-ACT performance. When on, the ACT acts only when excess light is on the scene. The system will also accept non-ACT tubes without modification; and accepts more than 25 different lenses of various manufacturers. Luminance signal-to-noise is rated 54 dB or better under typical conditions. New aperture corrector aids in setting flat response to 5 MHz, (400 TV lines); with the latest tubes typical modulation depth claimed is 50 percent uncorrected. A 10 kHz-bandwidth FM intercom enhances audio quality. AMPEX CORP.

**Low-Light-Level Camera 301**

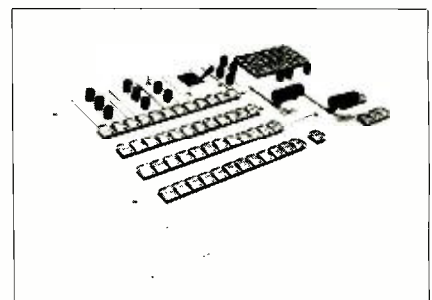
Single-tube color Isocon camera system gives full color output at  $3 \times 10^{-3}$  lumens/ft<sup>2</sup> faceplate illumination. The 6400 series provides NTSC output for extremely low light applications such as live theatrical productions, using the available light. System has automatic light control with adjustable gating window. Light entering camera goes through a filter that encodes the color information optically, allowing

use of a single tube for a video signal with color information. Encoded information from the camera is decoded and processed; then encoded into two NTSC signals, one composite and one non-composite. Automatic black level has manual override. Automatic sen-

sitivity control operates motorized iris and motorized variable density filter between lens and camera. S/N is white, 36 dB; black, 46 dB; resolution is typically 250 lines. COHU.

**Video Production Switcher 302**

Switcher has 12 inputs, including black burst and color, four switching busses. Model 712 (one of series) has built-in black burst generator, colorizer, RGB chroma keyer, downstream preset and program busses; also adjustable soft



wipe and border edges, built-in pattern modulator, many other operating features. Output is rated 1v p-p, response 15 kHz to 5 MHz  $\pm 0.5$  dB, crossface linearity better than 1.5%; differential phase less than 1°, differential gain less than 1%. J&D ELECTRONICS.

**Modular Audio Consoles 303**

New series has standard mainframes that accept desired complement of mic and line input modules, with typical broadcast switching/control capabilities. Included are 15-watt monitor amplifiers, cue, talkback, muting/on-the-air light relays, and provisions for remote control. Model 6012 has 12 channels, for AM/FM stereo/mono, with dual stereo and mono mix output. Model 6022 has 16 mono input channels, for TV audio, two outputs; Model

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6032 is the same with four outputs, including two submasters, foldback, echo send, and equalizers on every channel. MODULAR AUDIO PRODUCTS.

**Video Tape 304**

New color 2 in. video tape has polyester backing, high band characteristics. Color S/N of Model H-701-E is  $\pm 5$  dB, and b&w S/N is  $\pm 1$  dB. Estimated tape life of 2000 passes is claimed, with drop-out of less than 10 per minute, average. Audio sensitivity is within  $\pm 1$  dB. FUJI PHOTO FILM.

**Expander For Mixers 305**

Up to 12 additional channels can be added to the TEAC Tascam Model 5



mixer series with optional expander. The Model 5EX is self-powered, works with all functions of the Model 5, including four line output busses, cue buss, echo buss and solo output. Less than \$1300. TEAC CORP.

**Video Carrying Carts 306**

Carts for carrying mobile video equipment are designed for video field operations. Both operate upright or horizontally, have pneumatic tires, padded equipment shelves with safety straps, cable holders. Mini Carrier holds the essentials—camera, CCU, and portable VTR. Maxi Carrier lets one operator handle camera, CCU, VTR, audio mixer, portable color monitor, lights, and tape storage. \$250 and up. VID-COM.

