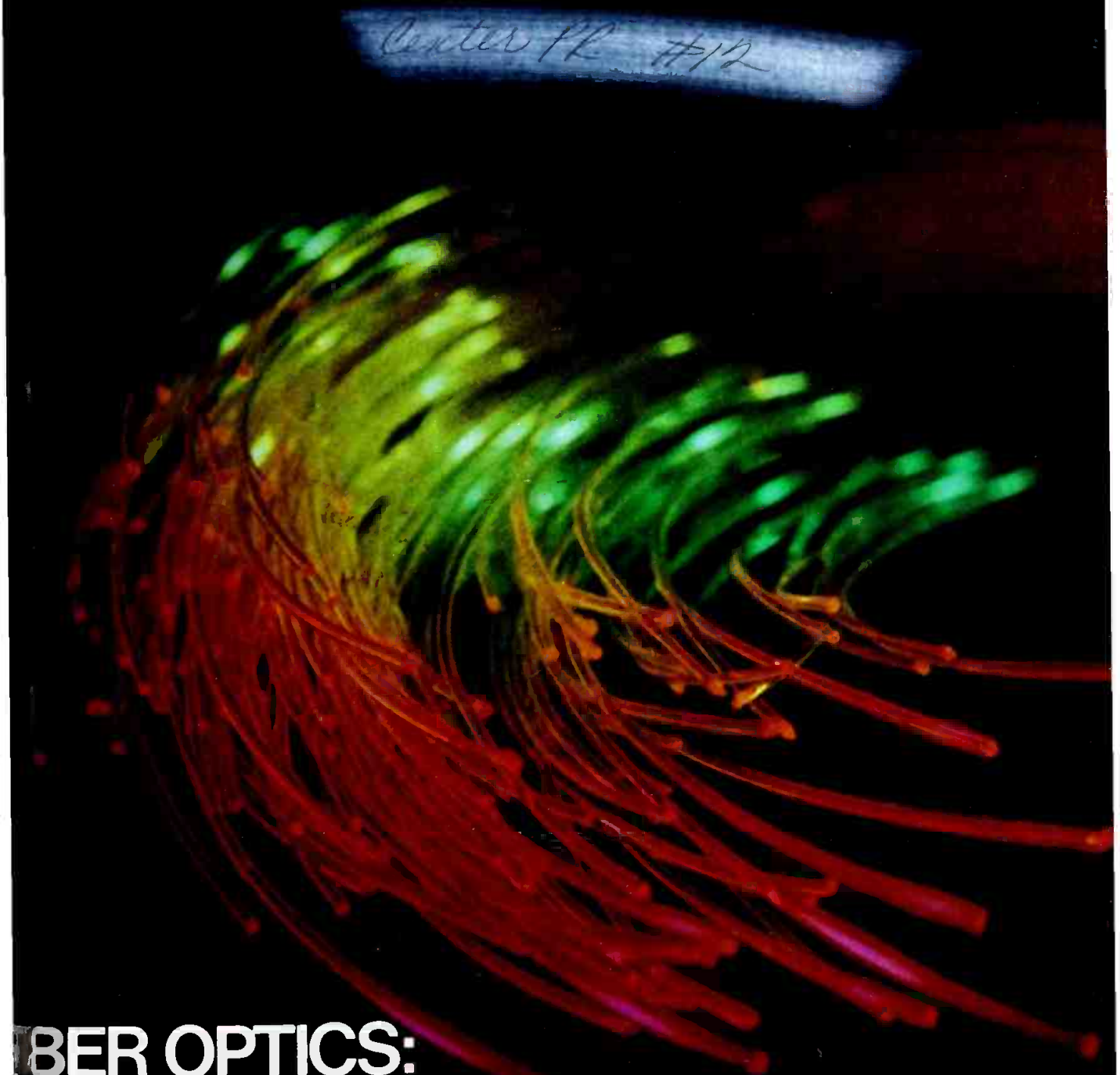
December, 1976/75 cents

ROADCAST ENGINEERING



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For More Details Circle (1) on Reply Card

BROADCAST engineering.

The journal of the broadcast-communications industry — *December, 1976 Volume 18, No.*

About The Cover

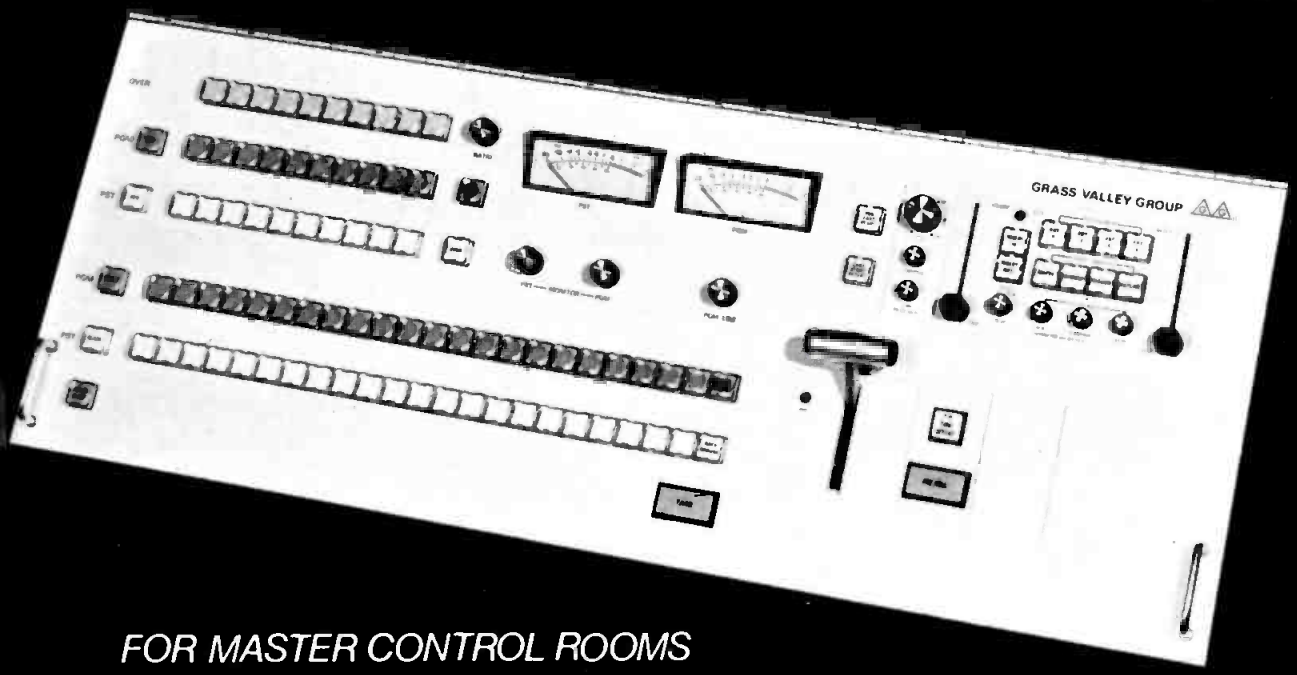
We're guessing that Optical Fibers will find their way into broadcasting, but it will be some time coming. Our what's ahead issue starts with Optical Fibers on page 22. *Photo is by Ron Whittaker*

Departments

GRASS VALLEY GROUP

MODEL 1600-4T

AUDIO/VIDEO SWITCHER



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DIRECT CURRENT FROM D. C.

December, 1976/By Howard T. Head and Harold L. Kassens

CB Expansion Takes Effect

Beginning January 1, 1977, the Class D Citizens Band at 27 MHz will be expanded from 23 to 40 channels. The expansion of the band is expected to extend the already severe harmonic interference problem now affecting TV Channels 2 and 5 to include TV Channel 6 as well.

At the same time, the requirements limiting CB harmonic radiation will be tightened from the present 49 dB below carrier to 60 dB. Broadcast and receiver interests have maintained that this limit falls far short of that necessary to provide adequate protection to TV reception insisting that suppressions on the order of 100 to 110 dB below carrier are needed.

The CB people maintain that much of the problem of CB interference arises from audio rectification, affecting not only TV receivers but other home entertainment instruments as well. Whether this is so may very well be determined by a series of in-depth investigations which the FCC's Field Operations Bureau (FOB) is undertaking in the field, as well as other testing under way. In the meantime, the Commission has insisted that much of the blame lies in the inadequate performance of TV receivers, although it is hard to see how a receiver can be designed to reject a radiated r.f. harmonic. Hopefully, the tests now under way will provide at least some answers to this question.

FM Height/Power Reduction Formula Challenged

The FCC Rules established a maximum limit of 100 kW ERP for Class C FM broadcast stations. Exceptions are provided, however, in the case of stations operating prior to the existing classification scheme employing power in excess of this value. In a recent case in Florida, a Class C station requested authority to increase its antenna height from 205 to 598 feet and to change site while retaining its (above-maximum) power of 160 kW. The application was granted by the Commission's staff, but was taken back when opposition was filed. On reconsideration, the Commission granted the application for the new location and the new

Continued on page

"This is probably a terrible conversation to have during the dead of winter (Eastern style, that is), but Broadcasters who have visited our California marketing headquarters on the beautiful Santa Barbara coastline tend to identify us as the "Sea-Tek" Broadcast Group.

Curiously, we actually pronounce our name "SEA-TEK" . . . with an S, and an E, and an A, for your S-E-A . . . with a T, and an E, and a K, for your T-E-K—SEA-TEK.

However, when we print it, we spell it Cetec . . . with a C, and an E, and a T, and an E, and a C.

Well, enough of this. There's a lot more from the good group at Cetec on the following page.

Read on . . ."

DIRECT CURRENT FROM D. C.

Continued from page 4

height but reduced the power to the 100 kW maximum. The reason for the action was the rule that super-power stations cannot extend the distance to the 1 mV/m contour.

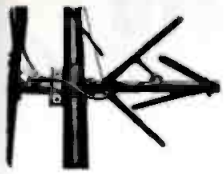
Reinstatement of TV Translator Channels Urged

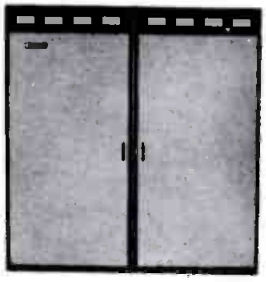
The Council for UHF Broadcasting (CUB) has requested the Commission to restore the use of UHF TV channels 70-83 for use by UHF TV translators. These channels were originally part of the UHF TV band, but were eliminated when this frequency space was vacated for land mobile use. Existing translators above Ch. 69 were permitted to continue operation on a secondary basis to land mobile, but no new authorizations are being issued.

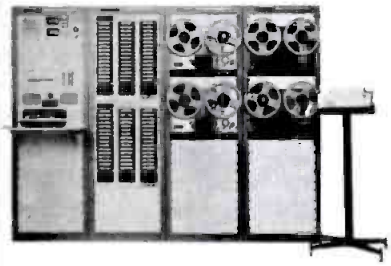
CUB, noting that it is already difficult to find frequency space for translators in the preferred range of Channels 54-69, has urged the Commission to resume licensing of translators on the higher channels. One of the arguments advanced in favor of such an action is that the principal use of the band for land mobile operation is likely to be near large metropolitan areas while the greatest need for TV translators is in outlying areas where land mobile requirements can be satisfied at lower frequencies.

Short Circuits

10-Watt non-commercial educational FM broadcast stations may now use Third Class Radio-telephone operators without broadcast endorsement or holders of restricted radio operator permits - under certain conditions...The Commission has reminded all stations that, in cooperation with the FAA, the painting requirements for antenna structures were changed in October, 1970 with the proviso that all towers must comply with the new requirements by November 1, 1977...From now on, when you file papers in rule-making proceedings, you only have to file an original and five copies instead of the 12 copies formerly required.







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Cetec Corporation's major divisions in the broadcast equipment business are now united to meet your expanding needs! The specialists that make up the Cetec Broadcast Group are:

Cetec Schafer. The World renowned leader in radio automation, with a tradition of quality and rugged dependability. Schafer manufactures a wide line of automation for every format and station size . . . all with features that you won't find anywhere else.

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Cetec Jampro. The antenna specialists with circular FM antennas for every power level . . . each with performance specifications second-to-none. Jampro is now the company with a circular TV antenna for either VHF or UHF, too!

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For More Details Circle (5) on Reply Card

INDUSTRY NEWS

NAB Is Booked Solid For March Convention

All exhibit space for the 1977 annual convention of the National Association of Broadcasters in Washington, D.C. has been sold.

The convention will be held March 27-30 at the Washington Hilton, Shoreham Americana and Sheraton Park hotels.

NAB Exhibit Manager Edward L. Gayou said at the annual NAB exhibitors' meeting, that 188 associate members have signed up to exhibit broadcast equipment at the three hotels. At the 1976 convention at Chicago's McCormick Place, the total was 182.

Gayou said a total of 84,502 square feet has been assigned and a waiting list of firms will be established in the event of cancellations. He added that this is the first time all space has been sold by the time of the exhibitors' meeting.

Meanwhile, the National Association of Educational Broadcaste held their annual convention Chicago. Attendance reached a ne low, and the exhibitors who d show up did little business. On tabbed the "little NAB", the Ass ciation saw a near shutdown of t exhibit area on the second day the meet.

The problem runs in sever directions, not the least of which the Association's emphasis on fun ing and other strictly educatio television problems. From the e hibitor's standpoint, the conve tions should have allowed mo time for floor traffic in the exhib area. The feeling toward the clo of the convention was that e hibitors would not show next yea A second exhibitors' meeting w held on the last day of the co vention. While it served to clear t air, it was already too late.

SMPTE Winter Conference Will Focus On ENG's Future

Beyond ENG—the future of Electronic News Gathering, and Digital Television will be the subjects of the Eleventh Annual Winter Television Conference of the Society of Motion Picture and Television Engineers. The Conference will be held Friday and Saturday, January 28 and 29, at the St. Francis Hotel in San Francisco.

The ENG session will explore current production methods and take a look at this rapidly advancing technology. A panel discussion by ENG users should provide a lively exchange of ideas and experiences.

The session on digital television will cover a variety of subjects including digital disc recording, progress on digital video standardization, and digital and analog video enhancement techniques.

Beyond ENG is the topic f Friday's sessions. Lee Marvin, Tel vision Research International, an David Fibush, Ampex Corporatio are the session chairmen. The top for Saturday's session is Digit Television. The chairmen for t session are William H. Orr, Orr Corporation, and Louis Pourcia International Video Corporation.

For Latest News See Direct Current page 4

First they cut your budget. Now they scream for video quality.

VPR-1 makes you a hero.

Unbelievable VPR-1 produces spectacular broadband color pictures in a one-inch helical format. Viewed side-by-side against a quad machine, it sounds professional engineers. You'll probably buy your VPR-1 because you want quality and versatility priced to fit your budget. But once you get your feet wet, you'll want to add the optional Automatic Scan Tracking (AST) accessory. It upgrades your VPR-1 to an entire *system*, with one-fifth speed slow motion, still frame, manual jogging, and real-time video verification features. Add the optional digital time base corrector, and the entire bag of tricks can be broadcast commercially, without compromise.

You can put in-house productions on the air, because they'll have all the polish, creativity and audience appeal of network programs. That's the league a VPR-1 puts you into.

VPR-1 is the one-inch helical recording system from Ampex, designed for users who can't take chances.

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For More Details Circle (7) on Reply Card

NCTA Hits Restrictive Rules

Burt I. Harris, Chairman of the National Cable Television Association, has urged the Federal Communications Commission to do away with its restrictive rules that have served as "copyright" substitutes.

He also outlined the industry's recommendations on several cable television issues scheduled for action by the FCC this fall. Specifically, Harris focused on the 1977 refranchise deadline, redefinition of cable, and subscriber rate regulation.

Appearing before an en banc meeting of the FCC, Harris told the Commissioners that with the recent passage of the Copyright Revision Bill, syndicated exclusivity and signal carriage restrictions base cable's failure to "pay" for programming it received coul longer be justified.

"The Commission's rational these rules was the alleged u competition provided by cable tems using products for which didn't pay," he said. "Irrespe of the original merits of position, it is now moot."

Harris said fears of ca adverse economic impact on tablished broadcasters—the F other major regulatory ration were virtually groundless.

"The difference which previ existed between parties who copyright and parties who did have been eradicated," Harris the Commissioners. He urged agency to eradicate the now lete regulatory differences bet cable and broadcast television.

The 1976 Copyright Law, w becomes effective in January, 1 grants CATV systems a compu license for the carriage of all r and television broadcast sta whose carriage is authorized by FCC. The new law also req CATV systems to pay for carriage of all distant non-net television programs.

Harris also focused on se cable issues now pending before FCC, among them the 1977 franchise deadline, redefinitio cable, and subcarrier rate reg tion.

In March 1977, Harris said, s 5,000 CATV systems will be quired to file "amended franchi with the Commission in orde meet the certification requirem

Harris said that while NCTA in accord with the Commissi proposal to conform to the rule has "grave concern about Commission's requiring that t rules must be reflected in franc prior to the normal date of franchise."

Irrespective of what action Commission takes on the refranchising issue, Harris s three important public interest cerns must be considered.

- No cable operator should his ability to serve the pu jeopardized as a result of the C mission's desire to obtain franc uniformity.

PEACE OF MIND.

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as or updating the ones
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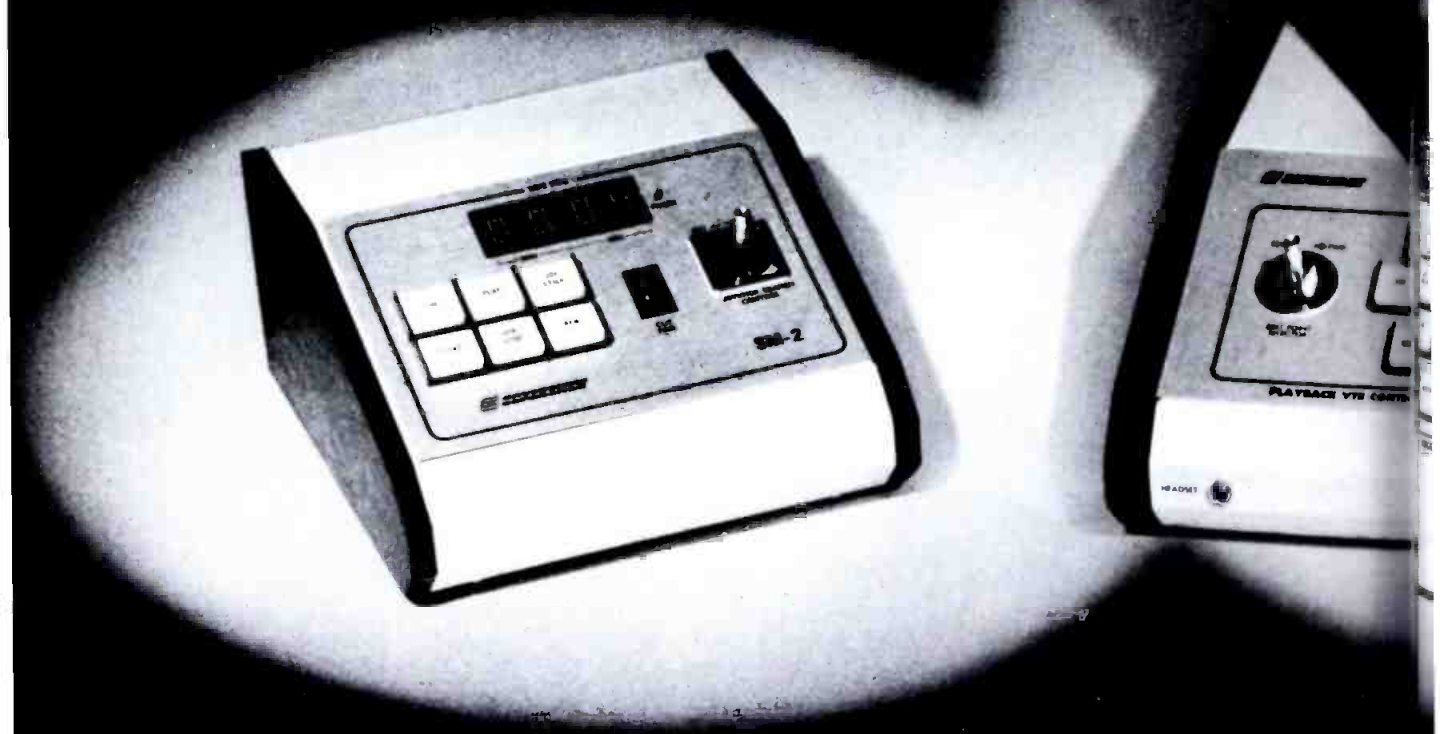
For More Details Circle (9) on Reply Card

Introducing the Family o

Now you can add that perfect touch of editing professionalism to any news story or commercial on helical videocassettes with Convergence Corporation's Family of Fabulous Frame Finders. Discover how fast and easy it is to find any frame you're looking for and how simple it is to automatically do what you want once you're there.



SM-2 Joystick Search Module gives you incredibly flexible tape handling and remote control on a stand-alone VCR. The unique Convergence joystick allows you to see pictures at speeds continuously variable from still frame to three times normal play in forward and reverse. The LED tape timer lets you quickly screen and log news stories or commercials for pre-edit decision making. The SM-2 also programs precise on-air roll cues and lets you slave extra playback machines for A/B rolls.

ECS-1 Joystick Editor provides, for the first time, l style editing flexibility on helical videocassettes. New film editors converting to video tape find the ECS-1 a to operate. In fact, networks and group owners are al using the ECS-1 by the hundreds. Production houses h found our Editor to be perfect for economical on-line off-line editing. The Convergence Editor is great by it but it's fantastic when combined with the PC-3 and th TT-4 – the newest members of our Fabulous Family.

abulous Frame Finders.

Digital LED Tape Timer fits neatly under the mon- a standard ECS-1. It counts control track pulses to know where you're at and where you're going. It's iat helical video tape editors have been looking for. -4 counts up and down and can be reset to zero or to any number. It even times assemble edits to u accumulated program time. Buy it now or add

PC-3 Program Computer combined with the ECS-1 gives you precise end insert timing and scene duration timing. Insert and stopwatch functions are programmable with the simple-to-operate PC-3 computer keyboard. Now you can automatically preview insert edits as many times as you want and trim them up to ±99 frames from the keyboard. What's more, plug your PC-3 into a TT-4 and get keyboard access to automatic bidirectional tape search.

the time and trouble out of your VCR searching and editing. Join the Family of Fabulous Frame rs today. They'll help you find exactly what you're looking for. For complete specifications and ss of your nearest distributor, write Department BE12.

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For More Details Circle (10) on Reply Card

Chicago Will Host CATV '77

Chicago's Conrad Hilton Hot the site and "CATV 77: The Ch of 11,000,000 Families" the th for the National Cable Televi Association's 26th annual con tion, April 17-20, 1977.

More than 5,000 attendees expected at the nation's lar CATV trade show, which feature a full array of technical management sessions, pre and p convention activities, and well 100 hardware and software exhi

"This year the Convention C mittee is working hard to prese program which is topical exciting, but which also of plenty of practical experience information," said Marc Natl son, President of Falcon C munications and Chairman of NCTA Convention Commit "Also for the first time, the N Convention will include a m session devoted to the internati cable television scene, featu cable representatives from are the world."

According to Nathanson, 1977 Convention Program wil organized around five basic c topics: System Operations, Fina Regulation, Pay Cable, and Tec cal. Throughout the convent eye-opener and major sessions focus on different aspects of t basic topics.

Convention activities will acti begin on Saturday, April 16, with the NCTA Convention Te Tournament at Chicago's MidT Tennis Club, and a Saturday e ing reception. The convention officially open with a keyn address on Sunday afternoon, A 17, by a prominent national offi

Beginning Monday, April each day's program will inc early morning eye-opener sess followed by major management technical sessions each morn and afternoon.

The new International C Session on April 19 is b planned by NCTA in coopera with the International Broad Institute and its executive dire Jean D'Arcy.

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all for the price of a single camera. We'd be pleased to
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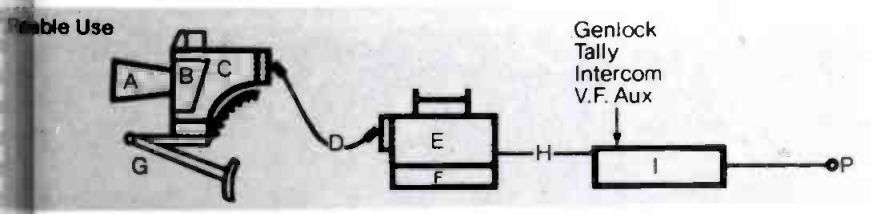
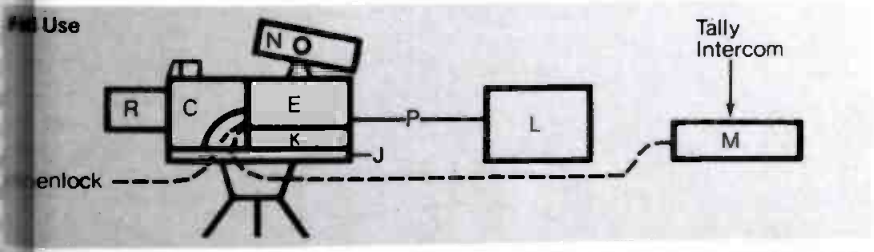
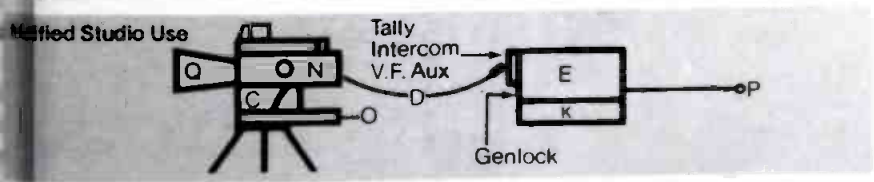
requirements inside or outside your TV studio, and more:

1. Fully studio-equipped

Digital Command Unit (DCU)







A)	Portable lens
B)	1.5" viewfinder
C)	Camera head pack
D)	Camera cable (300 ft.)
E)	Process pack
F)	D.C. pack
G)	Shoulder Mount
H)	Co-axial cable (3000 ft.)
I)	DCU
J)	Mount adapter
K)	A.C. pack
L)	VTR or FPU
M)	Operation panel
N)	5" viewfinder
O)	5" V.F. Mounting Plate
P)	Co-axial cable (video)
Q)	Portable lens w/conversion adapter
R)	Studio lens

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For More Details Circle (13) on Reply Card

SBE Journal

We believe that those stations stalling ATS control equipment sho be required to submit a proof performance to the FCC before p manent authority is granted for s operation. Further, the Commiss should demand suitable inspection documentation, on an annual basis, the performance of the ATS in or to regularly confirm the integrity the system.

The SBE concurs with the C mission's view that, during periods temporary failure of portions of system, an absolute go/no-go se may not serve the public intere Rather, "failsafe" circuitry, coup with a reliable alarm system, sho adequately insure against those sit tions which could cause interfere to other stations, as long as transmitter would shut off if eit the circuitry or alarm system sho fail.