**Computer Audio Processor 307**

Computer system for sound manipulation is built around Digital Equipment Corp. PDP-8/A minicomputer. The System IV is a completely digital system allowing control of conventional functions such as echo, and also a wide range of special effects—such as Doppler shift and timbre alterations and many unique sounds—with simple keyboard commands. Signals are manipulated with introduction of minimum distortion. The processing is accomplished with computer programs;

the length of delay, for instance, depends on the amount of memory in the computer. Thus the range of effects is extremely wide. \$15,000. COMPUTER MUSIC, INC.

**Digital Timer 308**

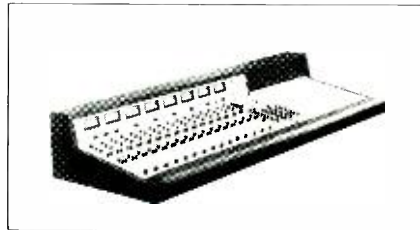
Battery-powered electronic digital timer with digital readout, counts up to 9 hours, 59 minutes, 59 seconds or



shows countdown time from any preset time, with buzzer sounding at the conclusion. Model ET500 allows "time out" for interrupted timing, either up or down. Accuracy guaranteed to 1 second in ten hours. \$59.95. FELDMAR WATCH CO.

**Audio Console 309**

Console with 16 inputs has 8 busses. Model QM-168 has, on each input, a solo, mute, two echo sends and two cue



sends, six-frequency equalizer on 3 knobs, mic/line switch. Pushbutton selects bus, line or playback. \$5900. QUANTUM AUDIO LABS.

**Time Lapse VTR 310**

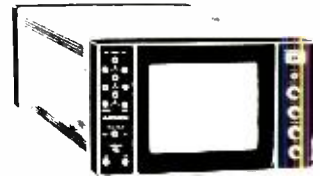
VTR operates for 1, 25, 50 and 85 hours of recording on standard 1/2-in. 2400 reel of video tape. Model XL-5500 can be switched manually or remotely from time lapse to real time. It has internal 2:1 sync generation; frame by frame advance; audio and still

continued on page 70

Available in NTSC, PAL and SECAM

The honest-value compact color monitors  
**AMTRON**  
RACK MOUNT  
COLOR MONITORS

**AMTRON**  
AM-5



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PHONE: (408) 688-4445

IN EUROPE CONTACT: C.W. CAMERON LTD  
GLASGOW TELEX: 779469

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## Broadcast Equipment

frame. Format is EIAJ-1. JAVELIN ELECTRONICS.

### High Brightness Display Tube 311

High brightness character display tube operates much like a cathode ray tube. The front plate carries a high-luminance phosphor energized by a flood of electrons. Between cathode and face plate is a seven-segment mask with a lead brought out from each segment so they can be switched. Switching can be at electronic speeds, requiring only 5 volts at 10 M ohms input resistance. Sizes up to about 25" diagonal can be made, with luminance up to 2000 ft—lamberts. Special characters can be installed, such as switched arrows for direction indicators and walking figures for pedestrian signals. Supply voltage is 12 V DC. ENGLISH ELECTRIC VALVE CO.

### Light Precision Tripod 312

Aluminum tripod weighs 8½ lbs., has maximum height of 6 ft. 7½ in. and minimum of 2 ft. 2 in. Super Stix has removable leg wedges for low angles,

adjustable friction, hooks for paraphernalia, reversible rising column, balanced carrying handle, leather shoulder strap, \$695 with Miller F head; \$995 with Ronford F-1 head; \$960 with O'Connor 30 head. IMAGE DEVICES INC.

### Fluid Camera Head 313

Aluminum head for film and video cameras weighs 4½ lbs., carries cameras weighing up to 30 lbs. Model 30 is a fluid type with infinitely variable drag adjustment; 360° pan; ±60° tilt. Counterweight adjusts to match cameras from 30 lbs. down to zero. Handle can be set for right or left hand operation. List \$625.00. O'CONNOR ENGINEERING LABS.