The alert signal, indicating a c dition, an alarm level, or a turn should be mandatory, and the S proposes that it be located at studio along with the control cen A responsible station employee sho monitor and exercise control over ATS, and the system should equipped with the capability for hi quality, off-air monitoring, as well the means for that person to turn transmitter on and off in response indications that any operating para eters are out of, or back wit tolerances. Upon an alarm indicat a qualified operator would be imm ately sent to the transmitter locat

The test circuitry incorporated i the ATS controller should be s that when an operating parame which had been out of tolera returns within tolerance, the unit instantly revert to its normal sta On the other hand, if that operat parameter had been so far out tolerance as to cause a shutdow the transmission system, then a the condition had been corrected, system would have to be reset be the station could return to the air

The SBE believes that ATS tr mitters should continue to meet existing requirements of design, stallation, safety, and intruder pro tion. A high limit of output po must be established to prevent in ference to other stations. The q tion of a low limit merely relate the desirability of a low-powe

Continued on pag

Leitch!... A good word to know in television terminal equipment.

itch Video engineers ecialize in designing and ilding the key elements in ntemporary test, pulse and deo distribution systems.

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For More Details Circle (18) on Reply Card

Mix an ENG camera with a studio camera, and what do you get?

A Sony.

The Sony BVP-100, to be exact. A new kind of portable color video camera, from Sony Broadcast.

There have been portable ENG cameras before. Field production cameras, too. But the BVP-100 is a camera deliberately designed to give you the best of both worlds.

The BVP-100 combines the lightweight body, economy, and simple setup procedure of an ENG camera with the broadcast picture quality, manual controls, and built-in professional features of a field production camera.

It's like having two cameras in one.

In the field, the BVP-100 is fully portable, easy to handle, completely automatic. You can depend on it to cover fast-breaking news, sports events, any ENG situation you run into.

But when you're in commercial or documentary production, you need more than an automatic ENG camera. You need a camera you can control manually. A camera you can interface with other cameras. A camera like the BVP-100.

Take a look at some of the special advantages the Sony BVP-100 can offer you:

1. Beam-splitting prism optics. Three 2/3" Plumbicons* with beam-splitting prism optics provide broadcast quality signal resolution, high sensitivity, low registration error, and extremely stable operation—at a signal-to-noise ratio of better than 50db.

2. Built-in masking generator. Unlike many portable color cameras, the BVP-100 has built-in masking circuitry. This insures optimum predictable colorimetry at all times, and of course allows matching the BVP-100's colorimetry to that of other cameras.

3. Built-in test generators. On location, you can make many necessary balance and test monitoring adjustments without accessory equipment. And the less accessory equipment you need, the faster you can move.

4. Quick adjustment to changing light. The BVP-100 special black stability circuit and automatic white balance help maintain correct color proportion levels. Even in rapidly changing lighting conditions.

5. Flare compensation. The BVP-100 has fully adjustable flare compensation circuitry to remove any annoying distortion in black balance created by an optical disturbance.

6. Recorder playback through viewfinder. For field situations, the recorded video signal is switchable to the BVP-100 viewfinder. You can monitor and review instantly.

7. Easy access to controls. The BVP-100 is designed with all setup and operating controls conveniently located for quick adjustments while the camera is in use.

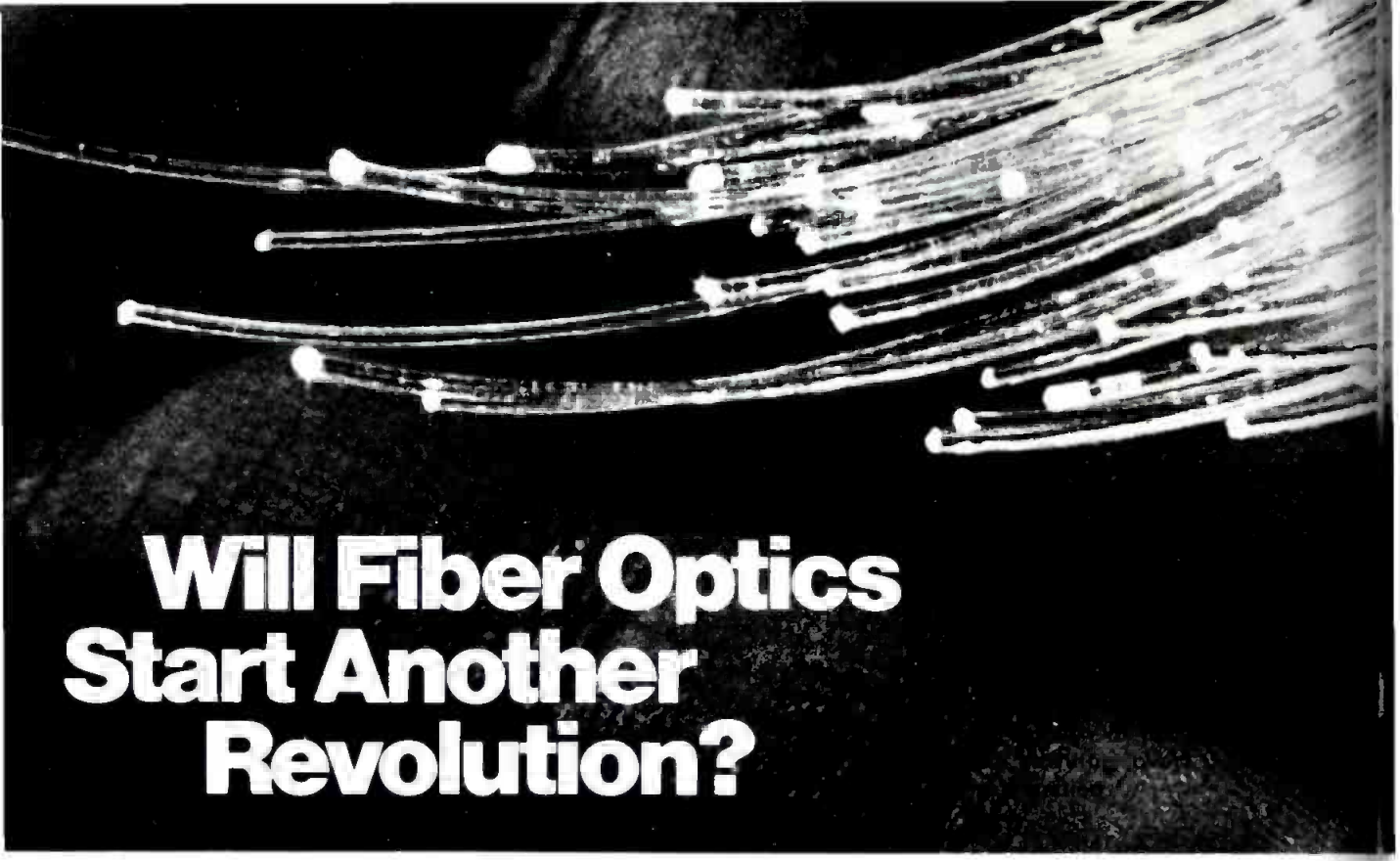
And there's more. Much more. Built-in filters. Image enhancement. Easy setup. Operation with battery or AC adaptor. Plus a single 10-pin connector cable that links to the new Sony BVU-100 Portable Videocassette Recorder, or to any other Sony portable recorder.

For further information on the BVP-100 Color Video Camera, write to Sony Broadcast.

*Trademark N.V. Philips

Sony Broadcast

Sony Corporation of America, 9 West 57 Street, New York, New York 10019



Will Fiber Optics Start Another Revolution?

By Ron Whittaker

Now that many of us are convinced that fibers in our **diet** can improve our health, we are learning about some revolutionary advantages in another fiber for **video**—fiber optics.

The term "revolutionary" is a bit trite by now—so many things have gotten to be "revolutionary" these days—but with fiber optics we in television may just be facing a new technology which could fully qualify as being revolutionary. Some engineers, in fact, are viewing the new fiber optics technology as being as significant as the development of the transistor in the early 1950's.

Consider the advantages given for an optical fiber (OF) "cable" when it is compared to a standard coaxial cable:

- Broadband; up to 1 GHz or more per 90 micron fiber
- Uniform attenuation over very wide frequency range (no equalization needed)
- As little as 4 dB loss per mile (2 dB per kilometer)
- Highly resistant to interference
- No problems with "leakage"
- Insensitivity to temperature variations
- Extremely small size
- Not nearly as fragile as coax
- Lower cost than coax
- High reliability

Optical, or light-conducting glass fibers have been around for quite some time. You probably first saw them used in the little fiber optic "fountain" lights with their 100 or so fibers "spraying" out of the top. Since they normally require dim lighting to be appreciated (which means that they are rather dim, themselves) many of these lights ended up sitting on the top of TV sets being used as "TV lights."

But now it appears that these fibers will be going from the top of TV sets to inside TV systems, as optical fiber (OF) technology very rapidly takes hold. In fact, things are moving much faster in OF research (and application) than many "experts" predicted several years ago.

In a rather well-publicized application of OF, Teleprompter, in cooperation with Fiber Communication Co., has put into regular use an 800-foot (250 meters) link from their microwave receiver to the head end of a cable system. Six fibers were packaged in a single cable, which ended up being about the size of a piece of standar RG-59 drop cord. The fibers themselves, are only 90 microns i diameter each, or about the size o a human hair. Each of the fibers i **capable** of over 1 GHz bandwidth which means that a six-fiber bundl would, theoretically, be able t carry about 1,000 TV channels.

In actual fact, however, the fiber are capable of a much broade bandwidth than present technolog can handle. The Teleprompter sys tem is now limited to 20 MH bandwidth because of limitations i the light-emitting diode (LED) go ing into the fibers. However, ne devices have been announced whic could extend this 20 MHz limit t 200 MHz. In the next few year even newer technology could wel extend this into the GHz range.

How It Works

Before going further, it woul probably be appropriate to take look at how OF works, at least as i is now being applied in video cable It must be kept in mind that this i only one of a number of potentia TV-related applications of OF Optical fibers will probably fin their way into such things a picture tubes and camera tubes, t name just two applications no

All-Plastic OF Cables

The Du Pont Company has developed two new all-plastic fiber optic cables for data transmission use.

They are PFX-P140R, a single plastic optical fiber reinforced with "Kevlar" 49 aramid fiber in a protective jacket of flame retarded "Hytrel" polyester elastomer, and PFX-P240R, a dual optical fiber cable designed for two-way communication. The two inner cables of PFX-P240R are color coded for easy identification and each is protected and reinforced by "Kevlar" and "Hytrel".

Both products feature attenuation of 470 decibels per kilometer at a wavelength of 656 nanometers. They transmit visible light over twice the distance of other currently available plastic optical fibers, according to Du Pont.

The cables are tough, flexible and crush resistant, Du Pont said, and the all-plastic make-up of the cables allows preparation of the ends with a simple razor cut for coupling to a light source and detector. The all-plastic construction also simplifies repairs, which can be made in the field by a technician, usually on the first try.

Du Pont expects the two fiber optic materials to be used in military applications, in ships, submarines, helicopters, chemical plant or refinery control instrumentation, and in mining communications, as well as for optical links in computers and for the transmission of other data without electromagnetic interference. PFX-P240R, with its dual cables, allows two-way communication between computer and peripheral unit.

These two products join PFX-S, a plastic-clad, pure-silica-core cable announced earlier this summer. PFX-S features attenuation of 80 decibels per kilometer at a wavelength of 800 nanometers. Its attenuation is below 60 decibels per kilometer throughout the range 650-750 nanometers, assuring its compatability with systems designed for red-transmitting PFX-P. It was developed to approach the mechanical toughness of plastic fiber optics with the run length capability of silica.

...ng experimented with.

...igure 1 shows how the OF ...nciple is being used for video ...le. The video and audio signals ...dulate the light from an LED ... unlike the LED's being used in ...few hundred-thousand pocket ...culators and digital watches right ...o). The light then passes through ... optical fiber, which acts as a ...veguide for the modulated light. ...the terminal end of the fiber ...e is a P.I.N. diode sufficiently ...ed (50 volts or so) to be ...onsive to the high-speed fluctu...ns in modulation. After being ...lified about 20 dB, the signal ... on its way as a normal 1-volt ...vision signal. The concept is ...plicity itself.

How About Losses?

...he optical fibers used for the ...smission of video signals are ...le to far more exacting specifi...ons than the fibers in the lamp ... may sit on your TV set. The ...awing" of glass fibers to the ... specifications needed for ...tical video applications has ...n a number of years of inten... research and work—work that ...lved page-long formulas and ...rences to such things as meridi... rays, dielectric waveguide energy flux and Fresnel losses.

Although the light attenuation in the Teleprompter installation is listed as 10 dB per kilometer (0.62 mile), losses in newer-type fiber is reportedly down to less than 2 dB per kilometer. Of course, in the short 250 meter (800 foot) "hop" from the rooftop antennas to the central processing center 34 floors below in the Teleprompter installation, the attenuation involved is negligible.

Using the 2 dB per kilometer figure, 20 dB amplifiers would make possible 15 km (9 miles) spacing between amplifiers. Depending upon the efficiency of the coax used in comparison, this would probably end up being somewhere near 10 times as efficient as ordinary coaxial cable. Equalization devices can be eliminated as well as automatic gain control (AGC) equipment, since OF is blind to both frequency and temperature variations.

The present 20 MHz bandwidth used in the Teleprompter installation represents only a fraction of what would be possible if the full potential of OF could be used. Current speculation is that with the adoption of digital processing of video, a bandwidth of a few hundred or even thousand MHz would not be out of the question. What is needed at this point is small, inexpensive digital processers which could be mass-produced. If the video signal(s) could be digitized, you could conceivably move up to the potential afforded by a type of electromagnetic energy (visible light) which has a frequency of close to 1,000 terahertz (THz). (By the way, a THz is one step above a gigihertz and is equal to 1,000 GHz or 1,000,000,000,000 Hz.)

Lasers and OF

Another important contribution to OF-video technology will be the perfection of small, inexpensive lasers, which will greatly improve the efficiency of the fiber optic light transmission process. The scattered light of the LED causes the light to "ping-pong" its way along the walls of the OF waveguide in a way that hardly represents an efficient and orderly transfer process.

The coherent light from a laser has already proven itself to be a much more efficient "light launching" device for OF. However, because of the imperfections in the best of today's fibers, there are still certain ping-pong effects, even when a laser is used. It is only

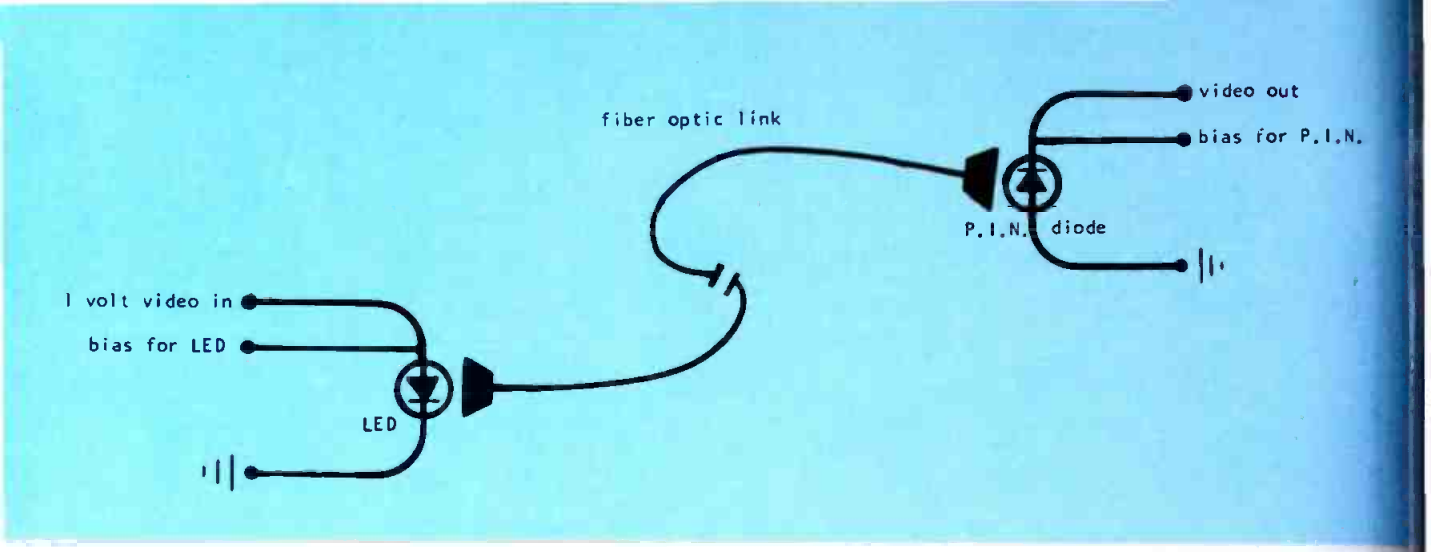


Fig. 1 The basic concept for an optical fiber (OF) system is illustrated here. Even with today's limited OF technology, it is estimated that it is possible to send video signals six to nine miles before re-amplification is necessary. No frequency equalization or AGC processing is necessary.

when this effect becomes great enough to result in a lack of resolution between discrete bits of information that the process breaks down. Fortunately, the extremely short wavelength of light (10^{-6} m.) coupled with the extremely high speed (about 29^{10} cm./sec.) gives phenomenally high limits to work with. Some idea of the relative information capacity of OF compared with other electronic media is shown in Figure 2.

Numbers this big have very little meaning for most people until they are broken down into recognizable quantities. To give you some idea of just how removed these laser frequencies are from ratio frequency (RF) energy, consider the following.

20-Million TV Channels?

Laser emissions run from about 80 to 1,000 terahertz (THz). If we were to put 6 MHz-wide television channels throughout the region of possible laser emission we would have room for about 20-million separate TV channels!

The region on the electromagnetic spectrum which can be used by lasers starts considerably below the visible light region. In numbers, laser emissions run from a wavelength of about 5.3 to 0.4 microns, and visible light runs from about 0.7 to 0.4 microns. (In case you are having trouble with "microns" and don't have a dictionary handy, a micron is equal to one one-thousandth of a millimeter, or 10,000 angstroms.) When you get down to these wavelengths, missing something by a "hair" can put completely out of the ballpark, since the length of these waves is about 100 times the size of a hair!

To put it another way, the electromagnetic range theoretically possible with lasers would be capable of carrying about 300-billion telephone conversations simultaneously.

Back To Earth

Although it's interesting to speculate, such astronomical channel capacity is completely beyond present television needs. So, returning to some numbers that are a little more down to earth and in line with current technology and needs, we find that with the best of LED-fiber-PIN combinations we can now transmit about 30 6 MHz signals through one of today's 90 micron "glass hairs" with plenty of room left over for guard bands. With a 1 volt video signal fed into the fiber optic link, you can expect a loss of about 2 dB per kilometer (0.62 mile) using the best of today's OF, which means that over a long distance you would need (20 dB) amplifiers about every 10-15 km (6-9 miles).

The receiving PIN diode and amplifier currently being used by Teleprompter is very lightweight and small—only about 10 cm (4 inches) square. The signal-to-noise ratio of the installation is reportedly 57 dB. The biggest current limitation appears to be the frequency response of the LED light launcher. The Teleprompter LED's are manufactured by Bell Northern and have a response of 20 MHz, but the state-of-the-art appears to be the 200 MHz LED's recently announced by RCA.

Other Current Applications

The Teleprompter installation isn't the only communication-related OF application. Rediffusion in England has installed an underground video link which they are currently testing. Japan is wiring a small community with OF, which will probably represent the first full-scale test anywhere. France is reportedly anxiously awaiting the outcome of such tests before launching an extensive OF project for Paris.

If rumors can be believed from France, that country plans to take a quantum leap into state-of-the-art communications by wiring the entire city of Paris with OF (instead of coaxial cable), thereby giving it the most modern broadband communications system found in any of the world's major cities.

Future Possibilities

The adoption of digital signal processing will undoubtedly be a major step forward for OF technology. At the same time, however this will vastly complicate the "cable"-to-home CATV interface. A digital-to-analogue-to-RF converter would undoubtedly necessitate a very sophisticated and costly "black box"—at least with today's technology.

The first approach, and the one that seems most practical right

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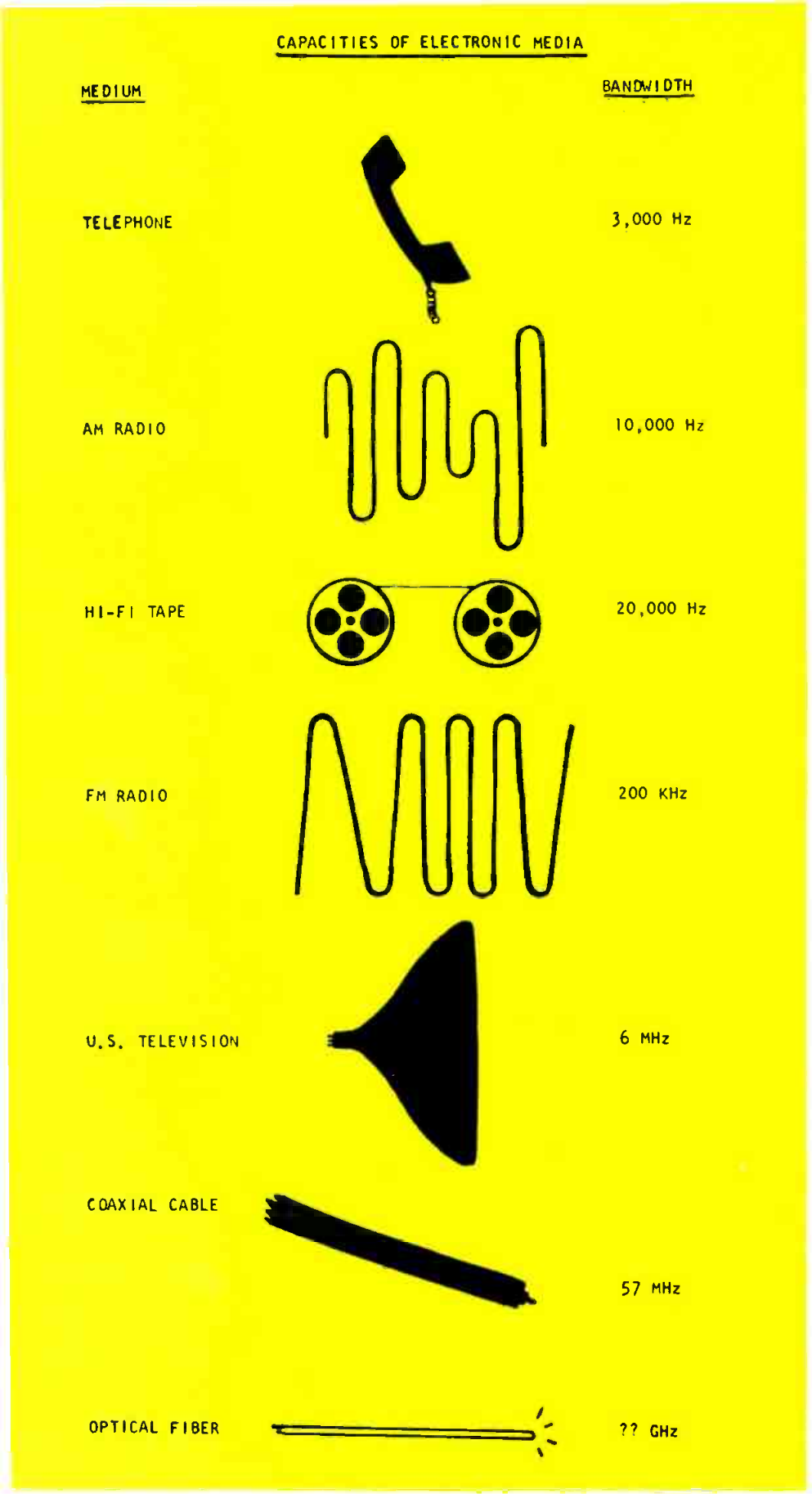


Fig. 2 The bandwidth and information-carrying capacity of electronic media continues to grow. From a bandwidth of 3 kHz (telephone), we now have developed a medium (OF) which, with the help of lasers, could (theoretically) have a bandwidth in the trillions of Hz. Right now the theoretical is a long way from the possible, since the maximum bandwidth attainable is reported to be 200 MHz. However, as the technology develops, we might someday see bandwidths of ten and hundreds of GHz.

now, would be to use OF trans sion only for major long-dist links. From this point the di light-frequency signals could converted into analogue RF and into branch lines for local di bution. In the case of CA existing coaxial hardware would become obsolete. By making long-distance hops by OF, ce quality and cost advantages sh be possible.

Another possibility would b take the OF cables directly into home. Receivers would have t manufactured which could acc modate the digital OF signal (a with standard RF).

For starters we could ini channels which operate on do our current 525 line standard. 1,050 or so lines we could achie video resolution which would e the resolution the 35 mm mo picture film we see at thea Large-screen television projec systems would then become meaningful in terms of incre image detail. With "bandwidth burn," we could even tran three separate 12 MHz pictu one for each of the primary col Why compromise anything? let's not forget audio. We w want two audio channels minim (stereo) and would probably wan throw in the provision for a more for other languages, diffe age levels of comprehension, etc

In the beginning, even if on few entertainment centers had s receiving equipment, it woul matter, since such "narrowcast gramming" could be inexpensi distributed, once the OF sys was a reality. The programm would not crowd anything else of the band.

As a final note, it should be in mind that at this early stag OF technology there are m claims and counter claims ab what it can and cannot do. withstanding some confusion present OF specifications limitations, what we do know that fiber optic technology is definitely on the scene in bro casting—both in this country in Europe and Asia. The future these little hair-sized fibers l good, and they may even (as dicted) have the impact on e tronics and broadcasting which be equal to that of the transisto

RCA

NTENNA AND RANSMITTER SER REPORT

-AM, NEW YORK CITY, 50 kW AMPLIPHASE RANSMITTER

-AM delivers great sound d the clock," reports Bob n, Chief Engineer of this station.

r RCA 50 kW Ampliphase nitter comes through with a ut signal in the tough New narket," Mr. Walton says. "It's BTA-50J, located at the na site in East Rutherford, nd remote-controlled from anhattan studio.

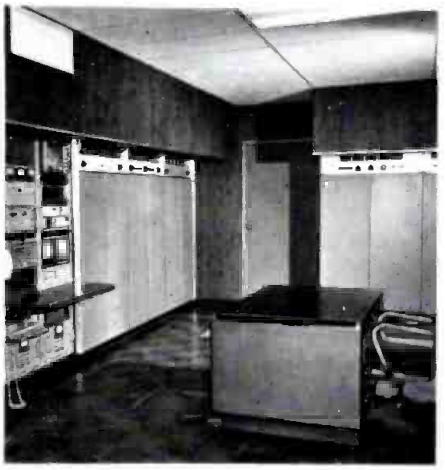
operate the Ampliphase and r transmitter as an Alternate- ystem, with a weekly over. The common point ce presented no matching n for the Ampliphase trans- nor does our directional

50 kW Ampliphase transmitter delivers a standout [illegible]"

WBEN, BUFFALO, UPGRADES WITH REMOTE-CONTROLLED TV AND FM TRANSMITTERS

"We used RCA on our TV-FM modernization program for good reason," says Frank Maser, Director of Engineering for WBEN, Inc.

"When you're investing nearly a million dollars in new plant facilities, more than equipment is involved. Technical expertise in system design and installation is important —and RCA was able to provide this



valuable support.

"The automated transmitters for FM and TV completed our initial master updating program. Both systems are remote-controlled from the studio, with full redundancy in circuitry, STL, power, and transmitter functions.

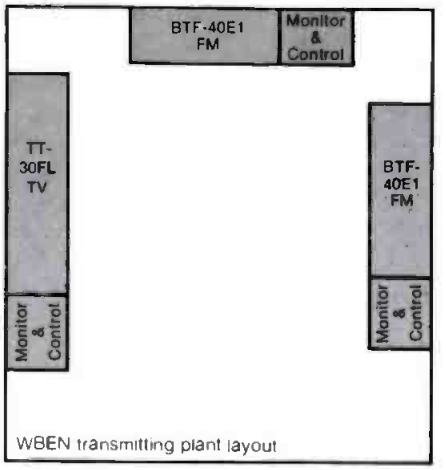
"Technical expertise in system design...important"

"For TV, we installed a TT-30FL, 30 kW transmitting system with OPTO-Switcher and bi-level switching capability. This arrangement gives us full flexibility to operate in parallel, or one side only, maintaining optimum VSWR without need for re-tuning.

"Rock 102, our 24-hour-a-day automated FM stereo station, operates twin BTF-40E1 40 kW transmitters as Alternate-Main systems. With this configuration and our custom logic systems, we're well protected against transmitter outages. The transmitters are fully automated, including automatic power level control. Our FM plant also includes a new BFG-8 circularly polarized antenna with de-icers.

"With the new transmitting systems behind us, we're moving on into the next phase of our master plan for improving technical operations."

"...transmitters are fully automated, including automatic power level control"



WBEN transmitting plant layout

antenna system.

"I like the BTA-50J's wideband sound and low distortion. It doesn't use a modulation transformer or any audio transformers—which gives us a cleaner signal over a wider frequency range. And, although we operate at 100% modulation, it is good to know that the transmitter is capable of 125% modulation.

"The RCA transmitter sounds great and gives no trouble."

RCA

At the Olympics, we saw coverage from a helicopter. Here you see Larry Scheer (left) of KNBC, Los Angeles, working as possibly the only U.S. newsman to pilot and report from what is, in effect, a mobile, remote color TV station mounted in a helicopter.

What's Ahead For Broadcasters?

By Ron Merrell

Don't get caught looking. It's nice to look down the pike, but if we dream too long of tomorrow, we'll lose today.

If there is any one thing you can say with certainty about the broadcast industry, it's that changes will confront us just about the time we settle down to the task of digesting the last twist or turn in the technology.

In this issue of **Broadcast Engineering** we've put together some of the changes that are likely to affect the industry. Fiber optics, by far, is the most distant and mind boggling. But fiber optics is only one of the shadows on the horizon with new challenges we could be facing. Even if fiber optics is still years away from making inroads on the broadcast industry, it already is being introduced to cable television.

But not all changes are technical. OSHA appears on the scene, the environmentalists throw up roadblocks, the FCC gives and takes away, the FTC puts advertising under the microscope, and even the professional and trade associations find themselves pressed to keep their rails straight.

On a day-to-day basis, the industry is on the edge of its chair. Which way will it go and will the trend last? And one of the greatest dangers is that the broadcaster can get caught waiting. ENG is a fine example.

Most of the early ENG equipment was not designed for broadcast applications. But innovators at the network and local station level opted for experimenting and doing it their own way. When improvements in equipment began to hit the market, they were the ones in the best position to make judgments on what features were relevant. Meanwhile, this doesn't mean that film is dead. There still are situations where film is more appropriate. What's more, the conversion costs may be inconsistent with profits vs. investments at some stations. Of this you can be sure, the industry will gain from the competition.

At The IBC

At the recent International Broadcasting Convention in L don, ENG was one of the hot topics. Even the planning c mittee had not anticipated such interest, and several hund people were turned away. T general European and U.K. feel has been that image quality ENG pictures is just too poor serious consideration as a pict origination format in non-NT countries.

ABC's Julie Barnathan and seph Flaherty of CBS stood t ground, based on network news special events coverage experie Actually, Barnathan was no member of the panel, but he m his opinions heard. Others on panel were: moderator E. R. R of the BBC's designs departme A. Protheroe, BBC News; M. M zono, Sony; F. Van Poessel, Phili and J. Fielek of Microwave A ciates.

This meeting will be covered detail in the January issue. from a what's ahead standpo Barnathan stated that ENG eq ment must be easy to operate ultra reliable. He added that cost had to be controlled beca every $1000 added to the E package cost would have to multiplied 100 times at ABC cause of the number of units t have in the field.

A Shopping List To Remember

The networks usually lead

CBS was into electronic news
ering at the network and
n level in 1971. Today, more
400 stations are equipped with
kind of ENG equipment.
from the flagship stations,
is not commonly known is
network engineering, produc-
and management can have a
effect on what the manu-
rers will come up with next. It
the only way innovations are
but even when the manu-
rer develops something really
n his own initiative, his initial
duction often is made to the
rks.

the recent Society of Motion
e and Television Engineers
TE) annual conference, CBS/
dcast Group president John A.
ider made his technical de-
known. The word was loud
lear.

e at CBS are now in our third
ation of ENG equipment. The
minicam weighed 51 pounds,
ned for the 1968 convention.
73, we had the first camera
ned expressly for ENG. That
ed 34 pounds.

he latest newsgathering cam-
re fantastic. They only weigh
unds. And the development of
ortable videotape cassette re-
has been a major contribu-
o the success of ENG. It is
possible for journalists,
ped with camera and re-
r, to report the news elec-
ally right on the spot—where-
nd whenever it happens.

t even the best 'portable'
er weighs 32 pounds, a heavy
n after a while. Thus, the first
n on our shopping list is a truly
le compact, reliable video-
recorder, weighing only about
unds. This may require a
e in standards that CBS may
ling to accept.

yond ENG, the next item on
st involves the power source
is portable equipment. Pres-
y batteries are heavy, too
They have also been known
k and even to explode. Re-
ng is sometimes unreliable
o time-consuming. We need
er source with a capacity of
tt-hours per pound of weight,
can be re-charged reliably
night, and which is safe and
perate over a range of tem-
perature.

"Perhaps you can attack the problem from both ends, by reducing the power required to operate the portable equipment while reducing the weight of the battery.

"When a news event is covered abroad, we have to be able to edit and assemble the complete story on the spot. We must be able to transmit it by satellite, ready for broadcast. Thus, for the third item, we need smaller and lighter videotape editing machines and edit controllers which can literally be fitted into a couple of manageable suitcases. Once again, the editing equipment must be battery-operated. It must have all the facilities needed for editing and assembling a complete story to be transmitted, ready for broadcast.

"Equipment with these characteristics obviously lends itself to the production of documentaries. In fact, many local television stations are already using ENG equipment for documentaries. The cost savings are enormously impressive, where a shooting ratio of 30 to 1 is common. The freedom to keep the camera running has made all the difference for the producer in the field.

"However, the high shooting ratio obviously means a very large number of edits, and this in turn requires more sophisticated editing equipment than is now available.

"And because the camera crew should be as unobtrusive as possible in both news and documentary shooting, we need greater sensitivity for the cameras to operate effectively in natural indoor lighting. Perhaps you can achieve a two-stop improvement in sensitivity in two ways. The pickup tube in the camera may be made more sensitive or the zoom lens may be made faster.

"Speaking of optics, cameras are approaching the point in development where we have to plug a camera into the lens. It used to be the other way around. In the new Microcam the lens weighs two and a half pounds; the camera weighs eight pounds. However, the type of lens needed for typical sports shots weighs more like 57 pounds and is 10 times the bulk of the Microcam. Even on full-sized cameras, the marvelous and expensive 30:1 f/3.5 lens looks enormous, like an all-seeing eye in a science-fiction show.

"Can't you pass some new laws of physics—or make the electronics so good that a big part of the zoom range can be handled by signal processing? Somehow, we just have to have a smaller optical front end. The optics problems, by the way, are equally serious whether on film or tape.

"Now let's turn to sports coverage. Have you ever seen our mobile units heading for a football game? On the road, they look like an armored division on the move.

"There are two semi-tractor trailers, each 40 feet long and 8 feet wide. One of these has expanding sides to increase work space when operating at the event. We may use 6 or 7 cameras at a regular football game, and up to 14 cameras for a special event like the Super Bowl. The gross weight of just one of these loaded units is 31 tons. The cameras must be monitored, switched for live broadcast, recording and slow-motion replay. There are microphones, audio switchers, and miles and miles of cable.

"There is no hiding the fact that it takes tons and tons of equipment to cover a major sports event, not to mention conventions, elections and the like.

"Even covering an event such as a golf tournament is a monumental undertaking. CBS doesn't own the golf course in Augusta, but I sometimes wonder. We have 16 miles of cable buried beneath the sacred fairways to provide the hole-by-hole coverage that viewers expect of the golf classic.

"Why is all this needed?

"One major advance in reducing the weight and size that you have given us in the past few years is changing from a cable the size of my fist to one the size of my little finger. We truly appreciate that, but we need more, much more.

"We need a color-stable, high quality, motion-insensitive transmission system.

"Perhaps digitally encoded signals along with automatic digital reprocessing can be used to achieve a "walk-around" wireless camera. Perhaps frequency bands and bandwidths not now allocated to the broadcaster may be the answer.

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BOSCH
FERNSEH

e engineers have decided:
System

For More Details Circle (120) on Reply Card

"Now if you do manage to create a lens-camera combination that is compatible in size and is as compact as we want, we come to another onerous problem on our shopping list.

"We have prompters which are in effect large 'portable' television receivers placed on the camera. The arrangement is in every respect a full-fledged Rube Goldberg contraption—and one must almost mount the camera to the prompter. It is an unbelievable rig. It adds an extra cable or two to be taped to the camera cable—or vice versa. It's time to do something about this.

"I understand a hologram produces an image right out there in space. That would be a good objective for a solution to this problem. I respect the problem; it's a tough one.

"That takes care of news and sports. But the largest part of our broadcasting operation is television entertainment. It is competitive, and we want to do it in the most effective and economic way.

"At present, we use both videotape and film—about two-thirds tape and one-third film. Film is more flexible, but it's twice as expensive to use. So, if we are successful in working out satisfactory labor agreements, we plan to start using tape at our Studio Center film stages in Hollywood, where many of our situation comedies are made before live audiences.

"However, film is still used in our nine weekly, hour-long prime-time drama series. We would like to convert to tape. But that means that we will need an electronic editing device—something to handle the 300 to 400 edits presently made in each hour-long program by a movieola. Perhaps that is something that you, here in this room, can develop.

"That's our shopping list. Not too long, although perhaps demanding.

"As you see, all things have not been invented, and all techniques have not been developed.

"We have been in this business for a long time, by current standards, but in some areas we still use first generation equipment.

"This shopping list is not of the pie-in-the-sky variety. It's down to earth. It's something that the people in this room can fill."

Now the manufacturers are not always waiting with baited breath to hear what the nets want. Enough of them are leaders in their own right. But the fact remains that when the nets say they want something, it has a definite effect on what you're likely to see, sooner or later, exhibited at conventions.

CP Antennas

Although still in the wings, circular polarization for television was the subject of a petition of Rule Making filed in February of 1975 by the American Broadcasting Companies, Incorporated. The reply comment date was September 6, 1976. There was substantial response from the networks, the Corporation for Public Broadcasting, the NAB, the Association of Maximum Service Telecasters (AMST), equipment manufacturers and broadcasters. Apparently, there wasn't a consensus. In another section of this issue, you can read a report updating that situation.

There's Logic, Too

In recent issues, BE has been running a series on "Logic Illustrated". In recent times we've seen digital becoming a vital part of the broadcast equipment scene. A better understanding of how digital circuits work is a prime requisite for keeping up with what's coming down the pike. More importantly, since it will likely continue on its way to more widespread uses, a lack of at least basic digital logic theory will cause more problems than the equipment was designed to solve. The equipment manufacturers could be forced into increased costs, if they become too closely tied to equipment downtime. Troubleshooting digital circuits is a problem confronting both the broadcaster and the manufacturer. In 1977, **Broadcast Engineering** will start a monthly column called "Logic Lab". The first part will deal with where you can get more information on digital logic, and from there we'll be off into practical troubleshooting.

Up and Down

Up in the sky, satellites are
and more a factor in everyday
munications. Who knows how
we are from seeing the nets
pumping programming down
the sky to the local TV sta
You'll be seeing more on tha
BE.

What About AM And FM?

In another section of this i
our Radio Workshop editor
his look ahead. But looking a
is not a private issue. Cox Br
casting, among others, has
doing its share.

Cox's data show that:

- FM stations have been profi
since 1973.
- FM revenues have grown ove
percent per year since 1963.
- In the Top 40 market, I
share of radio listening will r
42 percent this year.
- In the country as a whole,
FM audience should account
about 35 percent of all radio li
ing this year.
- FM revenues should grow a
percent annually over the next
years, while AM revenues will
at 4 percent annually.

Parting Shots

Automatic and unattended t
mitters will be in great eviden
the future. TV stations will
their chance at circularly pola
antennas. And as you might
pect, live news will find its way
virtually every station.

Somewhere out there, we're g
to see the solid state pickup de
replacing tubes, especially in l
cameras. Automation will bec
an increasingly important facto
daily operations at TV stat
And you can expect to see
from the video disc and hear
about the digital VTR. Watch
stereo. Of course there will be c
innovations.

Before we pull the switch he
word of caution is needed. You
can't afford to say, "Well, if
great stuff is coming, I'm goin
hold off until it gets here." T
are station needs for today
tomorrow. The danger is that t
can be lost because tomor
didn't get here soon enough.

he 1480 Waveform Monitor looks
ke your faithful 529...
ntil you examine the features

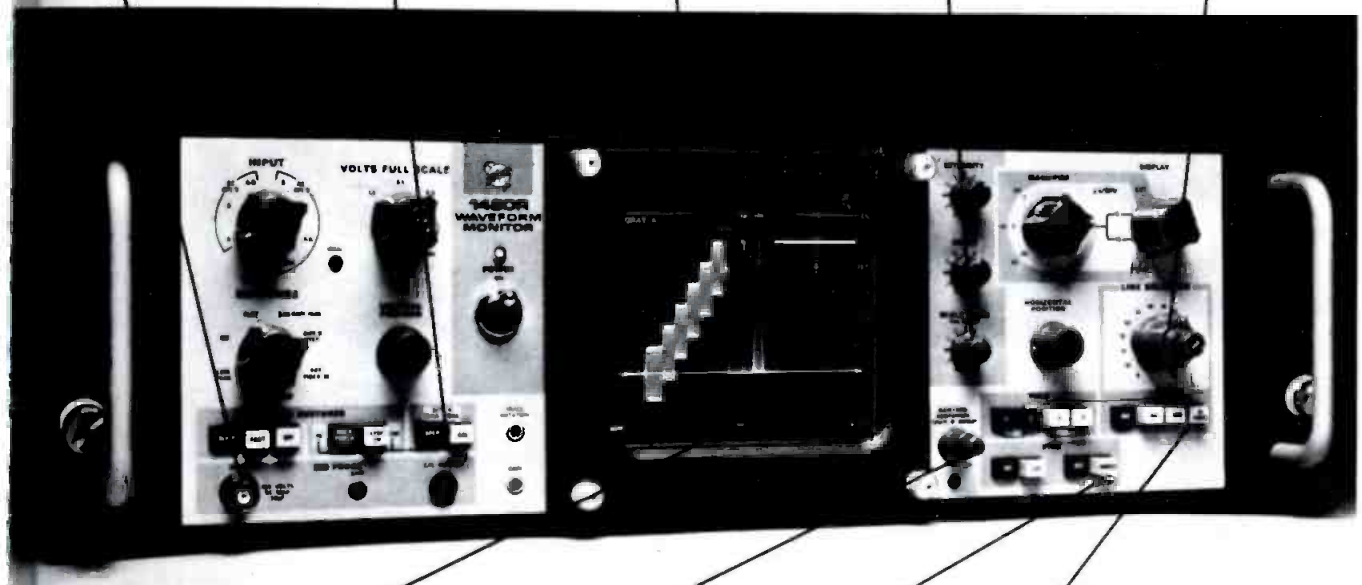
Input option For mpedance test

Display offset For level setting accuracy approaching 0.2%, offset the display of your signal with 1480's very accurate calibrator.

Bright CRT Bright enough to examine VITS without dimming the lights.

Two graticules Your choice of an internal or an external graticule is made with the scale illumination control.

Digital line and field selection For positive identification of signals displayed.



matic intensity e When you select er time base from o-field mode, opti- intensity is main-

Comparison modes The 1480 will overlay portions of a signal for easier and more accurate comparison of levels.

Direct or AFC Sync Eliminates display jitter or displays jitter.

15 Line display This 1480 feature permits head-by-head VTR signal examination.

on rear panel

Auxiliary video input A special input/output circuit allows you to measure chroma/luminance gain and delay without disturbing your signal and for the use of special filters for unique measurements.

Line strobe In addition to having an auxiliary strobed video out for identification of individual lines on picture monitors the 1480 will strobe individual line vectorscope displays.

TEKTRONIX 1480R Waveform Monitor does look like the CTRONIX R529; just as the half-rack width 1480C looks like 529. But, there are differences. Some of them subtle, like the ply focused trace on the bright CRT, others more conspicu- like the optional input for use of a high-impedance probe. e features won't be noticed until you examine the rear panel, he line strobe output for strobing a vectorscope. This is a hique for intensifying individual line displays.

the 1480 Series Waveform Monitors are different, just as your surement needs are different. Different from your needs in sixties, when the 529 series was the high-performance tor.

e us, or you use the reader service number to get a series of cation notes on the 1480. Better yet, contact your Tektronix vision Field Engineer.

ill be glad to show you the 1480 and its benefits.

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committed to technical excellence

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For Demonstration Only Circle (38) on Reply Card

Broadcasting And The Environment

By Harold Dorschug*

One of the stories about the environment making the rounds recently purported to relate a conversation between the Lord and Moses.

According to the story, the Lord said to Moses, "There is both good news and bad news. The good news is that plagues small smite your Egyptian oppressors. The Nile shall be turned to blood, and frogs and locust shall cover the fields. Gnats and flies shall infest the Pharaoh's people, and their cattle shall die and rot in the pastures. And hail and darkness shall visit punishment upon the land of Egypt!

"Then will I lead the children of Israel forth, parting the waters of the Red Sea so that they may cross, and thereafter strewing the desert with manna so that they may eat."

And Moses said, "O Lord, that's wonderful. But tell me, what's the bad news?" And the Lord replied, "It will be up to you, Moses, to write the environmental-impact statement."

If you have filed recently to construct an AM directional array, or any towers or supporting structures over 300 feet, or any of four other FCC major actions, you may understand how Moses felt. Such construction requires submitting environmental information which may include an impact statement.

*Chief Engineer, WTIV-TV, Hartford, Conn.

While this probably will be handled by your attorneys, there are certain aspects of the process which you, as an engineer, should understand in order to assist them. Your advice in pointing out areas in which broadcasting facilities are not as harmful to the environment as some other uses, and in offering suggestions for minimizing the impact of new construction, can be very helpful in persuading zoning and planning agencies to give approval.

The environmental issue is highly charged with emotion and often vague points of relatively minor importance are allowed to confuse a proceeding. Factual information, especially on some of the semi-myths that laymen hold about the effect of electromagnetic radiation on the environment, should be presented in an authoritative manner as often as necessary. Later, the engineer has a very important role to play in making certain that the plans proposed have minimum effect on the environment and that the work performed follows the original proposal.

As a result of a widespread movement to end practices which were destroying many valuable and irreplaceable aspects of man's natural heritage, Congress passed the National Environmental Policy Act of 1969. The FCC implemented the Act by incorporating its provisions applying to communications in Subpart I of Part I of the Rules and Regulations containing S tions 1.1301 through 1.1319. Bef planning any new work, start reading this.

If your project comes within t provision, read everything you c get your hands on devoted to t subject, especially material coveri the legal aspects, stories of ca involving power lines and pi lines, and the effect of electr magnetic radiation on the envir ment. Such reading won't make y an expert in the field and don't t to pass yourself off as suc However, it will acquaint you wi the language and processes e countered in opposing faciliti intended for critical areas. Abo all, don't deride your opponents you have any). The preservationis are usually sincere, intelligent, dec cated members of your communi who want to keep your part of t earth in good condition for peop yet to come.

The Roadblocks

What are possible reasons f objecting to new construction? He we are discussing how transmitte as studio plants located in dow town areas must satisfy othe criteria. In this former case, th tower is generally the first targ because of its visual impact. Ad mittedly, a tall tower can't b concealed and it is difficult t justify its presence in the desire location to laymen. This is fre

How a Panasonic VTR elps WISH-TV eliminate make-good headaches. FAST! FAST! FAST!

ISH-TV, the CBS affiliate in Indianapolis, they're using eo tape system primarily designed to stop robbers . . . op another kind of loss—false claims for make-goods.

The system is the new Panasonic time lapse video tape rder NV-8030. As Joe Missick, WISH-TV's director of neering, explains it: "When an advertiser refuses ment because he says his commercial didn't run, or 't go off right, we don't argue—we just show him a tape.

"Now there is no question of what was run. There it is ur advertisers to look at, and there are no areas of tention. We have already saved the cost of the sonic time lapse video tape recorder in the first ays by eliminating false claims for advertisers' e-goods."

The Panasonic VTR not only verifies that the spots ran, that the video reception was good.

In addition to high resolution, the Panasonic NV-8030 is atile. WISH-TV also uses it for log verification, to check ommercial loudness and to pinpoint any transmitter ruption.

The NV-8030 can record pictures from an off-air itor, continuously in different time sequences—9, 18, 72 up to 108 hours (that's 4½ days) all on one reel of tape. WISH-TV uses it in the 18-hour mode—so one tape monitors virtually an entire broadcast day.

Could the system work for you? The easiest way to find out is to call us. Or send us the coupon. That way, the next time one of your advertisers makes a false claim, instead of telling him he's wrong—you can show him.

Panasonic Company, Video Systems Division, Dept. 302
One Panasonic Way, Secaucus, N.J. 07094.

- ☐ Send me technical information on the NV-8030.
- ☐ Have a Panasonic video specialist call to demonstrate how the NV-8030 can be used at my station.

Name _____ Title _____
Please Print

Company _____

Address _____

City _____ State _____ Zip _____

Area Code _____ Phone Number _____

Panasonic.
just slightly ahead of our time.

In Canada, contact Panasonic Video Systems Department, 40 Ronson Drive, Rexdale, Ontario M9W 1B5.

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quently one of the few choice open areas left. Engineering constraints often make it difficult to find a suitable alternative.

AM plants, by nature, require flat, level terrain, ideally of a moist character. Tower height is determined by frequency and efficiency. Painting and lighting must meet governmental regulations. There can only be one "best" answer to the problem. Even though during storms or other emergencies its critics may stay tuned to the station for up to date information, in good times it looks like a big piece of ugly steel standing right in the middle of a wetland ecosystem.

FM, TV and microwave towers are vulnerable to the same arguments. Here the best site seems always to be on a hill that creates the most objectionable silhouette on the skyline. However, some latitude does exist in meeting power-height combinations and your knowledge of this relationship may help in working out a compromise. In a number of hearings covering a broad field reported in the literature on the subject, it was shown that if there is no satisfactory alternative, a reasonable accommodation could be worked out if the problem is approached properly.

Positive Points For The Station

What are some of the positive points to be emphasized on behalf of broadcasting?

Compared with other users of an equivalent amount of land, such as industry or housing, a broadcasting facility does not create any of the following problems:

- It causes no air pollution, creates no oil slicks, nor are any toxic gases used.
- There is no noise problem.
- Waste disposal demands are minimal.
- No valuable resources are removed from the earth such as minerals, gravel or timber.
- It has one of the lowest use densities, resulting in maintenance of the greatest amount of open space. For example, a two-tower array with full half-wave ground system at 1 MHz requires about 30 acres, yet less than one-half acre would actually be used for building, tower bases and guy anchors. The balance remains open space. With a ground cover of grass it would be a natural habitat for wildlife.
- Because of this low density use, minimal demands are made on community supported services such as police, fire protection, schools and roads.

The Big Myth

The matter of radiation sets broadcasting apart from other more common property uses and it must be considered because it is often confused in the layman's mind with nuclear radiation. With the current controversy over nuclear power stations, you should be in a position to adequately answer any questions about broadcast radiation.

Controlled laboratory tests on both plants and animals have demonstrated that electromagnetic fields produce observable effects. In the case of animals, "it is possible to observe agitation, excitement and increased motor activity sometimes going as far as turning tranquil animals into agressive ones"[1]. In the case of plants, "at large field intensities, for example in the vicinity of relay transmitters and ultra-short-wave links, growth is inhibited"[1].

The authors of this reference work concluded, "if we keep in mind the fact that the biological effects of radio waves depend on a number of factors (the most important being intensity of the field, its nature, and the exposure time), it becomes clear that not even the final results will be unambiguous and will vary more or less (or even be contradictory)"[1]. These tests used high intensity fields with carefully focused exposures not usually found in or around broadcast facilities. Also, pulsed radiation was found to be more biologically effective than CW.

An excellent survey of the broadcast situation in the IEEE SPECTRUM of August 1972[2] reaches the conclusion that "Radiation levels found in the vicinity of high-power broadcasting stations, in most practical instances, are considerably lower than those usually associated with biologically hazardous fields."

This statement assumes that itinerent personnel will be kept away from areas of extremely high fields, such as AM tower bases, by fences or other protective closures, and that FM and radiation, because of the ver patterns of the antennas used, not be directed at people.

Very often transmitters locate suburban or rural areas sup large populations of small animals such as skunks, squir foxes and even deer, together snakes and birds. It does appear that the RF fields cont ally saturating their habitat d ages their life cycle.

Unfortunately, while resea and study continue, opinions scientists often fail to agree. A result, standards for safety throughout the world are uniform. The greatest attention been given to effects of 3-30 G radiation, where tissue heating the primary hazard. Lower f quency phenomena have been thoroughly investigated because the lack of evidence of damage.

Maximum Levels

In the U.S., maximum reco mended levels for human expos have been established by the Am icn National Standards Instit (ANSI) and adopted by OSHA. a frequency range of 10 M 100 GHz, these are a power dens of 10 mV/cm² for periods of 0 hour or more, or an energy dens of 1 mWhr/cm² averaged over a 0.1-hour period. There is no lin established for radiation below MHz, although there appears to no reason why this same standa could not be used.

In the USSR a value of 20 V has been adopted as the limit ov the frequency range of 0.1-1.5 M but the Czechoslovakian Socialis Republic limit is only 10 V/m for range of 0.01-300 MHz for an hr/day exposure.

How Can The Broadcaster Help?

In summary, what steps shou the broadcast engineer follow protecting the environment? W suggest that he should use h specialized knowledge and abilit and here are some ideas.