### Direct Burial Line Layer 314

Four-wheel drive prime mover has direct-burial line layer and reel carrier. Model DH5 has a dual hydraulic system to balance power requirements between ground drive and plow oscillation. Vertically oscillating plow buries electric, CATV lines, telephone, underground sprinkler systems, etc. Engine is 55 hp liquid cooled diesel, giving 3.5 mph working speed, both forward and re-

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verse. Drive has limited-slip differentials and four-way articulation, for maneuverability in close places. DAVIS MFG., DIV. OF J.I. CASE.

### Head For Tape Certifier 315

Replacement head for Recortec tape certifier is made of hot pressed-glass bonded ferrite; life expectancy 10 times that of metal heads is claimed. New head is compatible with existing electronics; no modifications are needed. SAKI MAGNETICS.

### Video Tape Cleaner/Rewinder 316

New system cleans, retensions and rewinds video tape into a precision stack. Model VTC-160 does not erase tape, but is designed to eliminate cinching, windowing and other forms of tape damage from faulty winding. It is available for 2 in., 1 in. and ½ in. tape, and runs at 150 ips. LED display indicates tape running time at various operating speeds from 7½ ips to 60 ips.

## Generator - Reader - Video Generator

Datametrics Model SP-722 Generates / Translates SMPTE Code and Displays Time on Video Monitor along with Subject Matter.



#### Generate

- Time Code/User Bits
- Video Synchronization
- Jam Synchronization

#### Translate

- 0.25 to 10 Volt Sensitivity
- 1 to 40 Times Speed
- BCD Outputs

#### Time Display

- Infinitely Positionable
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## New from Holland Electronics!

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- FULL REMOTE CONTROL TO SEVERAL HUNDRED FEET
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970 East 92nd St., Brooklyn, N.Y. 11236 (212) 649-7330

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switch selectable. \$4600 and up. KYBE CORPORATION.

**Low-Cost Video Camera 317**

Two-tube color camera is designed for Betamax, V-Cord, VT-150 and other similar video recording systems. Model CCS-150S comes with a CCU-150 control unit, has a 6:1 (12.5 to 75mm) zoom lens, built-in microphone, built-in 1.5 inch electronic viewfinder, automatic/manual aperture control, servo iris sensitivity selector, and claims horizontal resolution better than 300 lines. Camera head weighs less than 6 pounds; an optional battery-operated CCU provides greater portability. \$2550. AKAI AMERICA LTD.

**Zoom Positioner For Telecines 318**

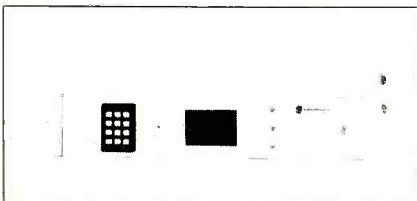
Zoom blow-up positioner for telecine film projectors allows correction of compositional errors, zoom in or out while transferring film to tape, pan or tilt independently. Unit also allows reposition for title insertion, mixing film with chroma key scenes, and "building" commercials on telecine. Pan, tilt, focus, iris controls are independent, with manual or servo motor drives. No alteration to projector is needed. Models are available for nearly all standard 16mm and 35mm projectors. \$3000 to \$4200. WARREN R. SMITH CO.

**High-Gain Klystrons For UHF 319**

New klystrons cover range 470 to 698 MHz with peak output of 57 kW, for final amplifier tubes in both visual and aural sections of UHF-TV transmitters. Models VA-953H and VA-954-H allow multiplexing both visual and aural signals at 50 to 75% of the visual-only rating. Gain is at least 47 dB, for 55 kW output from 0.7 watts RF drive. Efficiency is up to 42%. bandwidth of one dB is at least 7 MHz over the tuning range. VARIAN.