First, he must attempt to loca any new construction in the lea critical areas available and still consistent with engineering requir ments and statutory ordinances.

be sincere in his belief and de that the site he proposes is best available. However, he ld investigate acceptable alter-es, in case of controversial ion. He must convince his tects and engineers to design minimum facility required to ve the objectives and have the ing concept present a har-ous blend with the surround-The lowest land density use is ne most likely to be accepted. cond, he should seek the e of a qualified advisor such professor in the ecology rtment of a local college for mmendations on protecting the sensitive flora and fauna, ngered species list items, etc., how best to preserve them[5]. action has solved at least one -on confrontation[3]. Also, agement must be persuaded to cize the plans in order to any possible criticism that thing underhanded is being osed[4].

Finally, he must make absolutely certain that during installation, everything is done which he agreed upon with the preservationists. He should keep approaches to the property as narrow as possible. He should keep heavy equipment and building material off delicate root systems. He should reduce dangers of erosion and siltation by disturbing ground cover and soil as little as possible, by reducing the time when raw soil lays open and by covering exposed soil with mulch whenever possible to prevent run off. He should keep in mind that what may look like a weed to him can be a very delicate and scarce part of the ecology.

A concerted effort by everyone concerned can achieve your goal if you follow an approach which proves that you are not trying to use the earth's resources for a narrow or selfish interest. Show that you acknowledge the generations of the past who have preserved what we now use and that you are not forgetting the many generations yet to come. Only in this manner can life centuries from now become more than bare survival.

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What's Ahead For The Radio Broadcaster

By Peter Burk

Unless you've had your head buried in a transmitter for the better part of 1976, you're already aware that another technological revolution has descended on the broadcast industry.

Spin-offs from the computer and aerospace industries continue to spin into our domain, making it possible for us to deliver a better product more economically. In addition, the FCC is inching toward some changes that will enable us to take advantage of the new technology and offer our listeners exciting new aural delicacies. This month, as we tie the ribbons on 1976, we'll peek into the next three hundred sixty-five and beyond and see what effect these advancements will have on the back shop at your station.

No More Logs

By the time this issue goes to press, the commissioners at the FCC will be voting on the long-awaited Automic Transmitting System (ATS). If the men in the ivory tower put their blessing on the proposed system, many stations will be able to install a black box that will relieve the necessity of an operator on duty.

After approval by the commissioners, appropriate rules will have to be adopted and a magic date for going on the system established. It's hard to predict how long that may take, but if you have enough operating logs to last through the coming year, you probably won't have to get any more printed...ever.

AM Stereo

Stereo has probably done more for FM than all of its other assets put together. It's natural then that AM broadcasters would like to jump on the bandwagon. To date, two AM stereo systems have been proposed. The Commission isn't doing any testing on either system yet, but is interested in the results of outside studies now being conducted. Before any changes of this type can be approved, it must be demonstrated that the system is fully compatible with existing receiving equipment and that mono quality will not be degraded.

The receiver manufacturers are expressing a great deal of interest in AM stereo, and are providing some of the input to the broadcast industry. One of the interesting problems is the matter of lighting a 'stereo' light on the receivers. Most broadcasters agree with the manufacturers that it is almost imperative to inform the listener visually that both ears are being stimulated separately, but the limited bandwidth on AM makes the transmission of a pilot difficult.

It's not likely that any action on AM stereo will be taken in the near future, but it's something you might think about if you're planning a new AM studio. The transmitter conversion will be simple compared to the changes necessary at the studio.

Music For Four Ears

If you think stereo proof of performance is a task, dream for a few minutes about discrete four channel for FM. Let's see...left front into right ear, left rear into right front...**twelve** separation measurements at each frequency, not to mention cross-talk!

Progress on quad at the FCC encouraging. Field tests on a c crete system have already been c ducted and are being analyzed the chief engineer at the co mission's labs in Laurel, Maryla Results should be out in three six months, but don't hold yo breath waiting for a notice of p posed rule-making. Pacific FM I filed their discrete four chan application in 1971!

Several months ago, CBS fil for adoption of standards for F stereo quadraphonic transmissi and in all likelihood, Sansui w make a similar application. No te have been filed yet on either matr system, so it's going to be a wh before any decisions are made.

The Commission isn't intentio ally dragging its feet on the projects. The main concern is th any new system be the best po sible, since we'll have to live with for a long time. On the bright sid the people shortage that has han pered the Commission is beir rectified. Many new departmen that have been short of warm bodies are hiring right now.

Fortunately, not all of our tech nology requires commission ap proval before we can put it to work Microprocessors are perhaps th hottest thing in radio automatio for 1977. Digital has become a wa of life, with applications blossomin in almost every corner of th station. 1977 should bring us 'smart' audio processor, more soph isticated tape handling equipment and a whole raft of improvement in almost every type of broadcas equipment. Ever increasing use o

Old-New Reel Time Recorder

Telex/Magnecord series 1400 broadcast quality recorder/reproducer. An old name that spells reliability. A new design for today's state of the art.

• The Old. Telex/Magnecord products are still made in the USA so parts and service are always available. The series 1400 is still built on a solid die cast aluminum main frame for reliable operation around the clock. It's still available in full, half and quarter track configurations, has fail safe differential brakes and accepts 8¼ inch reels. It also still comes with three motors—but then, that's touching on the new.

• The New. A brushless d.c. servo drive with a crystal oscillator control reference so accurate it virtually eliminates program timing errors. New, three speeds: 3¾ - 7½ - 15 ips. New catenary head block for straight tape loading, the convenience of one hand cueing and the bi-level illumination of push button controls. New DTL logic controls eliminate EMI and provide fast, spill proof tape handling gentle enough for half mil tape. And new electronics, clean to 60 dB S/N at all speeds.

• If you're looking for a real time, reel recorder with old name reliability but designed for today's demands, you'll find it in the Telex/Magnecord series 1400. For complete information please write:

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large and medium scale integration is responsible for much of the progress.

Electronic news gathering, television's claim to fame last year, will receive more attention in radio as we find ways to preserve the immediacy of radio without sacrificing quality. **Radio Workshop** will devote the next several months to ENG for radio.

Are You In The Picture?

Yes, the state of the art is advancing rapidly. Are you? 1977 technology requires 1977 engineering. The engineer who's still emptying grid leak pans had best keep an eye on the young fellow standing behind him. Sure, he's still a little wet behind the ears, and probably doesn't know a cat whisker from a 5Y3, but you can bet he won't get lost on a Karnough map.

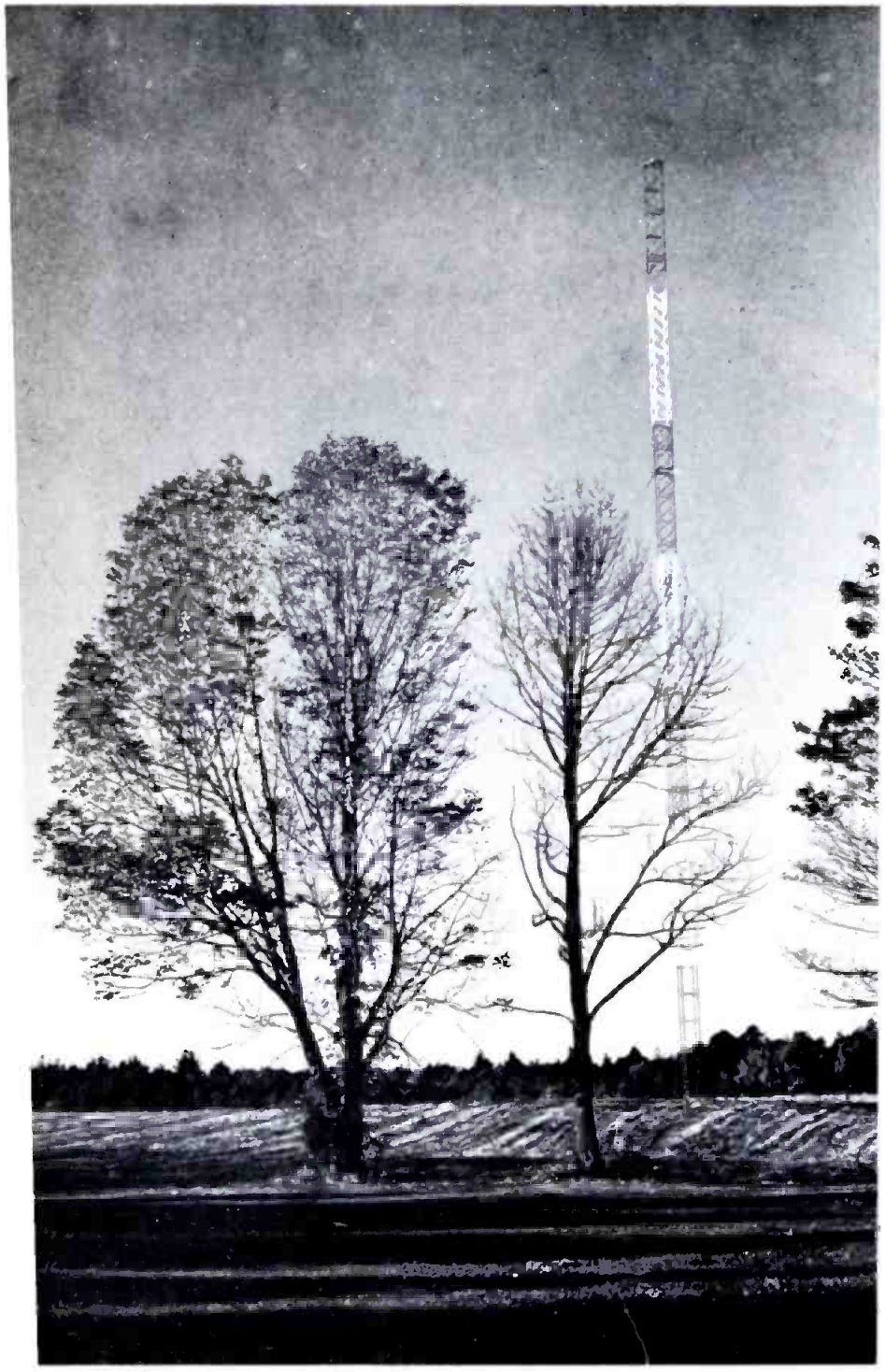
A comfortable working relat ship with digital logic is no lor just something nice to have, essential for survival. If you d already feel at home in the lanc true or false, now's the time to with the program. This mon **Broadcast Engineering** contains last installment of "Logic Ill trated" by Harold Ennes. N month, BE will begin anot Ennes feature called "Logic La These articles are written on a le that a newcomer to digital logic c understand and are an ideal way tune into 1977.

Another way to improve yc grip on those little black cat pillars is to establish a referen library at your station using da books supplied (usually free) by t IC manufacturers. They usua contain applications notes as w as device ratings and pinouts. No has made the best seller list yet, b they do make for good reading cold winter nights. Even mo important, when you do have problem with a piece of equipmen you can find out a lot more abo the device in question from th data sheet than you can from th equipment instruction book.

Many colleges and universitie are now offering night courses o digital logic. If you're not at hom with logic yet, consider taking course or two. Build or buy som sort of breadboard for experimen ing with TTL or CMOS package Learning by doing is tough to beat

1977 is also the year to get you shop ready to handle a new bree of problems. A good triggere scope is absolutely essential wit dual trace capability high on th nice-to-have list. A logic probe is a real time saver, too. Take a look at your hand tools, too. Removing an IC with a 250 watt soldering iron and a pair of vice grips just doesn't cut it!

If you're in a competitive market, don't forget the guy across the street has as much access to 1977 technology as you do. What worked for you last year might not be good enough this year. Change...like it or not...is the name of the game. If you have a need for informative articles in specific growth areas or if you have ideas to contribute, drop us a line in care of the Radio Workshop Editor.



There's more to this photo than meets the eye. Your station and the environment will be a subject you'll have to face the next time you change sites or plant towers. Note here that towers can blend with the surroundings. (Photo by Harold Dorschug, WTIC, Hartford, Conn.)

E will be running hard to keep up to date on what's happening but it will be more important ever to make it to the conions. Next up is the annual 3 convention. Exhibition floor e is already sold out. And all cations are that it will set a new rd for attendance. Here is your nce to touch and compare the s you need most.

o doubt about it, there will be ral new pieces of equipment. what the manufacturers like t is to have the broadcaster stop the booth and ask questions or for a demonstration. All too n the broadcaster walks the es, finds what interests him t, and then stands back and s and looks and looks...what we uld all be doing is communiing.

peaking of communicating, the iety of Broadcast Engineers E) will hold their annual meetduring the convention. Here's a den opportunity to meet and k with engineers from all parts of country. You'll learn more ut the SBE's engineering certifiion program, and you'll have the nce to talk about the industry d the equipment in the exhibits h other engineers.

From the financial side, and sed upon recently released FCC ures, FM had a great year in 75. Of over 180 markets reporting, about 160 showed gains, while ly 10 had losses. Eight markets, d by Jacksonville, Florida, reted revenue increases of more an 100 percent. AM growth was od, but not dramatic.

It has been reported (**Broadsting,** November 8) that NBC is epared to drop their all-news eration, News and Information rvice (NIS). Originally, NBC had anned on signing 150 subscribing ations. They're down now to a ported 62, with an audience of out 200,000.

While all-news is down for the unt at NBC, this format has met ith success at local stations. As u might suspect, the key is tting into the local news and not lying solely on the national news.

Among the challenges to come r radio will be new and interting ways of carrying the local ews. After all, ENG did start in adio. □

An Update On C

By Robert E. Winn*

A subject of growing interest and importance to many broadcasters is that of circular polarization for television. This discussion does not argue the case one way or the other but tries to offer an objective overview on the subject. It briefly reviews the status of the proposed FCC Rule Making and the Circularly Polarized TV tests that have been conducted. It takes a look at the theoretical advantages of circularly polarized TV, discusses the WLS-TV experiment on the Sears Building in Chicago and concludes with a discussion of transmitting equipment requirements.

FCC Status

The Federal Communications Commission adopted a notice of proposed Rule Making on May 11, 1976 in Docket No. 20802 looking toward the amendment of Part 73 of the Commission's Rules and Regulations to permit television broadcast stations to employ circular or elliptical polarization.

This notice of proposed Rule Making resulted from a petition of Rule Making filed February 12, 1975 by American Broadcast Companies, Incorporated, that requested the Rules and Regulations be amended to permit the use, on a permission basis, of circular or elliptical polarization for TV broadcast transmissions.

The comment date for the Television Circular Polarization notice of proposed Rule Making was August 24, and the reply comment date was September 6, 1976. There was substantial industry response consisting of the National Association of Broadcasters, the Association of Maximum Service T casters, the three Commercial T vision Networks, Corporation Public Broadcasting and seve equipment manufacturers. The sponses ranged from strong supp to opposition of the proposal various reasons.

Tests

Limited data on TV circul polarization had been attained an experiment some years ago Station WTAJ-TV, which was th WFBG-TV, Channel 10 in Altoon Pennsylvania. A recent experime was conducted during 1975 Station KLOC-TV, Channel 19 Modesto, California. A report o this test has been filed with t Commission.

The American Broadcastin Company obtained an experiment authorization to conduct televisio

*RCA Broadcast Systems.

The Manufacturers Are Saying...

It was one year ago that **Broadcast Engineering** ran a feature article on circularly polarized antennas. In that article, the CP antenna used in the KLOC-TV FCC authorized experimental tests was described and test procedures were explained. That was the Jampro antenna. And there are others.

Of course **Broadcast Engineering** is not supporting any one make or model. What most people want to know is (1) what tests have been run, and (2) what do the results reveal? Meanwhile, it's obvious that different designers will find different configurations and techniques. While these differences will affect the results, what **BE** is trying to nail down is the feasibility. And so far as we can determine, the evidence seems to support the theory that CP antennas can help eliminate ghosting and co-channel interference.

CP antenna manufacturers are putting their money where their mouth is. The antennas are available from Harris Corporation, Jampro, RCA, CCA (marketing the Bogner antenna), Micro Communications and Alford Manufacturing. So it shouldn't be held up because we are talking strictly theory.

Harris Corporation, Broadcast Products Division, feels that their CP techniques will produce excellent results. A company spokesman told **BE**, "Published reports by well known consultants have proven that fact to our satisfaction, and we now feel it is our responsibility to see that this new technology becomes established as the state-of-the-art in TV transmissions."

The Harris Cavity Backed Radi tor (CBR) CP TV antenna has unique feature. A broadcaster c install one now and transmit in t horizontal mode with excellent r sults, and then, with a minor c site modification, broadcast C signals when authorized to do so b the FCC. Harris, according t Product Administration VP Ji Combs, has their antenna in supp now.

CCA is marketing the Bogner C antenna, and they also have o which can be field modified afte installation for CP transmissions Their antenna uses the same basi slot-director technique as the standard horizontally polarize units. Their UHF and VHF high power CP antennas were announced and demonstrated at the '76 NAB convention.

Thomas J. Vaughan, president of Micro Communications, Inc., com-

V Antennas

ular polarization tests at WLS- their owned and operated ision outlet in Chicago. The S-TV transmitting plant was alled in the Sears Building in ago in 1974 and an interim nna installation mounted on west cylinder on the top of the ding was employed. Field mea- ments and observations were e for ABC by Smith and stenko, Consulting Engineers. ee engineering reports have n submitted to the Commission. itional details of this antenna em will be given later.

Is Circular Polarization Coming?

he question being asked by y broadcasters today is "Is ular polarization coming?" To answer that question, it is ortant to look at some of the theoretical advantages of circular polarization.

These advantages might best be seen by first investigating the horizontally polarized signal. As shown in Figure 1, the radiated field lies entirely within the horizontal plane and with time traces out a sine wave. The received signal will be maximum when the receiving dipole is in the horizontal plane, and will diminish to zero as the receiving dipole is rotated to the vertical position.

By taking two dipoles mounted at right angles, as in Figure 2, and feeding them in phase quadrature, we find that we can produce a radiated field that rotates around the axis of propagation with the magnitude of the field vector remaining constant. This radiated signal is circularly polarized and is defined to be either right hand or left hand, depending upon the rotation of the "E" vector when looking in the direction of propagation. We can see from this diagram that if we place a dipole receiving antenna in this field, the received signal will be constant as the dipole is rotated through 360 degrees. Thus, theoretically, circular polarization makes it simpler to adjust rabbit ear and whip type antennas since the antenna orientation will be less critical.

Ghost Reduction

Probably the greatest advantage of circularly polarized transmission is the theoretical ghost reduction capability. This benefit is based on two factors. First, the reflection behavior of circular polarized fields and second, the polarization discrimination by circularly polarized receiving antennas.

ting on the need for CP TV nnas said, "Some of the addi- nal services that are being ned will use TV for shopping, king, instruction, and business. BBC is presently transmitting ed signals to selected viewers are able to ask a computer for sorts of information...

All these new services have two gs in common: (1) They will and higher quality reception; (2) It will cost additional ds." He goes on to say that G is involved as well. He goes on conclude, "Our present method transmitting linear horizontal arization (for TV) is very restric- and does not permit the use of of the new Ghost Filtering hniques. CP is not only desired the broadcaster, but will be anded by the viewer when the applications are implemented, he has to pay for the service."

Jampro Antenna Company believes very strongly in CP antennas for television. In reply comment filed with the FCC, in favor of CP for TV, Jampro's president, Peter Onnigian, stated that none of the opponents for CP really had any substantiating arguments. The Association of Maximum Service Telecasters proposed a "go slow" attitude and more study of the matter to the Commission. The Corporation for Public Broadcasting on the other hand is concerned about a further disparity between UHF and VHF telecasters. CPB believes that VHF stations will switch to CP antennas, while UHF stations may not be able to do so economically. CPB therefore suggests a delay, and more study. Neither MST or CPB have indicated a desire to put money into tests of the matters they question. Onnigian says ABC television and KLOC-TV, Modesto, where Jampro conducted its CP tests, invited all interested parties to make tests using the two facilities.

Jampro believes that adequate testing of this new type of TV antenna and its resulting mode of propagation has been accomplished. Onnigian says the results are in and are positive. Jampro therefore has urged the Commission to promptly act upon its own proposed Rule Making, and adopt it as written.

In the Jampro tests, they found existing home antennas were completely compatible with CP transmission. As a matter of fact the Jampro field tests indicated 66 percent of the homes tested, showed better pictures with CP, compared to normal horizontal polarization, using the same ERP. Indoor antennas, for UHF reception, which consist of rings, vees, bow ties or other electrically small pickup devices, perform much better with CP transmission than they do with the present mode.

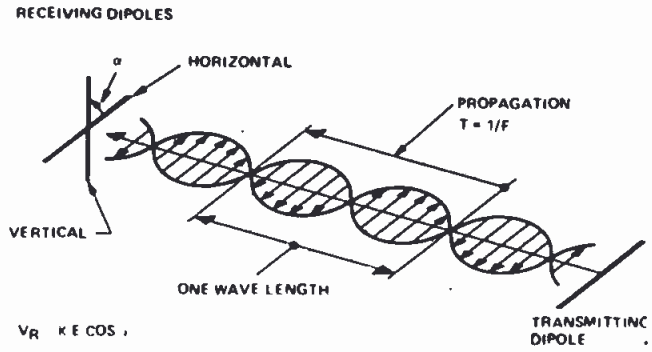


Figure 1

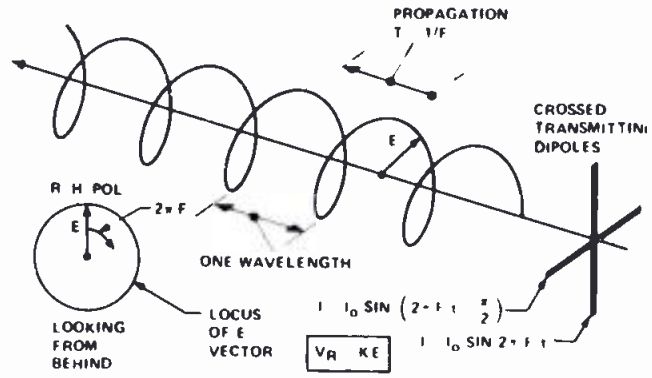


Figure 2

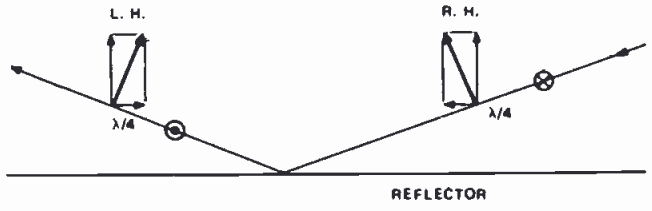


Figure 3

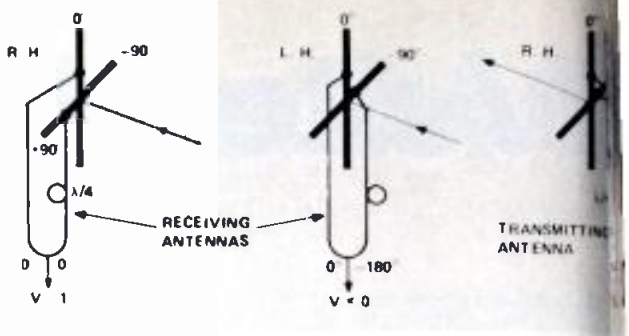


Figure 4

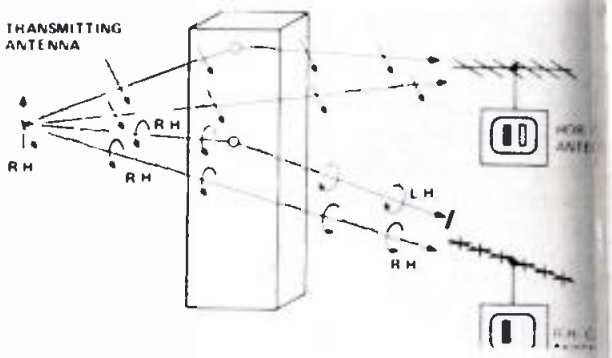


Figure 5

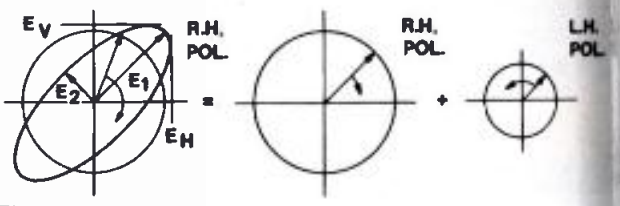


Figure 6

Figure 3 illustrates the reflection phenomenon of electric fields. The right hand circularly polarized signal shown on the right is vectorially represented with the instantaneous horizontal and vertical components. Note that the vertical component is pointed upwards and the horizontal component is directed inward. When the signal is reflected from a horizontal reflector, the horizontal component will be reversed in polarity as shown in the left hand vector representation. Note that the horizontal component is now directed outwardly, and that the vertical component remained unchanged and directed upwardly. The result is that the sense of rotation is reversed, and the reflected signal is now left hand circularly polarized.

The second factor contributing to ghost reduction is that of polarization discrimination by the receiving antenna. To rephrase this slightly, a right hand circularly polarized receiving antenna responds only to right hand circularly polarized radiation. Figure 4 illustrates why.

Shown are two receiving and one transmitting antennas. All three use identical cross-dipoles connected in phase quadrature. The transmitting antenna radiates a right hand circularly polarized signal as a result of the connections to the feed lines. The receiving antenna on the left is identical to the transmitting antenna in the drawing, and it is also right hand circularly polarized. Since it is used as a receiving antenna, it faces the transmitting antenna.

Note from the diagram that if either of the receiving antennas are rotated 180 degrees to face awa from the transmitting antenna their direction of rotation is re versed. This fact is similar t realizing that the hands on a cloc turn counter-clockwise when viewe from behind the clock. This re versal in front to back rotation gives rise to the potential advantag of circular polarization to reduc adjacent and co-channel inter ference.

The antenna in the center i wired for a left hand circularly polarized signal, but it is otherwise identical to the transmitting antenna. If we supply a signal to the input of the transmitting antenna we see it is first split between the horizontal and vertical radiators and that the horizontal feed contains a quarter wave, or a minus 90 degrees, phasing section. This

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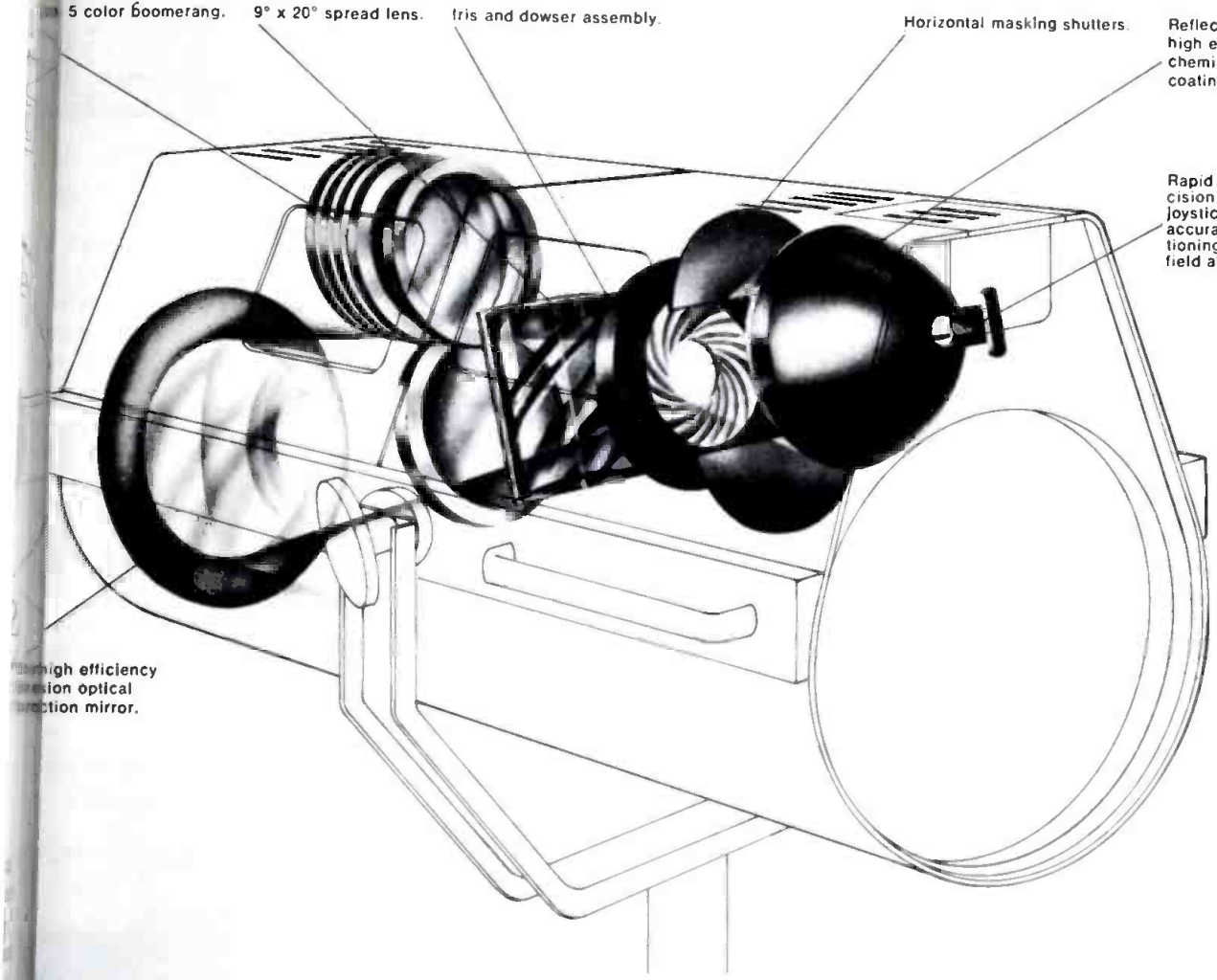

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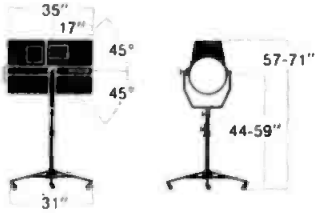

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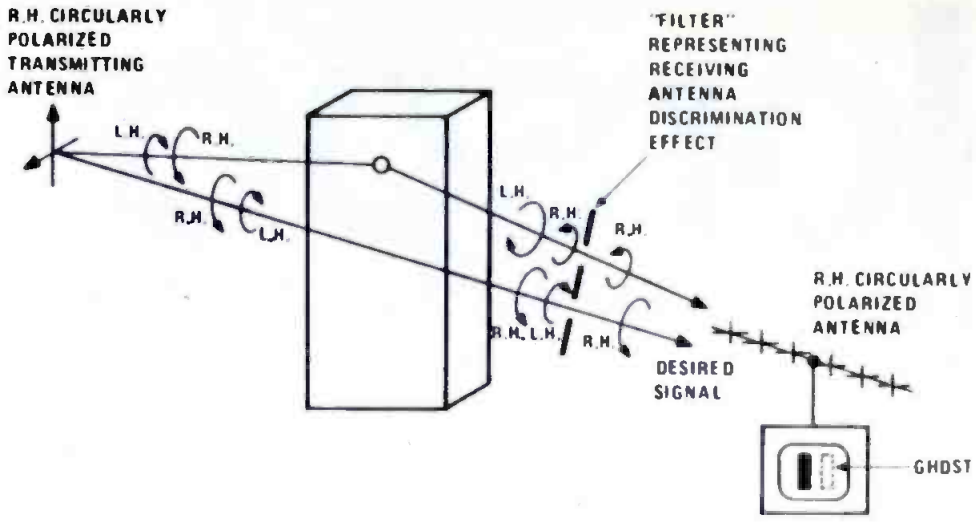

Figure 7

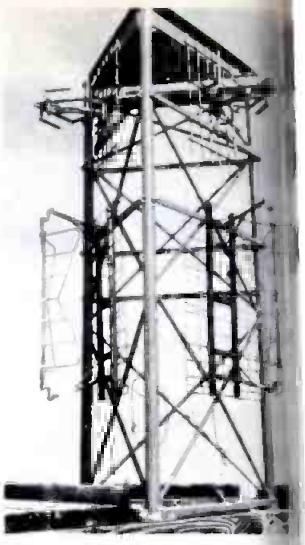

Figure 8

phasing section provides the required quadrature feed to the crossed-dipoles to transmit a right hand circularly polarized signal.

Looking at the center receiving antenna, it will have zero output since the signal arriving from the crossed-dipoles at the combiner junction will be 180 degrees out of phase.

Looking at the right hand polarized receiving antenna we see that the signals received by the two crossed-dipoles add in-phase at the combiner and produce an output.

To see how these factors provide ghost reduction, let's examine a simplified illustration of a typical transmission system.

Typical Transmission System

Figure 5 illustrates a transmitting antenna on the left and two receiving antennas on the right, the top right being a horizontally polarized antenna and the lower right being a right hand circularly polarized receiving antenna.

Looking at the upper signal, and assuming the transmitted signal to be horizontally polarized only, we see that the horizontally polarized receiving antenna receives two signals—one a direct path signal and the other a reflected path signal. Provided that the path length of the reflected signal is sufficient, and that its reflection amplitude is high enough, a ghost will be seen on a TV set connected to this antenna.

Looking now at the lower signal path and assuming that both the transmitting and receiving antennas are right hand circularly polarized, we see that again two signals a present at the receiving antenn The direct path and the reflect path. However, this time the r flected path changed polarity up reflection and is now left ha polarized. Due to the polarizatio discrimination of the receiving a tenna, only the direct path will b received, and the ghost signal w be eliminated.

Circular Polarization

In practice, rarely is anythin perfect, and the same holds true f the term **circular polarization.** Let examine the quality of the circuit polarized signal.

The term **Polarization Ratio** typically used to describe th

Continued on page 7

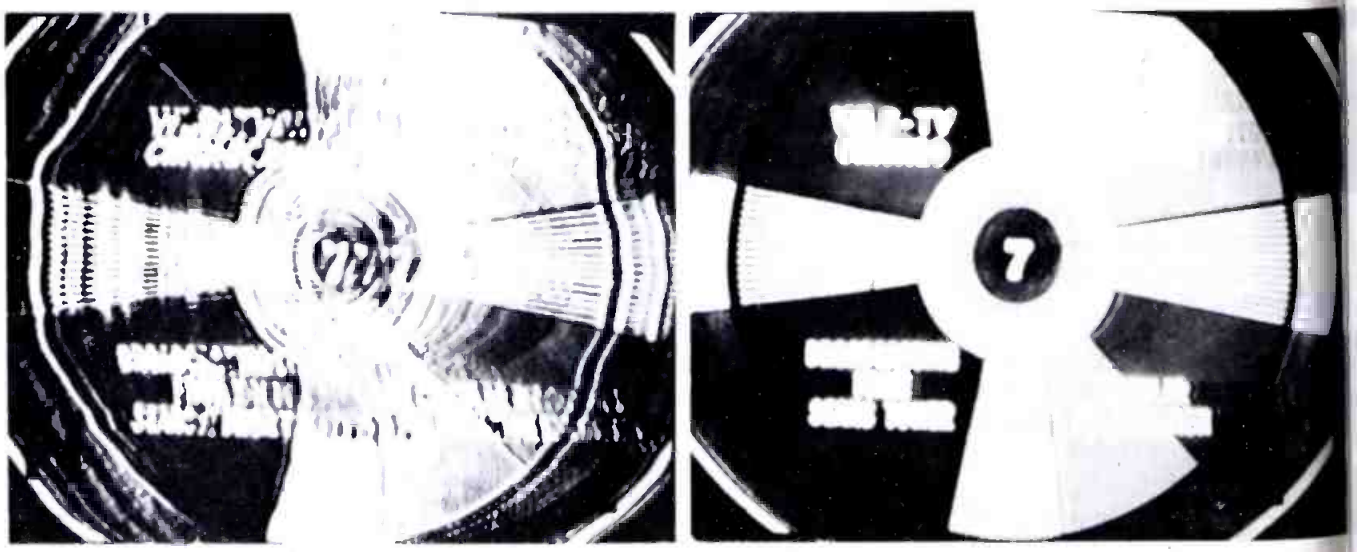

Figure 9 These are off-air pictures taken during the Chicago test. On the left, a signal under the worst conditions without CP. The right side picture shows CP improvement.

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Aural service	16,200 hrs.	14,000 hrs.
Up to 12.5 kW	10,096 hrs.	10,525 hrs.
Type 8891	9,402 hrs.	
Visual service		
Up to 17.5 kW	16,600 hrs.	18,300 hrs.
Type 8807	29,800 hrs.	21,200 hrs.
Visual service	30,100 hrs.	20,400 hrs.
Up to 27.5 kW	9,778 hrs.	9,776 hrs.
Type 8916	7,875 hrs.	13,183 hrs.
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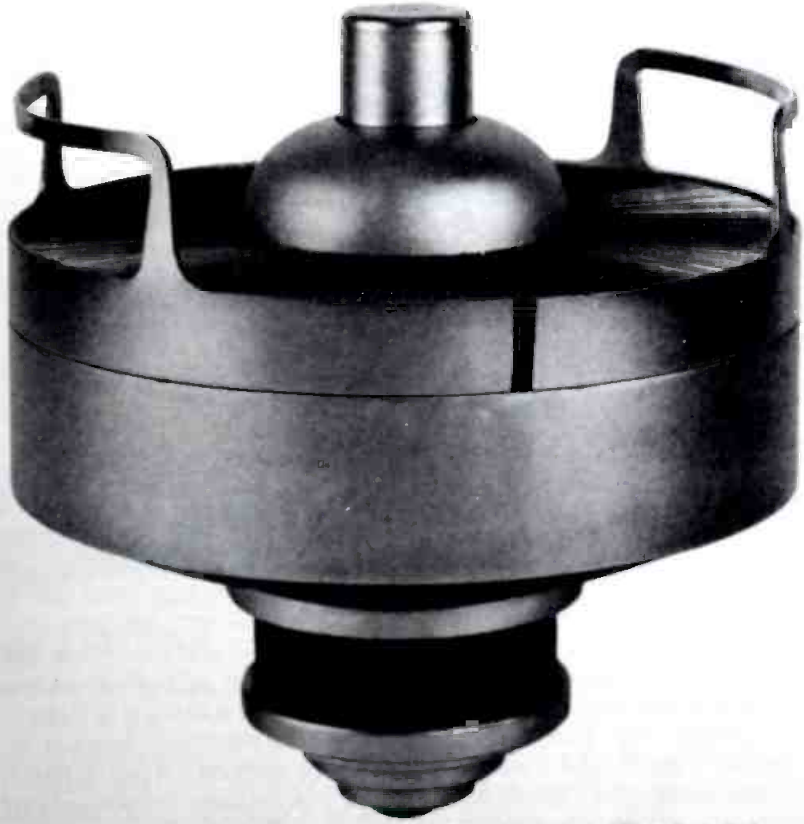
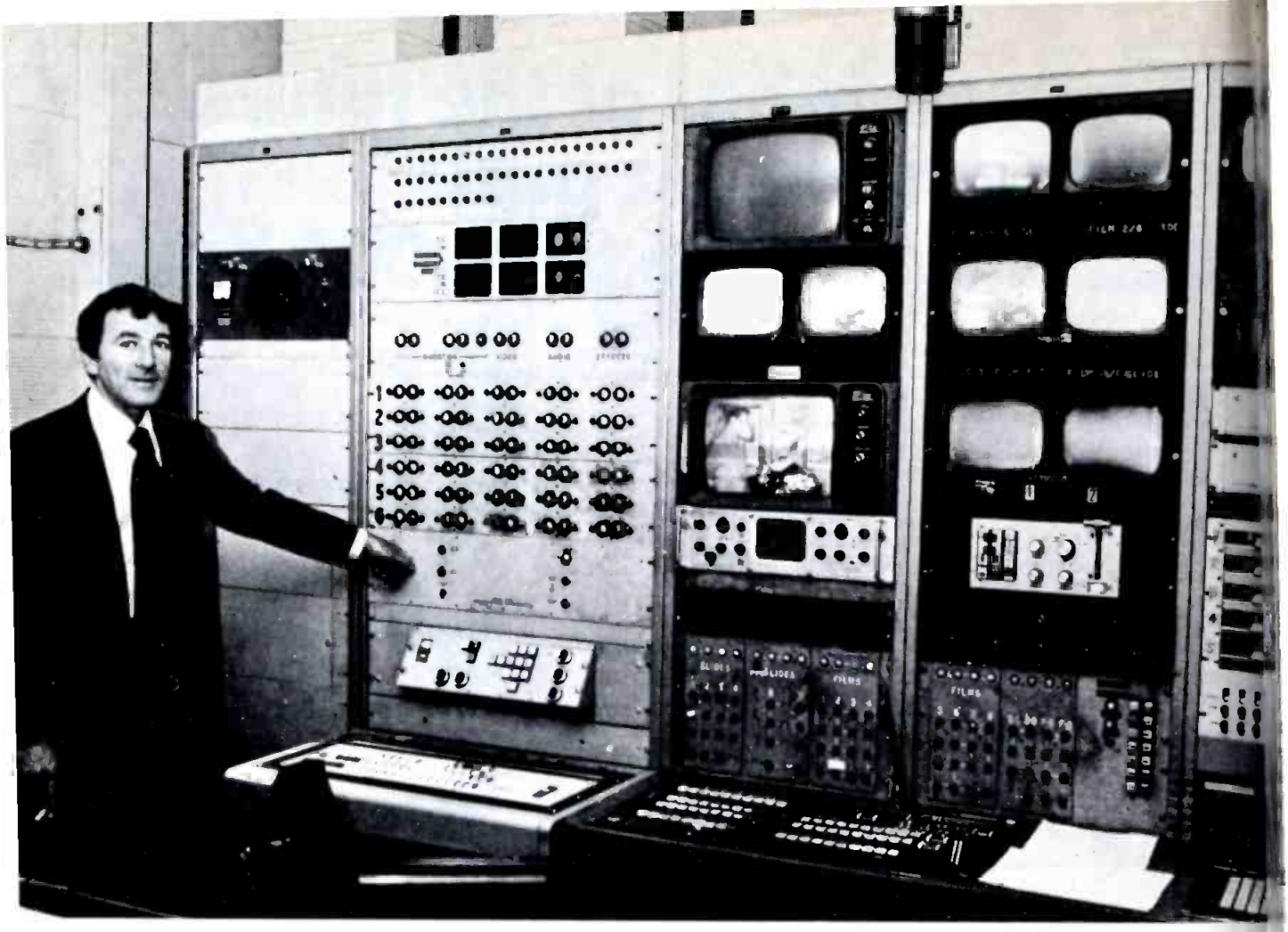


RCA

For More Details Circle (27) on Reply Card



Larry Fraiberg, Vice President & General Manager WNEW, powering-down a phasing out "yesterdays" automation system in preparation for the BCS/C Total Automation System. 1975.

If You Get People Involved...

You Can Take The Surprises Out Of TV Automation

Part 3 of a 3-part series/By Bob Hueffed

In the November issue of **BE** we traced the history of automation at Metromedia from 1961 to 1974. The November article started in the era of tubes and transistors and ended with the introduction of a digital computer, in 1969, at Metromedia's Los Angeles station, KTTV.

Incubation Period

From 1969 to 1974, the industry went through an incubation period, and some tough times, and then came on stronger than ever. "Things" had changed, and at a revolutionary pace. To compete and maximize profits, a station's communication system had to operate in "real" time. To illustrate, in January, 1970, WNEW-TV averaged 1200 commercials per week of which 550 were "60's". In January, 1976, they averaged about 3000 commercials per week of which 200 (approximately) were "60's". In December, 1976, WNEW is estimating 3500 commercials per week. Adding more people to a manual system could not handle this load effectively. In fact, just adding people could be self-defeating. Fortunately, the broadcaster and hardware suppliers were gettin prepared for the "better-days-tc come". The minicomputer grew t a giant in its industry, and manu facturers and computer program mers were learning more (in som cases for the first time) abou avails, orbits, rotations, aged re ceiveables, logs, makegoods, demo graphics, etc., etc., etc.

In the middle of this industry in cubation and development period 1973, WNEW's Bill Kelly was read for a giant step forward in "Total" automation. After Kelly made hi preliminary investigations, Dic

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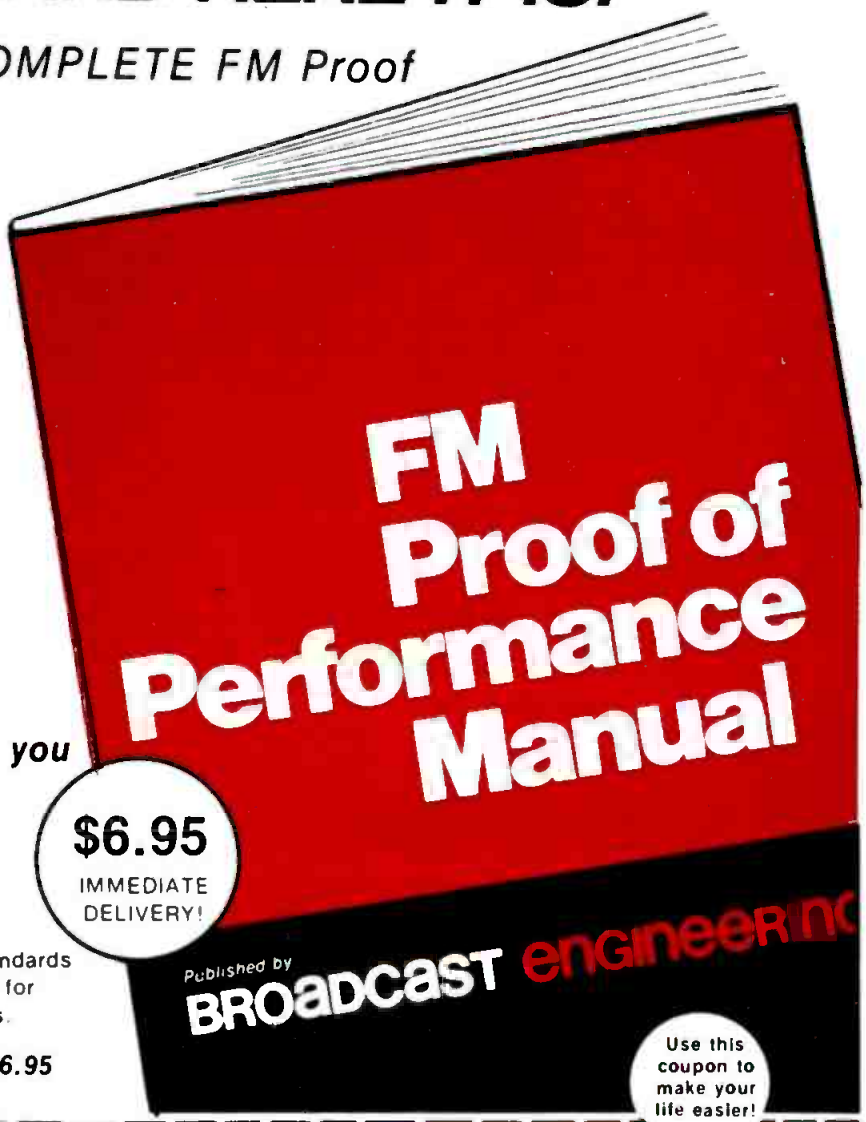

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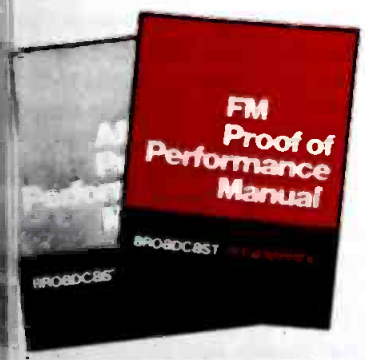

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Anderson formed an engineering team to define a Technical Operations automation system that could be hard wired to a Business Computer system, and the Metromedia master plan was modified. The "plan" now required that "Total" automation systems be installed at WNEW-TV, WTCN-TV and WTTG within a period of two years. And at the same time WTCN-TV, a newly acquired property in Minneapolis, had to design, build and move into a new building with all new equipment.

Early in 1974 Hal Christiansen formed a team to define and select a Business Computer system for five of the Metromedia stations... WNEW-TV, WTTG, WTCN-TV, KMBC-TV in Kansas City and WXIX-TV in Cincinnati. (Metromedia acquired the WXIX-TV property a few months after they purchased WTCN-TV.) All five installations were to be complete within two years.

In 1973 Metromedia selected the CDL System 200 Technical Operations Automation system for WNEW, WTCN and WTTG. Concurrently, they purchased Ampex ACR-25's. The ACR-25's were to become another link in the "Total" automation chain. Metromedia, Westinghouse, Ampex and CDL jointly defined an intelligent interface to permit CDL's System 200 to automatically program and control the Ampex ACR-25. These two interfaces are better known as the Ampex ADA (Automation Data Accessory) and the CDL ARCH (Automatic Remote Cassette Handler).

In 1974 the Kaman Sciences BCS-1100 Business Computer system was selected. Although it was a relatively new system, it was backed up with experience, and more adaptable to communicate directly with CDL's System 200. Both systems used the DEC PDP-11/05 minicomputer and random access mass storage discs for data.

It is next to impossible to describe in detail the operational features and advantages of these two systems in less than 100 pages and a two day seminar. More important is to describe **why** and **how.**

Metromedia recognized that "real" time and accurate communications were essential for operating a TV station now and in the future, particularly independent stations in major markets. They were following their master plan and in 1974 they saw that they could **approach** a "real" time data and communications system for a TV station. The BCS-1100 could effectively handle the Sales/Service Department's work load and problems. They could communicate directly with Traffic because both departments use CRT terminals and a common data base that are controlled by the same computer.

The BCS computer can "talk" directly to the CDL computer; therefore, the Program Log can be transferred directly to Technical Operations. The CDL system can automatically schedule and control ACR-25's, verify material, m machine assignments and con the machines, perform complic audio/video sequences with a va ty of effects, print the P "As-Aired" Log, and then trans this back to the BCS system automatic invoicing.

Over-simplified, but adequate illustrate the full circle of the c munications paths that you now control with computer syste and why Metromedia selected th systems.

Why Automate?

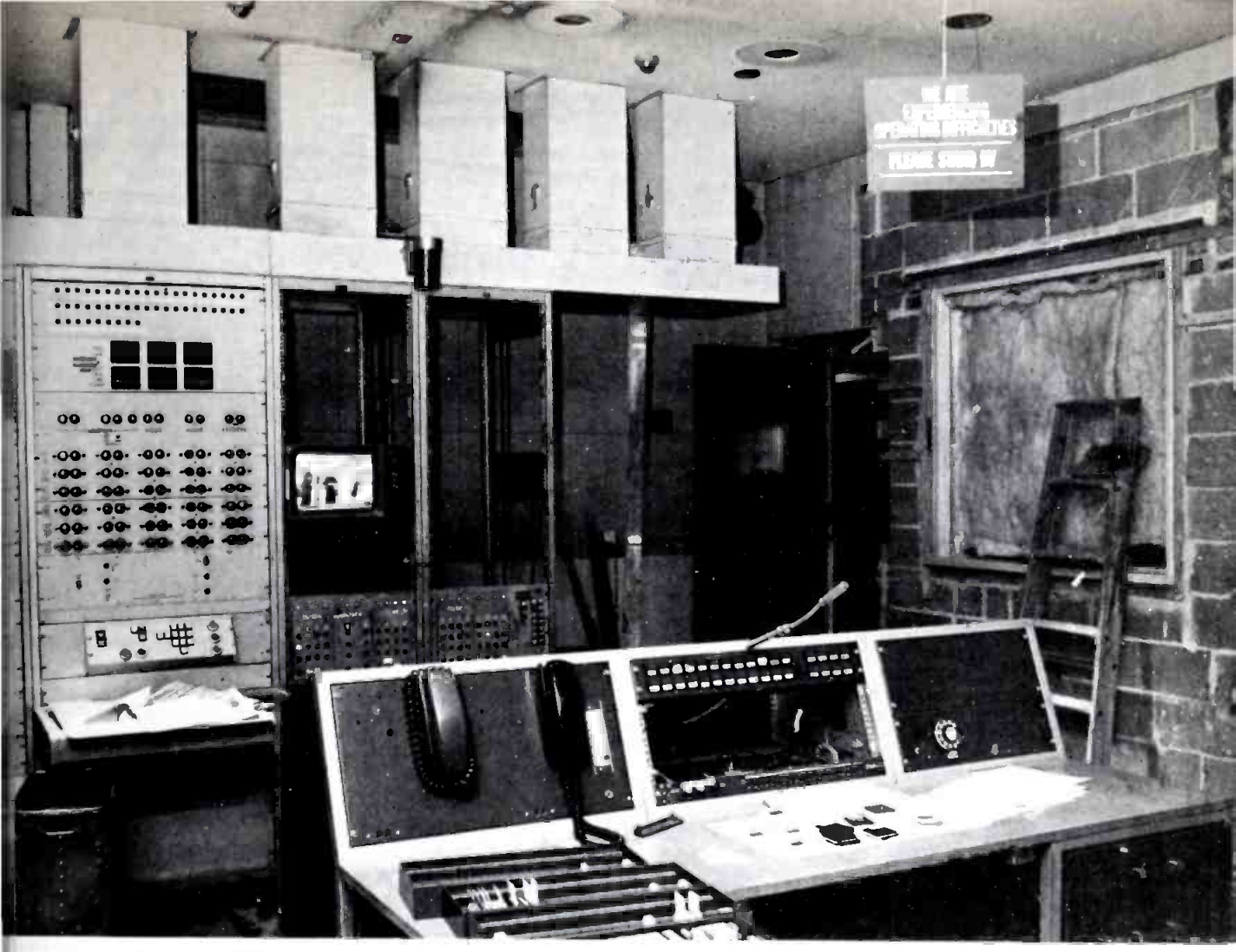
Predictably, the Sales Service partment asked the questio "Why automate?" "Change" always present in their operati and their clients are becoming m unpredictable. They are well aw of computer horror stories, there probably is not a sales partment anywhere, in any indus that is anxious to convert to a c puter operation. But as Bu Meehan, Vice President General Sales Manager for WNE said..."We had one of the best most copied manual systems in business...had to because we are independent station in the Num 1 market with a National S Manager, two Local Sales M agers, 11 salesmen and two re store specialists...but we could continue to use a manual sys forever...we have to learn to w before we can run, and we'll ready to run when we have to... that day is rapidly approachi Meehan added..."Ratings measured electronically in York, and when 0.1 of a ra point changes the price of inventory, you have to know ex what you have in inventory."