**Digital U-Matic Timer 320**

Timing system allows pre-programming of up to 65 different events,



within one second accuracy. DCP-65 digital clock programmer operator sets up start time for each event with panel  
continued on page 72

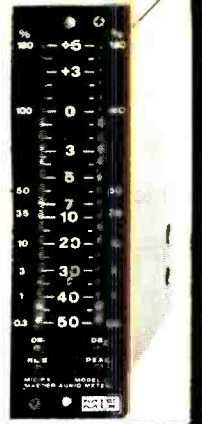
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Excellence is achievable if it can be measured. Master Audio Meter is a precision dual-channel panel instrument that can display those important PEAK program levels as well as RMS (VU) values, selectably in stereo or simultaneously in mono.

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**One (or two) for the road.**

Thomson-CSF Laboratories keeps breaking conventional sound barriers (cords and booms) with RF microphone systems that offer reliable transmission with excellent range and true high fidelity.

First, the RM-102 single channel portable system provides one full diversity channel for field and remote broadcast use. Or, if multiple channels are needed, where no AC power is available, the RM-104 solves the problem. Two full diversity channels can capture action dialog on the set or in the field, making it fully usable for filming or taping. 950 MHz diversity reception achieves drop-out free performance, and both systems come with transmitters and antennae so they're complete and completely portable.

**Now Portability Plus.** Thomson-CSF takes portability a step

further with its new ENG 101 single channel miniature, portable diversity microphone system, specifically designed for use with today's miniature ENG cameras.



Model ENG 101 transmitter and receiver.



RM-102 transmitter and receiver.

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## Broadcast Equipment

the real time and the time of the next event. When the two coincide the event readout moves to the next event. Clocks function as 24 hour timers, with readout in military time. \$495.00. SYSTEMATICS, INC.

### Lightning/Surge Arrestor 321

Three-electrode gas tube lightning and surge arrestor can handle a single surge of 24,000 amperes on an 8 microsec/20 microsec rise/fall. Model THH-46 also handles 250 surges of a 10/1000 waveshape at one minute intervals. 500 amps per electrode. On DC or any slowly rising ramp voltage, firing is from 300 to 500 V DC. Unit has low capacitance, 1.5 pf line to line, 2.5 pf line to ground, so it can be used at comparatively high frequencies. In action, the unit instantly grounds both sides of the line when either is surged. TH CORP.

For more information circle bold face numbers on reader service card.

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Use a postcard to give us the call letters of your station and its category, AM, FM or TV. In a few words as possible describe why your station is best, such as its overall operation, a recent modernization or completely new facility. Provide us with the name and telephone number of the person who can give us the details. The stories of the finalists will appear in the December issue of BM/E to be voted on by our readers.

### Mail to:

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Requirements include technical strength in AM and FM broadcast, 3-5 years or more of directly related overseas experience and at least 2 year Associate's degree in Electronics (BSEE preferred). Ability to work with minimum supervision is essential.

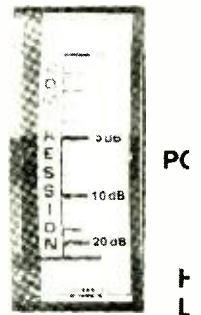
Advantages include salary fully consistent with your qualifications, plus overseas incentives and compensations for international field expense assistance. Please send resume with salary data in confidence to: Mr. Lawrence R. Carlstone, Professional Employment Supervisor, HARRIS CORPORATION, BROADCAST PRODUCTS DIVISION, Quincy, Illinois 62301.



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7.5 - 20 kHz

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Ampex, headquartered on the San Francisco Peninsula, is the company that "invented" the magnetic recording industry.

The technology pioneered by Ampex over three decades has affected many aspects of our modern lifestyles, and has established Ampex as a leader in magnetic recording. Our continued effort in developing new technology has always been the key to our leadership. Right now our Advanced Technology, Data Products and Audio-Video Systems Divisions are embarking on several new programs. To insure the success of these programs we are seeking innovative graduate engineers with experience in the fields listed below.

Opportunities like this don't happen very often. But they're happening at Ampex now.

## Advanced Technology Division

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- magnetic recording
- tape or film handling
- servos
- high-bit rate digital circuit design
- optics
- signal analysis
- pattern recognition
- high frequency circuit
- communications theory

## Data Products Division

- circuit/systems design of very high-bit rate systems

- disk read/write systems and equalizing systems for tape recorders
- codes for magnetic recording
- precision servo systems for both linear positioners and rotating systems
- mechanical design of high precision systems in disk recorders and in longitudinal, helical and transverse scan tape recorders

## Audio-Video Systems Division

- analog videotape signal systems
- digital video signal processing
- servo systems
- videotape editing
- professional audio recorders
- head technology
- TV cameras

If you think you have something valuable to offer in any of these or closely related areas, and if you would like to join some of America's most talented engineers, please send your resume or a letter outlining your qualifications to: Ampex Corporation, ATTN: Corporate Staffing Manager, Building 2, 2655 Bay Road, Redwood City, CA 94063. Or you can send us this coupon and we'll get back to you. We are an equal opportunity employer m/f.

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Dept. 5

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Address \_\_\_\_\_  
City, State, Zip \_\_\_\_\_  
Phone \_\_\_\_\_

Occupation \_\_\_\_\_  
Years of Experience \_\_\_\_\_  
Employer \_\_\_\_\_



## OUTSTANDING OPPORTUNITIES

# VIDEO ENGINEERING

Our client, a major division of a Fortune 200 company, has the following openings for video engineering professionals who are interested in becoming part of a team of leaders in State-of-the-Art television camera tubes.

## SALES ENGINEER

This position will locate you in an attractive Southeastern sales territory, and requires an engineering degree, plus solid experience in television camera, camera set-up and television systems. Your hands-on experience in these areas, along with knowledge of broadcast equipment, and good human relations skills will make you a key member of an exciting team.

## SR. APPLICATIONS ENGINEER

Your BSEE and 5 or more years experience in TV systems design, including thorough knowledge of TV systems equipment, cameras, camera systems and circuitry will qualify you to join a dynamic staff. This position offers an excellent compensation package and advancement potential in a modern Southern New England facility.

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The State of Montana Communications Division will accept sealed bids through 10:00 a.m. October 28, 1977 for the following equipment:

### TELEVISION TRANSMITTER:

Harris-Intertype Gates Division, model BT-50H; channel 7/offset minus; visual frequency-175.240 MHz; aural frequency-179.740 MHz; 50 Kw visual power; 10 Kw aural power; 220 VAC 3 phase 60 Hz supply voltage; TD-40H notch diplexer and equalizer; automatic power control; plus all other required inside RF equipment, cabinets and accessories for complete installation.

### TELEVISION ANTENNA:

Gates model TAH-10HM Helical antenna for operation on channel 7 minus; main lobe power gain 9.0 x 9.54 db; horizontal gain 8.8 x 9.44 db; 50 Kw power rating; antenna is designed to support a flange mounted 6-bay channel 4 batwing antenna. Transmission line and accessories included.

Both transmitter and antenna were built in early 1975 but have never been uncrated or used. Both have been kept in conditioned storage since delivery. For a complete list of the items being offered and the required terms of the sale, contact: Curt Wheeling, Administrator, Communications Division, Department of Administration, Sam W. Mitchell Building, Helena, Montana, 59601, Telephone (406) 449-2586.

## BROADCAST TECHNICAL OPPORTUNITIES

(All Fees Paid)

Alaska, TV Operator	\$12,000
Alaska, TV Maintenance	\$20,000
Arizona, Radio Chief	\$10-12,000
California, TV Maintenance	\$20,000
California, TV Assist. Chief	\$15-18,000
Connecticut, TV Camera Mfr	\$20,000
Florida, Assist. Chief TV	\$15-17,000
Georgia, Industrial TV Chief	\$15-20,000
Idaho, TV Chief Engineer	\$18,000
Kentucky, TV Maintenance	\$11-16,000
Massachusetts, Chief Prod House	\$17-19,000
Montana, TV Xmitter Supervisor	\$10,000
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