Ed Petrosky, Traffic Manager WNEW, was anxiously looking ward to the day the system w be installed. With a staff of e people since 1967, he had to c with an increase in the ave number of commercials per w from 700 in 1967 to 3500 in 1 and during this period the num of 60's decreased from 650 week to about 200 per w Besides that workload there are •35 to 60 new tapes and 10 t new films delivered to his dep ment each day that have to screened, timed, and classified.

About The Author

Bob Hueffed is a management and advertising consultant with offices in Rye, New York. He was formerly with Central Dynamics Corporation as Vice President and General Manager. Bob is not new to automation—in 1969 he pioneered and conducted broadcast automation seminars for Central Dynamics in major cities throughout the U.S. and was personally involved with the CDL automation systems at the Metromedia and Westinghouse TV stations. In fact, he is credited with coining the name "Total" Automation.

Bob has been an active member of many organizations in our industry including: a Trustee and Founding Director of the Broadcast Engineers Educational Advisory Committee, SMPTE ad hoc committee for standardizing and establishing the SMPTE Edit Time Code, IRTS computer and automation standards, co-chairman of the original NAB ad hoc Exhibitors' Committee, and has authored and contributed to many trade journal articles. He graduated with awards from Case Institute of Technology, and prior to joining CDL, he spent 15 years in the aerospace industry in sales and management positions.



ing preparations at WNEW master control room for installing the new CDL Technical Operations system. Note sign... are experiencing operating difficulties—please stand by."

average of 35 to 40 letters and ne calls per day that usually e changes to the original in- ctions. That is the average for days a week, but the majority hese requests arrive on Friday affect the weekend and Mon- s log.

ny of the spots require addi- al production work at the on, such as adding an audio or slides.

ou may question how eight ic people could handle such an ease in workload...500 percent ease! When Petrosky was on the inal "System Analysis" team in , he learned the importance of oughly understanding all other rtment operations. The Traffic artment has to accept and dis- ute data and interact with more artments, more often than any r department. As Petrosky said Ve are the traffic cops of the on, and if we didn't understand other guy's job and problems, communications would halt...you cannot second-guess anyone, and if you don't have the answer, you have to know where to find it...and quickly...you have to have awareness to anticipate and execute accurately and timely". This attitude and training permitted a smooth and rapid transition to the computer systems. The WNEW traffic people are specialists that understand and operate the BCS and CDL systems (both systems have terminals in the Traffic Department), and they have firm control.

Traffic can now comfortably prepare the Log over a period of two days vs. five days with the punch card system. Machine assignments and film, tape, and slide rundown lists are produced by the CDL System 200 in a fraction of the time. A commercial material inventory crosscheck routine can be called up on a CDL CRT terminal to check if a commercial is on a reel or an ACR-25 video cassette—important for scheduling people and machines.

The BCS-1100 and CDL System 200 computer systems became operational between May, 1974 and July, 1976.

The First Total Automation System

WTCN installed the CDL system first and it was operational in May, 1974. In January of 1975 the first ACR-25 was interfaced to the CDL system using the ADA/ARCH interfaces. That was a "first". In May, 1975 the BCS-1100 Business Computer system was hard-wired to the CDL System 200 Technical Operations Automation System, and with that connection the first "Total" Automation system became operational.

WNEW was operating their CDL System 200 in June, 1975, and the BCS-1100 was installed and con-

nected to the CDL system in August, 1976.

KMBC and WXIX had their BCS-1100 systems operating by September, 1975.

WTTG installed the BCS-1100 in December, 1975 and completed their "Total" Automation system when the CDL System 200 was installed in 1976.

The installations produced a few tears and some frustrations, but that was anticipated. WNEW and WTTG had the advantage of learning from WTCN's experiences, and the WTTG system was installed "easier than expected and according to plan". This learning curve also applied CDL and BCS, and their training programs were modified and intensified during this two-year period. Engineering departments visited CDL during the final stages of in-plant system assembly and test, and after the system was installed, maintenance and system operating courses were conducted at the station.

All agreed that training programs were essential to reduce the on-the-job learning curve cycle. Good training coupled with an understanding of your data and communications system will go a long way to eliminate frustrations, surprises and compromise.

WNEW installed their BCS system one month before the Fall season and the operator training programs had to be conducted on location during the hectic business hours. (BCS usually trains at their facility and provides additional instruction and "hand holding" on location.) Richie Witkin, Sales Service Manager at WNEW, had some rough days and long hours trying to convert from an established manual system to a computer system, but by October 1..."everything started to fall into place...we now feel comfortable with the system, understand how to manipulate it, and are looking forward to some of the new BCS operating programs".

Witkin's "wish list" will probably continue to grow, but many items are being developed now by BCS and will probably be available within the next six to nine months.

Wish List

According to Jack Finlayson, BCS Marketing Manager, BCS is developing some new powerful software for the Sales Service department.

1) The Avail format will be changed to allow for average cost per spot for a program or daypart and for each rate section or level. Specials can be reported separately. Customers can call for overlapping dayparts on the same run; i.e., 9:00 AM to noon and 10:30 AM to 11:00 AM. The customer can select the number of weeks wanted for each daypart. (This first phase has actually been completed and tested at the time of this writing.)

2) The Phase 1 data will be stored in the station's resident computer system to permit on-line manipulation that can be displayed on the CRT terminals or printed.

3) Allow a station to play management computer games to experiment with raising or lowerin certain rates or dayparts, and hav the system recalculate values, etc using the information of what sold, available, preemptible, etc.

4) Add rating booking informa tion to the station's resident com puter and merge it with availabil ties to prepare sales proposal analyze orbits, compute cost pe rating points, etc. These proposal could be printed for presentation t the client.

It is probably safe to say tha these computer programs are o everyone's "wish list".

And there are more. The industr is changing every day as is tech nology. Digital techniques, micro processors, Super LSI will force u to change, but if you do your home work now, you will recognize th opportunities.

To repeat Hal Christiansen opening comment in this article, "the journey is not complete be cause 'Total' Automation is moving target...to cope with it, yo have to have a master plan fo somewhere down the road". And h added..."get good hardware con trolled by good software that work in **your** business environment...it the only way to maintain control your business".

The author is taking the liber to append to these quotes excerp from the October 15, 1976 issue **Forbes Magazine.**

"New York-based Metromedi Inc. owns six TV stations, all b one of them unaffiliated. Says chief executive, John Kluge: 'Rev nues from our five independe stations are running at an avera 50 percent higher than last yea some of them up to 80 perce higher.' Reflecting this, Metr media's earnings more than doubl in the first half of 1976; its sto zoomed from five in 1975 to as hi as 30 this year. [the article co tinues]...Metromedia bought ind pendent WXIX in Cincinnati for million four years ago; today it worth at least $9 million."

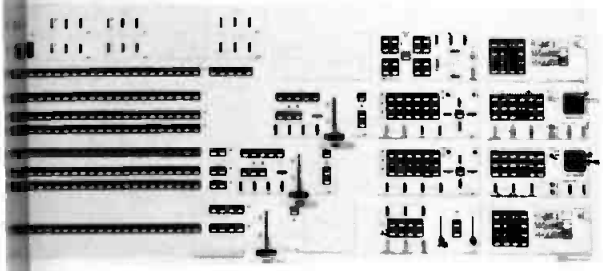
These are probably some of t reasons why Hal Christiansen looking for the P&L's on Mond rather than Wednesday...and probably being nudged just a lit by John Kluge.

(Editor's note: What a way to " to black")

Lottie Bryan, Assistant Traffic Manager WNEW, and Skip Aldrich, system specialist WTCN-TV, training on the CDL System 200 traffic terminals at WNEW.

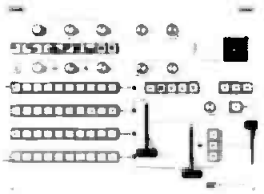
Central Dynamics.
International pacesetter in television broadcast equipment.

Video switchers.

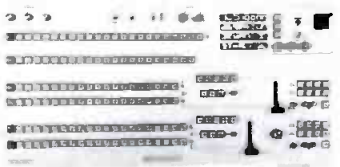


Super Powerful CD 480 The Smart Switcher
...utionary modular switchers with unprecedented production ...r. They outperform the largest conventional switchers, yet ...tremely simple to operate. Their power and ease of ...tion are due to CDL's new Sequential Effects (SFX) Amplifier. ... can cut, mix or wipe between two Background Sources ...wo separate Key Sources either individually or in any ...ination. Models with one or two SFX Amplifiers provide all ...andard and optional features you need, including Rotary & ...om wipes, RGB Shadow keys, Hard and Soft Color Border ..., Color Border keys, Quad with Color Borders, Encoded ...ma keying, Key Mask generator, and 16, 24 or 32 inputs. ...sety of modular accessories will continue to keep your ...ner smarter than the rest as new technology develops.

VS-10
An inexpensive broadcast quality 8-input switcher that features flexibility and ease of operation. Self-contained electronics for rapid installation in ENG and other small mobiles.



VS-14
Sophisticated enough for large studio production, yet compact and inexpensive enough for small mobiles. Soft wipes and keys—even a Downstream keyer—are standard. Self-contained and remote versions available.



VSP-1260S
An amazing value
Now the smallest station can afford a conventional 20-input mix/effects switcher of the highest quality and reliability and get it in under 30 days! All features, including an Encoded Chroma keyer and Bordered keys, are standard (not optional, as is often the case). And the price is astonishingly affordable.

...bout the AFM-10 Audio Mixer/Switcher—an ideal companion to the CDL VS-10 and VS-14 video production switchers.

...utomation.

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Logic Illustrated

Part 4 of a 4-part series/By Harold Ennes

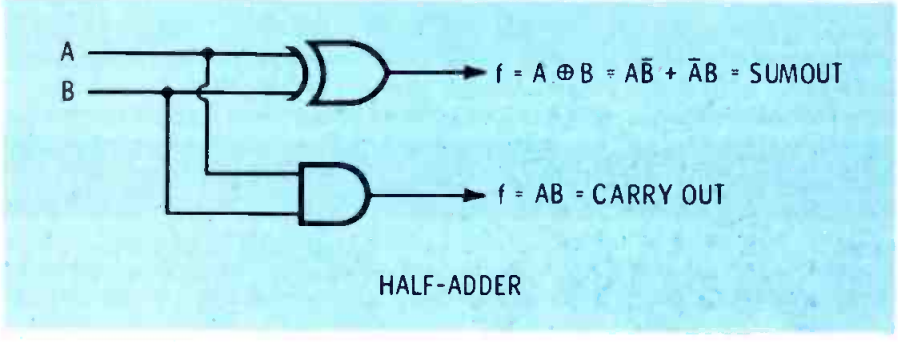
Logic networks are used for binary addition and subtraction. Multiplication can be accomplished by over-and-over addition; division by over-and-over subtraction. Any arithmetic function can be accomplished digitally by logic networks. Such functions are basic to all decision-making logic systems.

BASIC BINARY ADDITION TABLE

A PLUS B =		SUM OUT	CARRY OUT
0	0	0	0
0	1	1	0
1	0	1	0
1	1	0	1

4-1. This is the basic bina addition table. (To review bina addition, see "Digital Math Pa 1," **BE** June '74.)

Two outputs are required: Sum out; 2. Carry out.



4-2. This circuit satisfies the bina addition table of 4-1. This termed a **half-adder** because the is no provision for a **carry inpu** Only a **carry output** is provide This becomes a **previous carry** any following stage.

The boolean relationship for half-adder:

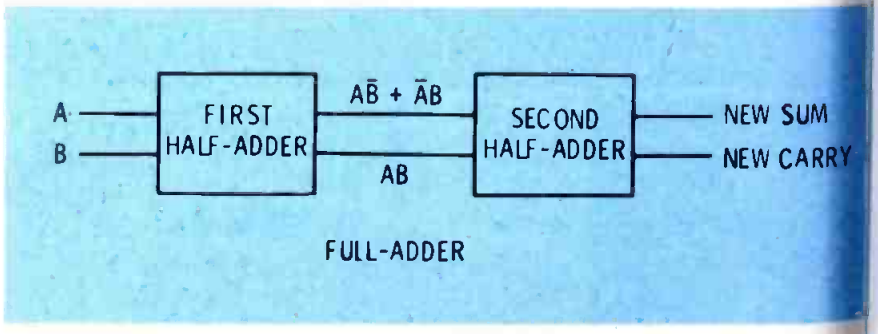
$$\text{Sum} = A\bar{B} + \bar{A}B$$
$$\text{Carry} = AB$$

FULL BINARY ADDITION TABLE

A PLUS	B PLUS	CARRY IN (C)	SUM	NEW CARRY (C_n)
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
0	1	1	0	1
1	0	0	1	0
1	0	1	0	1
1	1	0	0	1
1	1	1	1	1

4-3. Expands the binary addition table for a **carry input** (previous carry). Where:

C = previous carry.
C_n = new carry.



4-4. The circuit for a half-adder (4-2) simply represents the function required. In real life, 2-input or 4-input adders are constructed in a single **chip** (IC), usually with provisions for true or inverted inputs, and true or inverted outputs.

A **full adder** is, in effect, two half-adders in cascade as shown 4-4. Note that for the final su output to satisfy the binary additi table 4-3, the previous carry fun tion (C=AB) must be incorporat in the logic. The following sectio show the boolean development.

Introducing a Color Corrector for Electronic News Gathering.

Electronic News Gathering makes tough demands upon the broadcaster. Color imbalance and colorimetry problems are frequently encountered. Matching remote camera shots to indoor studio programs or assembling tapes from different locations or cameras is "chancy" at best. Often that fast-breaking story doesn't allow for camera rebalancing!

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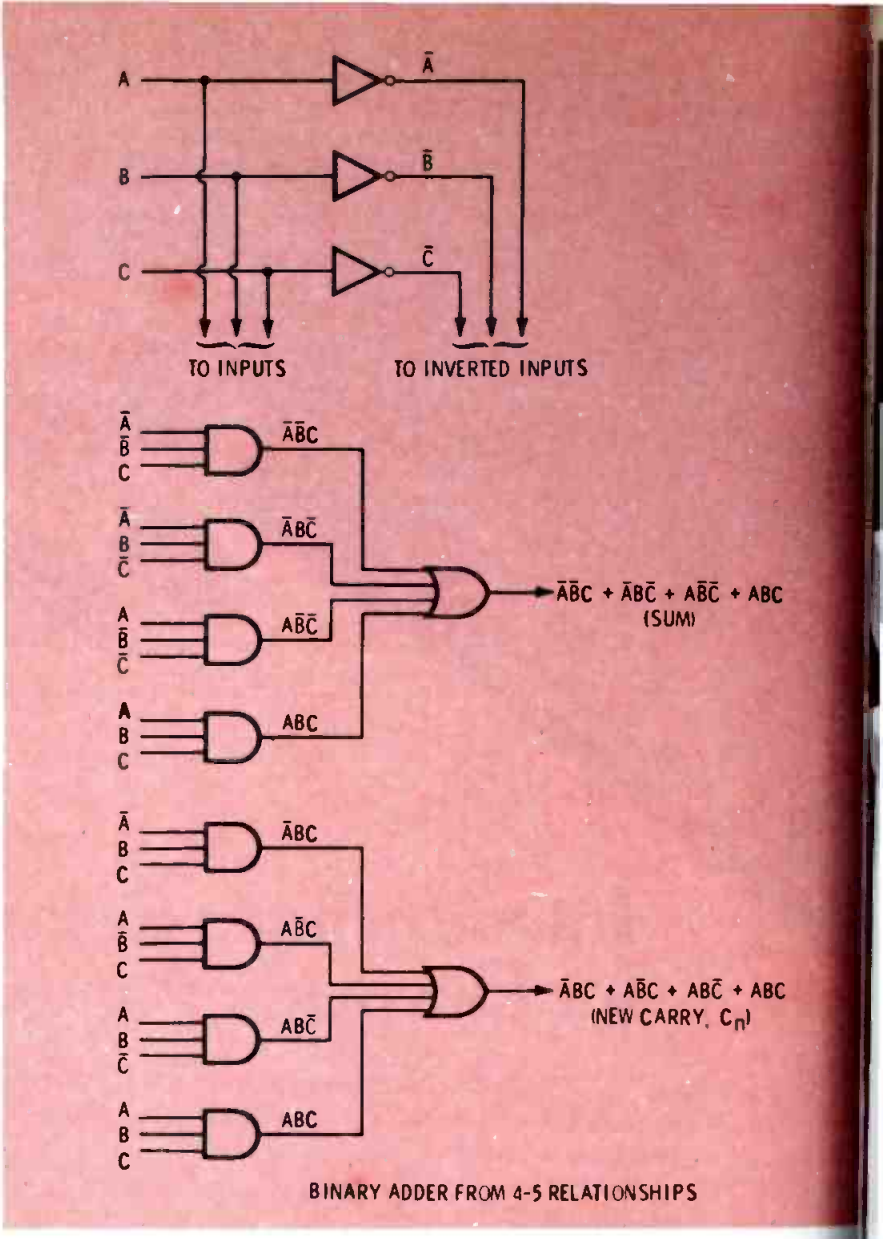
FULL ADDER IN BOOLEAN FORM

A	B	C	BOOLEAN SUM (f=1)	BOOLEAN NEW CARRY (C_n)
0	0	0	0	0
0	0	1	$\bar{A}\bar{B}C$	0
0	1	0	$\bar{A}B\bar{C}$	0
0	1	1	0	$\bar{A}BC$
1	0	0	$A\bar{B}\bar{C}$	0
1	0	1	0	$A\bar{B}C$
1	1	0	0	$AB\bar{C}$
1	1	1	ABC	ABC

C = PREVIOUS CARRY
C_n = NEW CARRY



BINARY ADDER FROM 4-5 RELATIONSHIPS

4-5. To understand the full binary adder, re-write the binary addition table (4-3) in boolean form (4-5), showing f = 1 for sum and f = 1 for carry.

Where C = previous carry.
C_n = new carry.

Then from the table (4-5) note that:

$$SUM = \bar{A}\bar{B}C + \bar{A}B\bar{C} + A\bar{B}\bar{C} + ABC$$
$$C_n = \bar{A}BC + A\bar{B}C + AB\bar{C} + ABC$$

4-6. This constructs a full binary adder from the relationships of 4-5. Note that three inverter gates, eight AND gates, and two OR gates are required, for a total of 13 symbols.

TRUTH TABLE PROVING: SUM = $C(AB + \bar{A}\bar{B}) + \bar{C}(\bar{A}B + A\bar{B})$ CARRY = $AB + C(A\bar{B} + \bar{A}B)$

A	B	C	$\bar{A}$	$\bar{B}$	$\bar{C}$	AB	$\bar{A}\bar{B}$	$A\bar{B}$	$\bar{A}B$	SUM $C(AB + \bar{A}\bar{B})$	SUM $\bar{C}(A\bar{B} + \bar{A}B)$	ORED SUM	CARRY $AB + C(A\bar{B}+\bar{A}$
0	0	0	1	1	1	0	1	0	0	0	0	0	0
0	0	1	1	1	0	0	1	0	0	1	0	1	0
0	1	0	1	0	1	0	0	0	1	0	1	1	0
0	1	1	1	0	0	0	0	0	1	0	0	0	1
1	0	0	0	1	1	0	0	1	0	0	1	1	0
1	0	1	0	1	0	0	0	1	0	0	0	0	1
1	1	0	0	0	1	1	0	0	0	0	0	0	1
1	1	1	0	0	0	1	0	0	0	1	0	1	1

WHERE C = PREVIOUS CARRY

4-7. Simplify the **sum** and **carry** expressions of 4-6, and prove by a Truth Table:

$$SUM = \bar{A}\bar{B}C + \bar{A}B\bar{C} + A\bar{B}\bar{C} + ABC$$
$$= C(\bar{A}\bar{B}) + \bar{C}(\bar{A}B) + \bar{C}(A\bar{B}) + C(AB) \text{ rule 20}$$
$$= C(AB+\bar{A}\bar{B}) + \bar{C}(\bar{A}B+A\bar{B}) \text{ grouping C and } \bar{C} \text{ terms.}$$

$$C_n = \bar{A}BC + A\bar{B}C + AB\bar{C} + ABC$$
$$= C(\bar{A}B) + C(A\bar{B}) + \bar{C}(AB) + C(AB) \text{ rule 20}$$
$$= C(\bar{A}B+A\bar{B})+AB \text{ grouping and solving C and } \bar{C} \text{ terms}$$
$$= AB + C(A\bar{B}+\bar{A}B) \text{ rearranged}$$

Thus the simplified relationships are as follows:

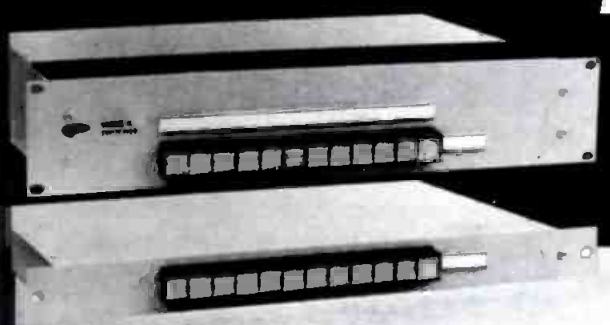
$$SUM = C(AB+\bar{A}\bar{B}) + \bar{C}(\bar{A}B+A\bar{B})$$
$$C_n = AB + C(A\bar{B}+\bar{A}B)$$

The Truth Table of 4-7 is derived from the procedure outlined in section 3-5.

THUS:
SUM = 1 when single 1 occurs.
CARRY = 0.
SUM = 0 when 2 ones occur.
CARRY = 1.
SUM = 1 when 3 ones occur.
CARRY = 1.

SOMETHING TO BUILD ON

DYNAIR'S Audio/Video Switcher will grow as your system grows.



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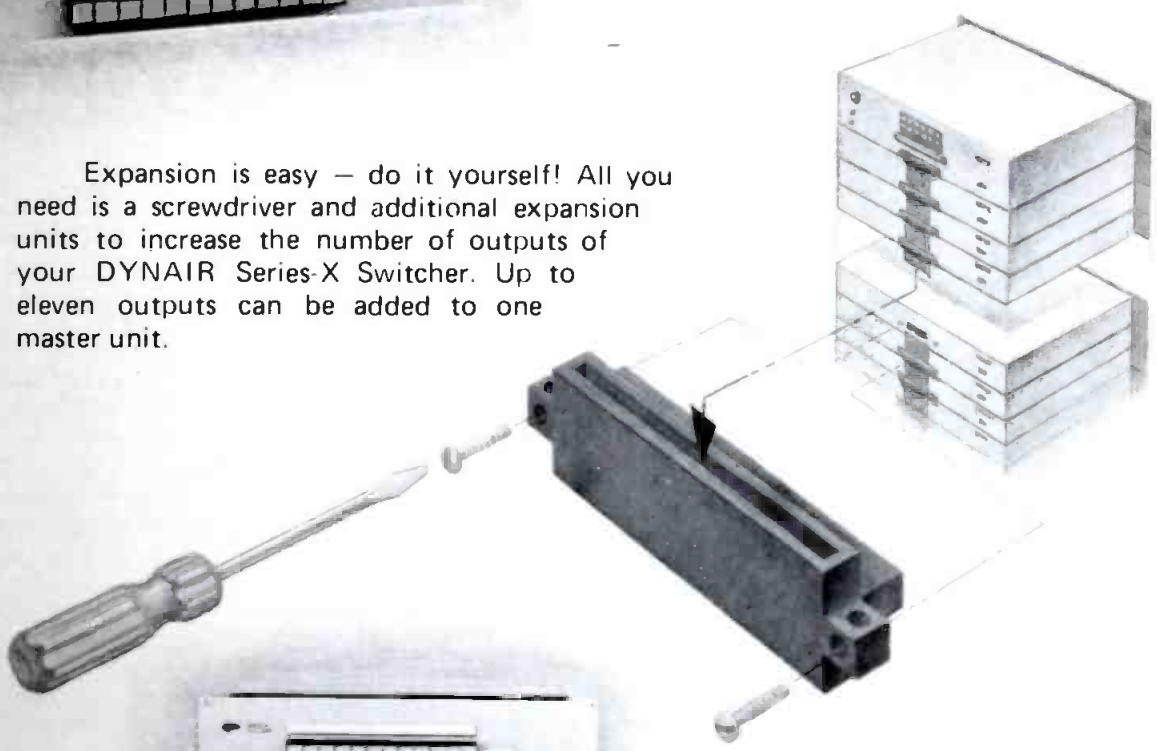

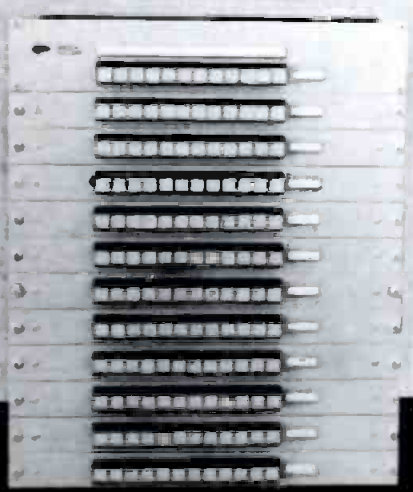

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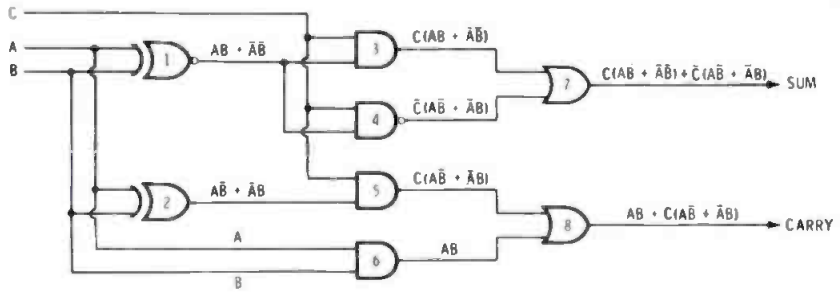


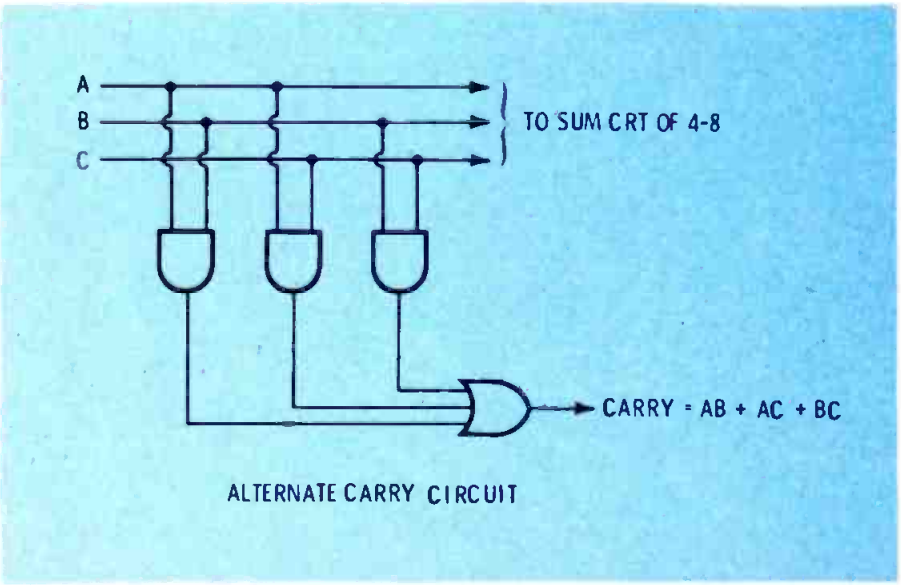
FULL ADDER FROM SIMPLIFIED BOOLEAN RELATIONSHIPS OF 4-7

4-8. Constructs a full-adder from the simplified relationships of 4-7. Where:

C = previous carry.
C_n = new carry.
$SUM = C(AB+\bar{A}\bar{B}) + \bar{C}(A\bar{B}+\bar{A}B)$
$C_n = AB+C(A\bar{B}+\bar{A}B)$

Gate 1 ..... Exclusive NO
Gate 2 ..... Exclusive O
Gates 3-5-6 ..... AN
Gate 4 ..... NAN
Gates 7-8 ..... O

This requires only eight symb in contrast to 13 symbols for 4 This is only one of many possil combinations.



ALTERNATE CARRY CIRCUIT

4-9. There may be more than o correct solution to a simplificati of relationships. Example:

CARRY of 4-7:
$\bar{A}BC + A\bar{B}C + AB\bar{C} + ABC$
$= \bar{A}BC + A\bar{B}C + AB(\bar{C}+C)$
$= \bar{A}BC + A\bar{B}C + AB(1)$
$= ABC + ABC + AB$
$= AB + AC + BC$ Final simp fication

For the carry logic, this would quire the circuit of 4-9, replac gates 2-5-6-8 of 4-8. Note that t does not necessarily simplify 4-8 illustrates only that more than simplification procedure exists fo given set of terms, hence circ can vary for identical functions.

4-10. Proves 4-9 by a Truth Table. Thus sections 4-6, 4-7, 4-8, 4-9 and 4-10 are all equivalent functions (f). Drawings 4-8 and 4-9 are equally valid in design. The unsimplified version (4-6) **would not be valid.**

TRUTH TABLE PROVING VALIDITY OF AB + AC + BC FOR CARRY

BINARY			BOOLEAN	BINARY SUM (TABLE 4-7)	BINARY CARRY (AB+AC+BC
A	B	C			
0	0	0	$\bar{A}\bar{B}\bar{C}$	0	0
0	0	1	$\bar{A}\bar{B}C$	1	0
0	1	0	$\bar{A}B\bar{C}$	1	0
0	1	1	$\bar{A}BC$	0	1
1	0	0	$A\bar{B}\bar{C}$	1	0
1	0	1	$A\bar{B}C$	0	1
1	1	0	$AB\bar{C}$	0	1
1	1	1	ABC	1	1

WHERE C = PREVIOUS CARRY

TRUTH TABLE METHOD OF SIMPLIFYING $AC + ABC + A\bar{C}$

A	B	C	$\bar{C}$	AC	$A\bar{C}$	ABC	$AC + ABC + A\bar{C}$
0	0	0	1	0	0	0	0
0	0	1	0	0	0	0	0
0	1	0	1	0	0	0	0
0	1	1	0	0	0	0	0
1	0	0	1	0	1	0	1
1	0	1	0	1	0	0	1
1	1	0	1	0	1	0	1
1	1	1	0	1	0	1	1

BASIC — BASIC COMBINATIONS CALLED FOR IN BOOLEAN — COMBINATION OF COMBINATIONS

IDENTICAL

4-11. To show the importance of simplification, suppose you have evolved the following boolean relationship for a given problem:

$$AC + ABC + A\bar{C}$$

Figure 4-11 is the Truth Table form of simplification for this relationship. Note that the first and last columns are identical. To solve algebraically:

$f = AC + ABC + A\bar{C}$
$= A(C+\bar{C}) + ABC$ (factoring a rearranging)
$= A(1) + ABC$ rule
$= A + ABC$ rule
$= A$ rule

This says that the relationsl $AC + ABC + A\bar{C}$ can be replac by a straight wire from A.

FULL SUBTRACTOR TRUTH TABLE

A	B	C	D	B_n	$f = 1_D$	$f = 1_{B_n}$
0	0	0	0	0	0	0
0	0	1	1	1	$\bar{A}\bar{B}C$	$\bar{A}\bar{B}C$
0	1	0	1	1	$\bar{A}B\bar{C}$	$\bar{A}B\bar{C}$
0	1	1	0	1	0	$\bar{A}BC$
1	0	0	1	0	$A\bar{B}\bar{C}$	0
1	0	1	0	0	0	0
1	1	0	0	0	0	0
1	1	1	1	1	ABC	ABC

WHERE B_n = NEW BORROW
C = PREVIOUS BORROW
D = DIFFERENCE

4-12. Shows the Truth Table for full binary subtraction, including boolean expressions for f=1. (To review binary subtraction, see "Digital Math" Part 1, BE June '74.)

Thus:
where B_n = new borrow
C = previous borrow
D = difference

$D = \bar{A}\bar{B}C + \bar{A}B\bar{C} + A\bar{B}\bar{C} +$
$B_n = \bar{A}BC + \bar{A}B\bar{C} + \bar{A}BC +$

Note carefully that the T Table for the **difference** (D) col is identical to the **sum** colum 4-3, and 4-5.

How did these broadcasters get ahead of the competition?

KING TV5

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"The Compositor's on-air display is a marvel,.. head and shoulders superior to the competition. We've virtually discontinued using hotpress for supers."
—Galen Daily, KRON Program Manager

KRON · SAN FRANCISCO

WTMJ TV

"We used the Compositor for the first time on election night. We were very pleased with the clarity and color. I'm sure we had the best election show in town that night." —Donald Loose, Manager WTMJ News Operations

"We used our new Compositor system during the election and were very happy with it. It seemed to me that the character edging made our display easier to read than the competitions'. We moved ahead of the other stations soon after the election results started coming in." —Terry Harrison, KTVK-TV Engineer

KTVK 3 TV

KGW TV8

"...the election went like clockwork--I couldn't have asked for anything better. The Compositor display is clear and easy to read...you just glance at it and you've got it. We were ahead of the competition getting numbers on the air." —Tom Craven, KGW Production Manager

"We were well ahead of the competition election night... the reason, I feel, was in large measure due to the Compositor. It's easy to use, and prevents a great deal of possible error. Where the TM unit really shines is its computer interface with the character generator, which eliminates the extra step of manually entering the election results."
—Bill Gill, WOTV News Director

WOTV GRAND RAPIDS

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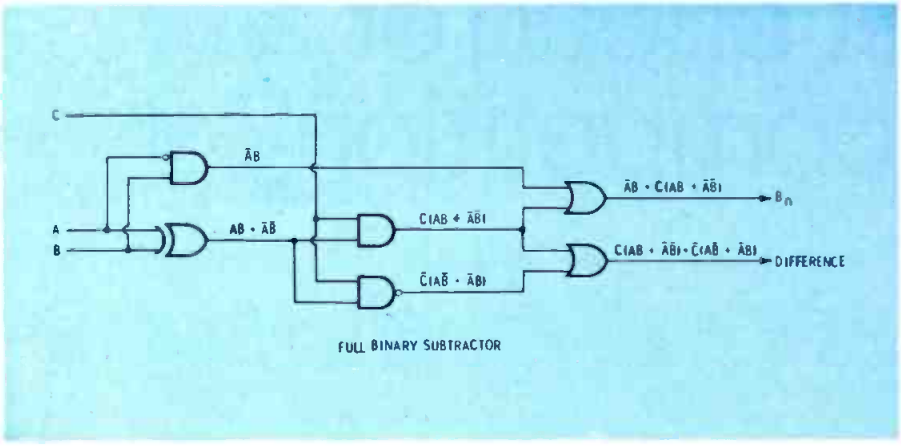

FULL BINARY SUBTRACTOR

4-13. Simplify the boolean expressions of 4-12, and construct a full binary subtracter from simplified relationships.

Let B_n = new borrow
$\bar{C}$ = previous borrow
D = difference

$$D = \bar{A}\bar{B}C + \bar{A}B\bar{C} + A\bar{B}\bar{C} + ABC$$
$$= C(AB+\bar{A}\bar{B}) + \bar{C}(A\bar{B}+\bar{A}B)$$
rules 20 and 21

$$B_n = \bar{A}\bar{B}C + \bar{A}B\bar{C} + \bar{A}BC + ABC$$
$$= \bar{A}B + C(AB+\bar{A}\bar{B})$$
rules 20 and 21

The difference (D) output is identical to that of the **sum** of 4-7, 4-8. This function is based on the fact that A-B is identical to A+(-B).

Figure 4-13 is one possible logic network to function as full binary subtracter. The functions A+B a A-B are identical for two bits. T resultant functional difference b tween add and subtract is t action of the previous carry (t add) and the previous borrow t subtract. Carefully compare 4- with 4-8. Note how the followi relationship is used:

A+B = Sum (reads A plus B sum).
A+(-B) = Difference (reads A pl a minus B = differenc

This 4-part series has hopefu guided some readers into a bett understanding of logic circuitry a basic design. If sufficient interest expressed, we will continue at son future date with codes and co conversions, and design of mo complex broadcast logic systems.

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Plug-in record relay.

Plug-in audio input/ output amplifiers

ry Revox machine is Studer rgned and built by Studer ories in Switzerland and many to Studer standards. m conception to componthe Revox displays the e meticulous attention to il and extraordinary preon that has made Studer and Revox products without equal in their respective fields. Consider the Revox A77 - a studio quality machine, compactly presented and offering features unique in its price class, with total indifference to minor fluctuations in mains supply voltage or periodicity. With a wow and flutter level below broadcast standard requirements plus a linear response from 20-20,000 Hz at 7½ ips. (± 2 dB) and an ultra low noise level, the Revox A77 continues to set the standard by which the rest are judged.

Write or call for further information: **REVOX**

155 Michael Drive, Syosset, N.Y. 11791 (516) 364-1900; West Coast Office (213) 846-0500.
For other countries: Revox International, Regensdorf 8105 ZH, Althardstrasse 146, Switzerland.

Admatk International

For More Details Circle (36) on Reply Card

Zoom in!

Take 1...Electronic Journalisn

This column, from time to tin will publish items written ASTVC members. The opinion that of the contributor and does r neecessarily reflect the opinions this column or **Broadcast Engi eering.**

Submitted by Stuart M. Rudnic "graduate" of NBC's VTR opns:

"At long last, the death knell film is being sounded across t land. Unions representing film a videotape crews are scrambling positions. Management people giddy from the prospects of savi 'all that money'.

"Electronic Journalism has sol ly established itself in all netwo as well as many of the independe stations across the country. Smal and lighter equipment arrives our shores from Japan and G many every day, adding to t produced in the USA.

"In Hollywood, budget peo have been eyeing prime-time seri already shot multi-camera TV st hoping one day soon we, or one our Japanese friends, will give th a 'black box' enabling them to p their videotape in the various wo standards.

"All of this has brought a twi to the eyes of the ASC membe while raising a twinkle in ours. A members have been seen in s out of the way places as Hollyw Video Center, E.U.E. and T tronics learning a new trade. T no longer spend all their wak hours knocking videotape."

In future issues and in semin the ASTVC will try to keep abreast of new developments dur this terrific proliferation of techniques and equipment. C versely, let us know what yo involved in so that our AST members might share your exp ences.

Take 2...The SMPTE invites the ASTVC

The ASTVC owes a debt gratitude to the Society of Mot

Continued on page

High Precision Rebuilding—and...

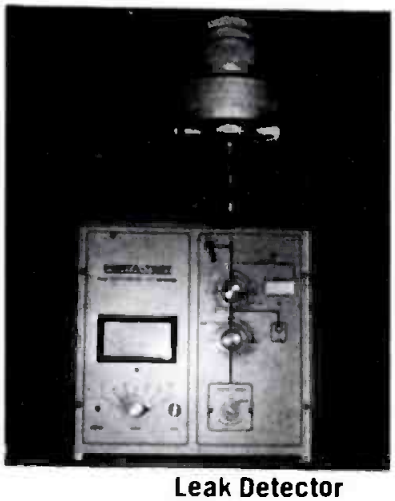
THE PRICE IS RIGHT!

rice Comparison (New vs. Rebuilt)

Typical savings on rebuilt tubes are as follows:

Tube Type	Econco Price	New Tube Distributor Price	Savings
3CX2500	$115.00	$230.00	$115.00
3CX3000	125.00	265.00	140.00
4CX5000A	265.00	530.00	265.00
5762/7C24	180.00	400.00	220.00
6076	180.00	395.00	215.00
6166A/7007	550.00	1225.00	675.00
4CX15,000A	400.00	825.00	425.00

onco's prices average slightly less than 50% of new tube ces. These savings are even greater when you include sales x on new tubes.

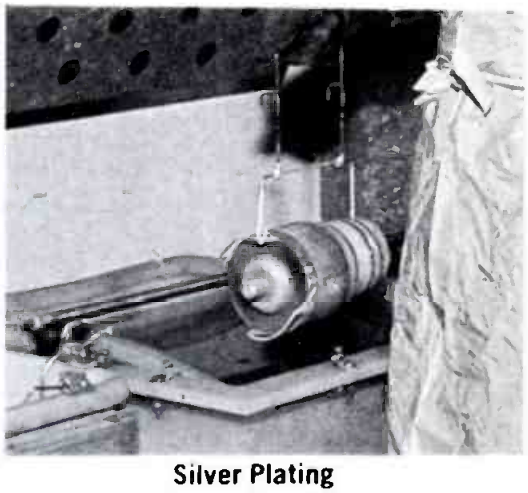


Leak Detector
Leak checking tube prior to pump operation

ervice

onco's prompt 30 day repair service coupled with fast iable UPS handling makes getting tubes repaired probably a icker method than ordering a new tube from a distributor. 90 day delivery on new tubes is not uncommon now. Econalso provides 7 day rush repair service and 1 day delivery for se stations that find power output down and no good spare ilable.

e feel we have both a cost and service advantage over new es. Rebuilt tubes have proven that tube life equals and often eeds that of new tubes.



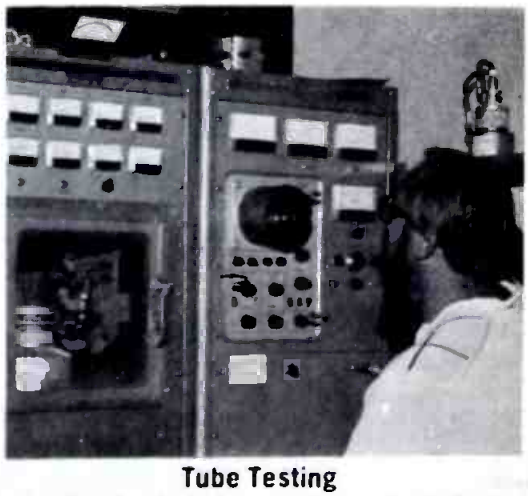
Silver Plating
A rebuilt tube ready to be silver-plated

cycle Used Tubes

e want to encourage stations which are continuing to buy new es to consider selling their used tubes to us. A price list is ilable upon request. Save your packaging and when you get w or a lot, send them to us for cash. We buy any amount of d tubes you have if they are on our list.

be Testing

rebuilt tubes are fully tested and must meet new tube specitions or we do not ship them. Tubes which do not meet cs. are repaired again or scrapped if not repairable.



Tube Testing
A finished tube getting tested to factory specifications

BROADCAST Econco SERVICE, INC.

ECONCO BROADCAST SERVICE INC.
Route 2, Box 188
1302 Commerce Avenue
Woodland, California 95695
Telephone (916) 662-4495 or (916) 662-6031

Zoom In!

Continued from page 64

Picture & Television Engineer Thanks to the generosity of K Mason, President of the SMPT and Dennis Courtney, its Executi Director, the ASTVC was able "set up shop" at their conventi at the Hotel Americana in Ne York City.

At various times during the we of October 17th through the 22n members of the ASTVC staff cou be found at our designated locati enthusiastically "distributing" o latest information brochures.

We would be remiss in our duti if, at this time, we did not also gi thanks to those of our staff th manned the ASTVC desk. Th are: Stuart Goodman (ABC), Ger Gander (CMI-Albany), Lois Filip (ABC), Joe Martini (Vizmo Pr ductions), and Gregg Suhm (Assc Dir. of Member Services). Tl above-mentioned would also like publicly thank the members of t Ikegami exhibit who very kind allowed ASTVC to "deposit" o crate of material with them ea evening at closing time.

To those of you who were fo tunate enough to attend t SMPTE convention, we don't ha to tell you a thing about all the delightful booths crammed with the latest new gear...and to all you who did not have a chance be there, we say you had better g to that next one! Jeff Friedman, the SMPTE staff, must be comp mented on the superb manner which he setup and ran the exhi area...

And lastly...for those who we given the ASTVC brochure at t convention, and for those of o members who will receive the copies in the mail, we wish to po out that the brochure was conceiv and produced by Gerry Ganc with the able assistance of t University Press at SUNY, Alba NY...

Take 3...Bits & Pieces

Malcolm Wall of the Office Programming, Mississippi Auth ity for Public Educational TV is be commended for his foresight a generosity. Through his instigati the Authority has sponsored a

paid the initiation fee for five of heir staff cameramen.

Wall said that he believes that is cameramen should be able o take advantage of every pro- essional/educational opportunity vailable to them. He believes that he ASTVC offers that opportunity o aid them in their professional evelopment. We certainly concur... hank you, Mr. Wall!

At a recent meeting in NYC, Bob lenson, Regional Manager, and Dave Dever, Sales Engineer, both f IVC, have assured Bob Zweck hat their corporation looks forward participating in a program of aining seminars with the ASTVC .As you may know, International ideo Corporation is one of the test in the industry to join us as a orporate Sponsor...

ASTVC staff members at the MPTE convention met with mem- ers of the 3M staff relative to firming up" our planned seminar nerously offered by the 3M Co.... itto AMPEX and their kind offer an upcoming demo/seminar...

Latest correspondence from the ritish) Guild of TV Cameramen dicates that the time may be here r an International federation of V cameramen! Representatives om the ASTVC were extended vitations to attend the Guild's nual meeting in London, possibly discuss just that...We are excited out the prospects of just such a ERGER.

The ASTVC wishes all of you a ry Merry Holiday and a Joyous ealthful New Year!!!

LO-Fade to black...

eligious roadcasters ike New Law

President Gerald R. Ford has gned a comprehensive bill up- ting the nation's copyright laws. he new law, which goes into effect nuary 1, 1978, contains a section hich protects the interests of igious broadcasters.

Section 112 (c) exempts religious ograms produced by non-profit ganizations from paying mechani- l reproduction fees for the use of pyrighted music on tapes or discs which they distribute to broadcast stations.

National Religious Broadcasters (NRB) initiated Section 112 (c) and supported it in hearings before the House and Senate. NRB is an association of 700 member organizations which produce and broadcast more than 70 per cent of the nation's religious radio and TV programs.

NRB executive secretary Ben Armstrong commented, "Section 112 (c) benefits the creators of religious music as well as religious program producers. On-air performance greatly enhances consumer sales of records, cassettes, sheet music, and concert tickets. Christian artists particularly need the kind of widespread exposure they receive on religious programs. Under the new law, as before, copyright holders will continue to receive performance fees from stations."

From BLUE BANANAS to SAG TAILS

The Original Blue Banana!

Color television was in its in fancy. The stillbirth of the CB. whirling filter wheel was supersede by a lively youngster called the a electronic NTSC[1] standard that wa confirmed by the FCC in 1951 Transistors and ICs were still decade away and TV equipmen was full of vacuumized glass cyl inders with metal innards tha glowed brightly and were calle "tubes".

A color camera of that era ha three image orthicons, took fou strong men to lift onto its pedesta and was controlled by a CCU tha was connected to three or four ove heated, seven-foot racks cramme with electronic chassis. Severa dozen appropriately colored knob and a larger number of screwdrive slotted pots, ferrite cores and bras slugs, most with some interactiv effect, completed the adjustmen picture. It was a formidable task t properly set up a color camera usually taking three to four hour of meticulous tweaking at bot ends of the system by a pair o patient and persistent engineers.

Inspired by the goal of an opera

1. *National Television Systems Committee Never Twice the Same Color*

n based on electronic precision, e major network installed a color studio without visual contact tween the camera operators and knob twiddlers in the back om. The high light levels needed the cameras of that period preded the use of a live model for h long set-up periods and the hnicians had to resort to still life ages such as children's toys or wls of fruit that didn't ripen too ch at 3200°K.

Fruit bowls were ideal on several nts—they didn't get union scale, y came in a wide variety of hues d saturation, even idiots knew at color they should be (or did y?), and you could eat them n you got through.

t was the early afternoon of a color spectacular and the crew e in lining up the cameras for t evening's production. After an r of prime adjustments of such ics as I and Q quadrature, subrier balance, gamma and aperre correction, video and pedestal ls, the real fun started. Registion, gray scale tracking, corner s and so on, were interspersed h remarks on the intercom such "give me a little more blue skew; you idiot, I said blue SKEW, blue Q! Now we will have to ign all over again".

pparently the color camera gn engineers who figured out adjustment nomenclature were ed to the fiends in Detroit who e spark plugs so inaccessible as equire an expensive special tool the digital dexterity of Harry dini to remove them.

t last we're ready for color ration, color bars look almost t, a little phase adjustment gs the magenta on target, and witch to camera position and owl of luscious, mouth watering in front of it; red apples, n grapes, orange oranges and bananas. Blue bananas? It be! A quick turn of the hue on the monitor renders yellow anas, but now the apples are n, the grapes are orange, and oranges look sick! There is a huddle in the control room, hty scientific opinions on ma shift due to cathode/heater age or screen grid saturation t in a new attempt to recheck reset all controls with more rigorous waveform scope monitoring. This takes another precious hour of frantic effort and time is getting short as a report comes in that the talent is beginning to filter into the dressing rooms.

Everything is realigned with the utmost care, the switch goes from bars to camera position again, and the bananas are still an unappetizing shade of blue. In desperation, the camera control engineer throws down his headset and stomps out into the studio to apply the last adjustment tactic he knows —a good swift kick to the side of the camera—when suddenly his problem is solved in one fell swoop. For what his eyes can scarcely believe is that nature's benevolent gift to the monkeys on top of this fruit bowl are the product of a prankster who had painted them bright blue!

Station to Station

KOMU-TV: A Commercial Success

I enjoyed the article in the October issue about WUFT in Gainesville, Florida. Particularly since our operation is somewhat similar, I must disagree, however, with the statement that the University of Florida offers "a unique experience in television news."

I'd like to point out some comparisons between the WUFT operation as described in the article, and our operation at KOMU-TV, which is owned by the curators of the University of Missouri.

While WUFT is a public non-commercial station with a **potential** audience of 460,000 **viewers,** KOMU-TV is a commercial NBC affiliate with a **measured** audience (ARB, Nielsen) of approximately 35,000 **homes** on major newscasts. KOMU-TV newscasts maintain a solid number one metro position in this 3-station market, and are tied for number one in ADI, despite the inherent disadvantage of frequently changing student anchor persons.

The newscasts on both WUFT and KOMU-TV are produced entirely by students under faculty supervision. KOMU-TV uses students (this semester about 55) from the university's journalism school for all filming, editing, reporting, writing, production and air work. Directors, engineers and studio cameramen are for the most part full or part-time station employees, but students are also involved—to a lesser extent than in the news—with these and all other departments of the station.

While WUFT replaces commercial announcements with public service announcements, the student-

duced newscasts at KOMU-TV cally contain seven to eight utes of national and local spot ouncements paid for at com- cially competitive rates. Since MU-TV is supported entirely these commercial revenues, pressure to compete economi- with other commercial stations ur market is identical to that in commercial television station.

hile "Everyone (at WUFT) es that it is better to make the s here in the somewhat for- ng atmosphere of a basically aemic experience..." at KOMU- we take quite the opposite view: it is better to work in an rgiving commercial environ- t closely approaching the so- d "real world" (which, inci- ally, we feel very much a part . Our atmosphere is basically -academic, and we wouldn't t it any other way. We, of se, agree that "supportive and tructive criticism" is essential udents' development and we try rovide that too.

hile WUFT's 30-minute news- contains "several silent films and one or two single-system sound-on-film news stories," KOMU-TV's one-hour 6 o'clock newscast tonight will contain 10 to 12 local stories, at least eight of which will contain sound on film, generally in a package with "silent" film (which actually, in most cases, is natural sound).

Dick Nelson
Managing Editor, KOMU-TV
Assistant Professor

Station-To-Station is a column designed to keep people in touch... station to station and station to magazine. We encourage all stations to take part in a column designed for them. Got questions to ask of other engineers? Ideas for other stations? Comments to make about the industry? Well here's where you can lay it on the line. Just address your correspondence to: Station-To-Station, **Broadcast Engineering** magazine, 9221 Quivira Road, Overland Park, Kansas 66212.

Antenna

Continued from page 46

quality of circular polarization for FM radio. This is the ratio of the maximum vertical component to the maximum horizontal component. This term describes the radiated power in each polarization, but does not necessarily describe the type of radiation formed when the two signals are combined. The combined shape may range anywhere from a circle, through a family of ellipses, to a straight line, without a change in the polarization ratio.

For antennas used in television broadcast, the term **Axial Ratio** has become the parameter to describe the degree of circularity. Axial Ratio is defined as the ratio of the major axis of the polarization ellipse to the minor axis. The axial ratio is typically expressed in dB.

Let's take a few minutes to see how the axial ratio of a circularly polarized TV antenna figures into the overall transmitting system. Figure 6 illustrates how an elliptically polarized signal can be represented as the vectorial sum of two circularly polarized signals that are rotating in different directions.

In the case of pure right hand circular polarization, there is, of course, no left hand component. As the amount of left hand component increases, the result of vectoria addition becomes elliptical as shown, and at the point that both the right hand and left hand components are equal, linear or slant polarization results.

To realize the effect of axia ratio, let's again refer to a simplified diagram showing a circularl polarized transmitting antenna wit a less than perfect axial ratio, reflecting surface and a circularl polarized receiving antenna.

Assume that the signal radiate from the transmitting antenna con tains a large right hand componen and a small left hand component a shown in Figure 7. As before, th receiving antenna will receive tw signals—one from the direct pat and one from the reflected path.

As we noted before, the reflecte signal will reverse polarity. How ever, this time there will be a sma right hand component from th reflected path present at the r

ıg antenna due to the im-
ct axial ratio of the trans-
ıg antenna. If this component
ge enough, and if the delay
is sufficient, a ghost will be
ion the receiver connected to
eceiving antenna. The axial
of the transmitting antenna is
ore an important factor in
mining the quality of a cir-
y polarized antenna.

eting Circular Polarization

the 1974 NAB Convention,
conducted live demonstrations
circularly polarized TV set.
horizontally and circularly
zed transmitting and receiving
nas were used with this test.
providing a reflected path to
stem with a built-in delay and
itching between the hori-
ly polarized system and the
arly polarized system the
e of ghost reduction could be
ed on monitors.
ng the horizontally polarized
, a great degree of ghosting
e result of the multipath
dion could be seen.
en both circularly polarized
mitting and receiving antennas
employed, however, there was
matic improvement.
's review now the circularly
zed TV test performed in
go from the Sears Building by
TV. Two 100 foot tall, 12 foot
ter steel cylinders are mount-
the top of the Sears Building.
the WLS-TV transmitting
na located on the west cylin-
the building.
o separate arrays were used at
TV for their test—one a cir-
y polarlized three-layer system
the other a two layer hori-
lly polarized system.
azimuthal patterns of the
ontally polarized antenna, and
ch component of the circularly
ized antenna, were made as
as possible to provide correla-
of the measurement data.
e supporting cylinder affects
na performance, and had to
imulated on the test range
g the initial design phase.
ter the testing cycle was com-
d, the antennas were shipped
hicago and installed on top of
building late in 1973. Each
nna was provided with a sepa-
feed system to provide an easy
ns of switching between hori-

Continued from page 73

zontally and circularly polari
modes of operation.

The first on-air tests were sta
in January, 1974. AFter a serie
initial tests assured that there
no increase in co- or adjacent in
ference and the circularly polari
signal caused no degradation of
received picture, the FCC gran
permission in May to use
circularly polarized antenna or
continuous basis rather than c
during off-air hours.

The off-air pictures shown ill
trate measured comparisons
tween the horizontal and circu
modes of operation.

First, let me assure you that
test pattern shown on the left is
typical of the TV signals in
Chicago area. It is one of the wo
case conditions and was obtair
using the horizontal mode of tra
mission. In other words, both hc
zontally polarized transmitting a
receiving antennas.

With the same conditions, and
the same test site, but now usi
circularly polarized transmitti
and receiving antennas we see
improvement in picture quality
the right.

Equipment Considerations

Let's discuss now some equi
ment considerations involved in c
cular polarization.

For the broadcaster conter
plating circular polarization, t
equipment to be considered is,
course, the antenna itself, tl
transmission line connecting tl
antenna to the transmitting statio
and the tower. The second item
the transmitter.

Many possibilities are involv
but we can discuss system packag
that will be useful to the majori
of broadcasters. The circular
polarized antenna will have a
approximate total gain of unity p
wavelength of aperture—or appro
imately one-half per wavelength f
either the horizontally or vertical
polarized component. Since mo
broadcasters will probably maintai
their present horizontal ERP usin
a circularly polarized antenna wit
the same aperture as their prese
antenna, it follows that a tran
mitter of twice the present ratin
will be required.

A typical lowband VHF statio
presently using a 6-bay horizontall

rized antenna and a 25 kilowatt smitter, will now require a 50 watt transmitter and a 6-bay larly polarized antenna.

typical highband package for lar polarization may range a 100 kilowatt transmitter and bay circularly polarized antenna 50-kilowatt transmitter and an ay circularly polarized antenna.

here are more options available e UHF broadcaster than to the broadcaster. Unlike most stations, who are operating at mum ERP, approximately 95 nt of all UHF broadcasters d more than double their nt horizontal ERP and still e at the maximum 5 megawatt .

second UHF option would be crease the illumination of the ipal market area through the llation of a new horizontally ized antenna with higher null The new antenna might also lower overall gain and be led with a new transmitter of er power.

e third option, of course, is to e circular polarization. Only a ough investigation on an indi- al basis will determine which n is best for the individual broadcaster.

summary, circular polarization elevision is a subject that has considered by the industry as neers search for ways to im- e television reception for the ng public. There is little or no ment about the theoretical fit of ghost reduction, but nd that, there is considerable roversy. The FCC has the ball and is weighing together the ntial advantages, and the vari- comments received as the result eir proposed Rule Making.

Illustration Credits

e author thanks the following viduals for permission to use illustrations found in this le:

gures 1 and 2: Fred L. Zellner, from his paper, "Circular rization in Television Broad- ng".

gures 3, 4, 5 and 7: Dr. Matti ola, from his paper, "Circularly rized Antennas for Television".

gure 9: Neil M. Smith, from paper, "Report on Field Tests Circular Polarization in Tele- n". □

Globecasting

The broadcasting and cablecasting explosion l reached Europe and most certainly Italy. Toc with its 249 FM stations and 72 TV stations tl broadcast throughout its 116,316 square miles, It is one of the most communicable nations in the fi enterprise world (with its 12.8 million receivers, It is the sixth nation in the entire world with the me substantial number of TV sets).

Because of such a position it couldn't afford lack of an adequate news gathering and reporti service, therefore it has dictated the creation of Italian Communication Service Agency, that will known as ITALCOM.

At present ITALCOM, with its five reporters, w provide an Audio News Service from USA a Canada for the various Italian speaking radio-T stations in Italy and abroad (there are 48 Itali speaking radio-TV stations outside Italy).

In the immediate future ITALCOM plans provide a Video News Service.

Until two years ago the Italian broadcast w monopolized (since 1944) by the governme controlled RAI-TV (before by another monopolist government agency).

With its two television networks (Channel 1 VH reaching 98.3 percent of the population, Channel UHF 91 percent of Italian citizens) RAI-TV tran mits yearly 5,912 hours of TV programs followe daily by 26 million Italians, against 36,000 hours b independent TV stations. With its three AM rad networks RAI transmits yearly 46,296 hours audio programs listened to by 17 million Italian against 749,278 hours by independent radio station For watching the government censored black an white RAI-TV programs the viewer is taxed fo cents per day plus sitting through a half dozen se of commercials (each set containing several a nouncements).

The independent Italian stations are based on th American model, supported by private industrialist politicians and paid advertising. At present 1 TV stations broadcast in color (PAL) and 20 othe are ready to switch to color.

In the Peninsula there are 61 cable TV, there i an annual Cable TV Expo in Milan and a T Federation called FILET (Italian Federation Inde pendent TV Stations).

With manpower of 19,230 the new industry ha practically forced 45 percent of Italian Electroni companies into manufacturing broadcasting equip ment.

A prime time RAI-TV commercial cost 8,33 dollars for a 100 seconds spot (network). Italia territory is also covered by foreign radio-TV station that broadcast in Italian, they are:

Tele Capodistria (PAL) reaching 18.4 percent o the Italian population, has the second larges covered area. The color programs of Tele Capodis tria are transmitted from Yugoslavia, the cost for 30 seconds prime time announcement is 3,06 dollars.

PEOPLE IN THE NEWS

aul Bergquist is the new President of Philips adcast Equipment Corporation, a wholly-owned idiary of North American Philips Corporation... **drew Brakhan,** Vice President of Philips Audio ideo Systems Corporation, has been appointed Vice sident and General Manager of that organization. **arry W. (Bud) Pearson** joins A.F. Associates, Inc. ngineering Manager...**Charles P. Ginsburg,** Vice sident-Advanced Development for Ampex Corration, has been honored with membership in the iety of Motion Picture and Television Engineers MPTE) for his pioneering work in the development videotape recording.

oseph Novik has been appointed Marketing nager at Belar Electronics Laboratory Inc. **ederick B. Bundesmann** joins the Robert Bosch poration as National Sales Manager for U.S. sales ernseh television equipment.

hn Donnelly has taken the post of Marketing rices Manager of Ikegami Electronics, Inc.... **dion Lund** is the IGM Western Sales Representative.

hn Macfarlane, Eastern Regional Sales Manager, mputer Image Corp., Denver, Colo., has been resigned to helm the new mid-west based Computer ge Production unit in Chicago...**Gerald M. kerman** has been appointed Chief on the Legal, visory and Enforcement Division of the Safety and ial Radio Services Bureau.

e. C. Hanson has been appointed as Assistant cutive Director of the Association of Maximum ice Telecasters, Inc. by the AMST Executive mmittee...**Jack B. Chapman,** President and Gen- Manager, KGAK, Gallup, N.M.; succeeds **ne C. Cornils** as a member of the Radio Board of ectors of the National Association of Broadrs...**Cornils,** President and General Manager, KKD AM/FM, Boise, Idaho; will join NAB as ector of Membership.

athryn Hilton, Director of Research for the onal Cable Television Association, has been ed a Vice President of the Association...**Don ffer** has been added to the KOLO-AM, Reno, NV as News Director...**John Gunn** transferred to the s department of KOLO.

and Gottlieb has been promoted to Director of dcast Acquisitions for Cox Broadcasting Corration...**Louis J. Kaib** has moved to the position of s Manager-Television Services for Cox Data ices.

Editorial Billboard

What's Ahead For BE

In all of us there's a spark of the gambler's sp That willingness to take a chance...to guess at wh coming...feeling that luck is on our side. E Saturday's game is covered in pro bets and o pools. The smart dollars are seldom put on whim perennial underdogs.

Tapping the pulse of the broadcast industry the manufacturers who supply the industry, keeps running in high. We're not going to ask anyon take a flyer on the possibility of a trend develop While we all are betting our lives on broadcast **BE**'s task is to make the risks minimal on all si How? There's no better way than to take a look our game plan for '77.

There's a time to be theoretical and there's a t to be practical. In the past we have published articles on logic theory for digital circuits we're li to encounter in broadcast equipment. In 1977 w going to have Harold Ennes on the line with a feature called "Logic Lab". It's a monthly colu based on practical troubleshooting of digital circ We hope it'll develop into a clearing house engineering problems at stations and at manufacturer's bench.

How about ENG? Well, we've got to remem that the history of broadcasting is based upon El so we will expand our efforts into RENG! Th right, radio electronic news gathering. And whe for TV or radio, the approach will be practical. T starts in January.

We'll be talking a lot more about audio and way it's processed and what you can do about it. / early in March we're going to deliver to you what consider to be the most complete pre-NAB convent issue ever.

Throughout the year we'll be paying a lot attention to production problems that have engineering base. Under a new feature head "Production Spotlight," we'll even go as far out improved makeup techniques. Engineering is still long suit, but we've found that more and more can't say any one broadcast activity belongs solely one department. They are interwoven and forgivingly related. This is why **BE** will talk ab what ATS, antennas, and facility changes mean the engineer and the station.

Yes, we're going to dig into automation, m computers, and new systems. We'll look at satelli radio and TV equipment roundups, and what FCC expects you to know. And if you feel we're cracking your toughest nut, drop a line to **BE** we'll get cracking. After all, this is a crossro magazine. Of course, we can't reach all our ge without your help. This is **your** station magazine, if you want to make the most of it, send us y news, new ideas, even your Blue Bananas.

We're betting on a great year.

The Edi

EW PRODUCTS

Digital Still Store System

new **Ampex** digital recording em was unveiled election night he CBS Television Network.

he Electronic Still Store (ESS) em is capable of storing thou- ds of color slides and still ures magnetically on computer packs for use in television adcasting. It is the first broad- t product to use digital re- ding techniques for video ges.

SS is a joint development of S and Ampex Corporation.

In this unique new system, nputer and video technology are bined to bring together the antages of high-density storage, id access, and reliability," said rles A. Steinberg, vice president the Ampex audio-video systems sion.

SS electronically converts the log television signal into digital n and stores the information on gnetic disc packs. Slides and s can be randomly selected from k memory with an access time of than 100 milliseconds.

he basic ESS system can store to 1,500 video frames on-line for mediate random access. Disc k shelf storage is virtually un- ited.

ccess to the system is through board controls located at the tronics rack, or from remote ess stations. Up to eight access ions can be incorporated in the tem, each equipped with a board terminal and alpha- neric readout.

Access priorities can be assigned any manner desired, depending the number and location of minals, and the operating re- rements of the station. A key- ivated lock out feature provides protection by preventing in- vertant or unauthorized erasures any images stored in the mory.

In addition to the record and roduce modes of operation, ESS

can rearrange selected stills in any sequence for inclusion in a program: and two independent video outputs permit preview, dissolve, mixed and special effects to be performed in the normal way at the studio switcher.

For More Details Circle (90) on Reply Card

Digital Tape Timers

The TT-4 and TT-5 Digital LED Tape Timers have been introduced by **Convergence Corporation,** according to John Campbell, vice president of marketing.

Campbell stated that when used in combination with Convergence's ECS-1 Joystick Editor, they provide a continuous readout of tape time in minutes and seconds for both playback and record videocassette recorders in an ECS-1 editing system.

Both the TT-4 and TT-5 can be used in combination with the ECS-1 to facilitate rapid scene location or for measuring scene or program lengths on helical videocassettes. ENG news stories can be accurately timed while they being edited; educational, indus or medical training tapes ca quickly assembled with ran accessed scenes on multiple sc tapes.

The large, bright LED dis may be reset to zero or prese any number up to 59 minutes 59 seconds. Accuracy in systems is maintained by coun control track pulses from stan videocassette tapes. The re channel automatically switche the 60 Hz AC line in the asse record mode to constantly provi readout of accumulated prog time on the edited master tape.

For More Details Circle (91) on Reply Card

Time Base Corrector

Sony Broadcast has annou the availability of its new BVT-1 Digital Time Base Corrector. unit employs a newly develo A/D system and is designed both high band and helical v tape recorders.

The BVT-1000 is sold in a

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2	14	26	38	50	62	74	86	98	110	122	134	146	158	170	182	194	206	218	230	242	254	266	278	290	302	314
3	15	27	39	51	63	75	87	99	111	123	135	147	159	171	183	195	207	219	231	243	255	267	279	291	303	315
4	16	28	40	52	64	76	88	100	112	124	136	148	160	172	184	196	208	220	232	244	256	268	280	292	304	316
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6	18	30	42	54	66	78	90	102	114	126	138	150	162	174	186	198	210	222	234	246	258	270	282	294	306	318
7	19	31	43	55	67	79	91	103	115	127	139	151	163	175	187	199	211	223	235	247	259	271	283	295	307	319
8	20	32	44	56	68	80	92	104	116	128	140	152	164	176	188	200	212	224	236	248	260	272	284	296	308	320
9	21	33	45	57	69	81	93	105	117	129	141	153	165	177	189	201	213	225	237	249	261	273	285	297	309	321
10	22	34	46	58	70	82	94	106	118	130	142	154	166	178	190	202	214	226	238	250	262	274	286	298	310	322
11	23	35	47	59	71	83	95	107	119	131	143	155	167	179	191	203	215	227	239	251	263	275	287	299	311	323
12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216	228	240	252	264	276	288	300	312	324

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- ☐ C. TV Station
- ☐ D. ETV Station
- ☐ E. CATV Facility
- ☐ F. CCTV Facility
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- ☐ H. Educational Radio
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- ☐ J. Distributor
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4	16	28	40	52	64	76	88	100	112	124	136	148	160	172	184	196	208	220	232	244	256	268	280	292	304	316
5	17	29	41	53	65	77	89	101	113	125	137	149	161	173	185	197	209	221	233	245	257	269	281	293	305	317
6	18	30	42	54	66	78	90	102	114	126	138	150	162	174	186	198	210	222	234	246	258	270	282	294	306	318
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8	20	32	44	56	68	80	92	104	116	128	140	152	164	176	188	200	212	224	236	248	260	272	284	296	308	320
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10	22	34	46	58	70	82	94	106	118	130	142	154	166	178	190	202	214	226	238	250	262	274	286	298	310	322
11	23	35	47	59	71	83	95	107	119	131	143	155	167	179	191	203	215	227	239	251	263	275	287	299	311	323
12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216	228	240	252	264	276	288	300	312	324

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- ☐ B. FM Radio Station
- ☐ C. TV Station
- ☐ D. ETV Station
- ☐ E. CATV Facility
- ☐ F. CCTV Facility
- ☐ G. Consulting Engineer
- ☐ H. Educational Radio
- ☐ I. Recording Studio
- ☐ J. Distributor
- ☐ K. Government Agency
- ☐ L. Corporate Officer
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- ☐ TV Station, Educational
- ☐ Campus limited Radio Station
- ☐ CATV with studio facility
- ☐ U.S. Microwave
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- ☐ Reproduction Facility, Film
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- ☐ Government Agency
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1(b) Check your CCTV Applications:

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2. Check the category that best describes your title.

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- ☐ **Technical Management & Engineering.** This includes technical director, chief engineer, engineering supervisor or director, engineer/technician or other engineering and technical job responsibilities.
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ptions configuration and includes elocity and drop-out compensators. ull processing and full NTSC dvanced sync. It combines a wide indow of ±2 H with a moving indow concept to help hold pic- ire lock, even with wide error scursions.

The BVT-1000 will handle both irect and processed hetrodyne odes and includes anti-gyro cir- itry helpful in time base correct- g portable recorders.

For More Details Circle (94) on Reply Card

Portable VTR, Camera Ensemble

Panasonic has introduced a por- ble VTR and camera ensemble, odels NV-3085/WV-3085. The en- mble features a full hour of ntinuous record/play, instant ld playback on the camera der, standard video output con- ctor, and the ability to record

BE Journal

ntinued from page 18

gnal over no signal at all. We would pose limits of 110% for high power d 20% for low power.

It is also our opinion that automatic chnical logging be an essential part the ATS system. We submit that presently required operating rameters be logged at intervals of t more than six hours. Since dern transmitters exhibit a high gree of frequency stability, con- uous monitoring serves no useful rpose. However, the various fre- ncies should continue to be mea- red on a monthly basis and the sults entered in the station's main- ance log.

The Society feels that, once a ble, fully automatic transmission stem is developed, it can provide h-quality broadcast service to the blic, while relieving the licensee of present operation log require- nts and providing for better utili- ion of the staff. However, the nsmitter should not be "locked and gotten." Rather, it should receive d maintenance, be inspected on a iodic basis, and have its integrity, well as that for the entire ATS stem, documented and certified e a year. This maintenance, in- ction, and documentation should, ourse, be performed by the holder first-class radio/television opera- s license.

directly on five-inch reels of tape that have been removed from standard EIAJ half-inch cartridges.

Applications of NV-3085/WV-3085 include, among others, the production of educational tapes, the study of traffic patterns and industrial processes, the recording of news and community events, home recording of family, and the production of alternate media programming.

Synchronous video and audio is assured by a single trigger-grip control on the camera. Video and audio record levels are controlled automatically. The standard zoom lens and a full 32 minutes of recording capacity on 1200 feet of tape permit versatility in production and convenient full-sequence shooting. The camera's whole image 1½-inch viewfinder monitor allows a full view of subjects. Horizontal resolution is greater than 300 lines for image clarity and fidelity.

For More Details Circle (95) on Reply Card

Three-Tube Camera

JVC Industries, Inc. has introduced the NU-1800U Color Camera, the newest in JVC's series of advanced three-tube, professional quality units with built-in camera control unit (CCU).

Designed to meet the standards of video studio use, even when operated by non-technical personnel, the self-contained camera offers a stable picture and compatibility with most color studio systems. Designed for industrial and educational A/V departments as well as cable TV companies, the versatility of the new camera provides capabilities that fit most operational growth demands.

The NU-1800U achieves sensitivity, resolution and precise color registration by combining the three-tube system with efficient dichroic-mirror color-separating optics. The color encoding system is NTSC-type. A high signal-to-noise ratio of 46 dB at f/2.8 with illumination of 250-foot candles assures sharply defined picture fidelity. A +6 dB gain switch instantly doubles sensitivity for low-light conditions. For reliability and ease of servicing, 2/3-inch electrostatic focus/electromagnetic deflection tubes are employed and all key circuits are on replacement plug-in modules.

A built-in color bar generator allows optimal adjustment of the color TV monitor and color balance can be adjusted by checking the reference indicator in the viewfinder. Color temperature compensation for 3200°K or 6000°K is accomplished by flipping a switch on the camera control panel.

The NU-1800U Color Camera is fitted with an f/1.8 Fujinon 12.5-75mm (6X zoom) lens with manual or automatic aperture control. C-mount lenses in the one-inch or 2/3-inch tube formats also can be used interchangeably.

For More Details Circle (96) on Reply Card

Automatic Switching Systems

Ward-Beck Systems Ltd., has recently designed and manufactured a series of computer controlled automated switching systems, for application in AM and/or FM radio master control areas. These systems provide control of signal routing, tape decks, transmitter, and radio plant supervision while operating either from a real-time program schedule, or sequentially, and logging all events as they occur.

The system pictured illustrates one of several smaller systems already installed and is used for the operation of a single FM and AM output bus. Other systems for the control of up to 11 stereo FM and AM buses are also in operation.

All systems utilize one or more Data General "Nova" Computers as the primary control element. Input/output devices provided include keyboard, teletype, and tape cassette. All audio switching is done by balanced solid state crosspoints which are both transient free and noise immune. Switching by "cut", "fade-down-fade-up", and "cross-fade" are all provided. Signal loss sensing and automatic fill are also available.

For More Details Circle (97) on Reply Card

Remote Synchronizer

A new accessory for time base correctors is available from **Microtime, Inc.,** enabling broadcasters to

eceive live or videotaped signals in nc with station timing direct form obile units up to 59 miles away.

Called the RS-1 Remote Synchroizer, the new device generates adance timing references by gen cking to the station's demodu ted broadcast signal. These refernces are used to adjust or synchroize the signals transmitted back to e station. Reinsertion of station nc on the incoming signal transission safeguards against any unesired closed loop effects.

The RS-1 eliminates the need for eld synchronizers, and can be sed with any wide-window TBC at e broadcast station. The resulting gnal can be put through a roduction switcher or special efcts generated and aired. Sync and urst LED's on the front panel are ctivated when the external refernce is present. A coarse range dial djusts phasing to within one-half ile accuracy. Fine tuning to ithin 140 feet is accomplished ith a second control knob. A ystal oscillator provides internal ference when video reference is sconnected or lost. A camera/ TR switch provides three-line dvance for VTR operation.

For More Details Circle (98) on Reply Card

9.5-57mm T1.9 Zoom

Angenieux Corporation of Ameri has announced the availability of eir 6x9.5, 9.5-57mm, T1.9 zoom ns. The Angenieux factory has creased production to make this ns more available.

Previously available in small umbers, the Angenieux 6x9.5 prodes a very wide angle (68°) ndered by the 9.5mm focal length. ombined with a photometric aperre of T1.9 and close focusing om 24 inches from the focal plane the subject, this lens has been a eat asset to both the documentary nd television news filmmaker.

Slightly smaller than the Angenix 10x12 (overall length; 7.5 ches measured from the image ane, maximum diameter: 2.68 ches), the 6x9.5 zoom lens weighs ly 29 ounces. This new concept in om lenses is available in Arri, ", CA-1, C.P., and other prossional 16mm camera mounts as ell as with one inch viewfinder for 16mm non reflex cameras such as the CP-16 and LW-16.

For More Details Circle (99) on Reply Card

VTR De-bugging Logic Analyzer

Pentronics of Hamilton, Ontario has designed a logic analyzer board for installation on the Ampex model ACR 25 cartridge videotape recorder. This unit is capable of identifying the origin of all test modes and assisting in the debugging of intermittent faults which are often very difficult to diagnose. The analyzer will be available through Glentronix Limited, Ontario.

The model PB9000 Logic Analyzer is installed in a spare position in the electronics assembly (#A38). No cutting of existing wiring or harness is necessary since all connections are bridging. Each input to the PB9000 is buffered and its

installation results in one TTL load per connection.

For More Details Circle (100) on Reply Card

Control Track Editing System

Television Research International, Inc. has announced a new control track editing system for On-Line, Off-Line and Electronic Journalism markets. Designated the Model EA-3, the unit features ease of operation, frame accuracy, and portability.

The new editing system can be interfaced to a variety of VTR's, including SONY Models VO-2800/VO-2850, RCA HR-1060, and JVC Models CR-8500U/CR-9300 LU. The system does not require factory installation.

Soon a companion unit, Model EA-6, will be available, which will provide editors with a system which utilizes control track data or SMPTE Time Code (in either standard Bi-Phase or SUN Formats) depending on the encoded data from the BTR's.

Model EA-3 features LSL (Logarithmic Search Level) controls for simple tape transport control, "return to edit" capability for frame trimming, constant speed audio search for syllable accurate audio edits, transport speed, and a rehearse edit mode with automatic cue-back and rehearsal.

For More Details Circle (101) on Reply Card

Remote Control System

A new digital remote control system, consisting of a TCT-150 Control Transmitter and up to eight TCR-150 Control Receiver(s) is now available from **TeleMation, Inc.** The system provides on/off or normal/alternate remote control of up to 15 functions at each receiver location. These functions can include operation of switchers (including non-duplication switchers), broadcast transmitters, microwave relays, security systems, and other equipment.

The TCT-150 transmitter will accept either front-panel switch commands or TTL logic/contact closure inputs generated by timers or computers. These signals are transmitted via a two-conductor cable or telephone circuit to th TCR-150 receiver(s), which in tu are connected to the equipme under remote control. Each TC 150 can be addressed individually.

The TCT-150 transmitter wi interface with TeleMation TM 1000 or TMP-2400B Digital Ele tronic Programmers; the TCR-1 receiver provides TTL logic optional form "C" contact closu outputs and can be connected to TeleMation SI-2400 Switcher Inte face/TMV-305 RF Switching Sy tem.

Telephone connection between TCT-150 transmitter and TCR-1 receiver requires an optional fa tory-supplied modern within ea unit and a dedicated voice-gra telephone circuit.

For More Details Circle (102) on Reply Card

Mono Console

The **McCurdy** SS8400 mono co sole is a modular, profession audio mixing unit. The features the Series 8000 Module are int grated circuit technology, balanc input and output stages, provisio for insertion of audio processi equipment, front panel plug- capability and complete compat bility with other modules in th 8000 series, with available optio suited to specific requirements.

Standard equipment on th SS8400 mono console is 12 inp mixing channels, complete wi A/B switching, allowing for audio sources; each mixer equipp with specially designed "conducti plastic" slide attentuator (fade cue switching provided with fad in maximum attentuator positio and front panel pushbutton facilitate production procedure and output from each input mix is available to either progra channel or both simultaneously.

Other standard equipment input sensitivity switching (two pos tions), to suit specific mix requir ments; two identical program ou put channels, each equipped wit "channel-on" switching, rotary ga controls and VU meters; two mon tor preamplifier and control sy tems, complete with eight inp selections; one cue/talkback syste allowing three-station communic tion; and extender module.

For More Details Circle (103) on Reply Card

Color TV Studio Camera

A new color TV studio camera by egami uses an add-on mini-mputer for setup cycling. The gital add-on unit automatically cles the camera in 15 seconds rough all setup adjustments in-ding black-and-white balance, re and gamma correction, video in, and the eight registration nctions.

The HK-312 color camera uses ree 1¼-inch Plumbicon tubes; s a better-than 56 dB signal-to-ise ratio; and a zoom lens and mera tube combined in a single sembly for optimum accuracy of tical axis. Class A deflection plifiers assure maximum line-ty.

Automatic black level and bal-ce correction maintain picture ality and brightness in the event flares from the lens. Automatic rizontal and vertical detail cor-tor maintains optimum picture olution. A special comb filter nimizes color noise in the color annel to keep background noise a minimum.

A high-resolution, tiltable seven-ch viewfinder presents the camera erator with a large-sized, sharp ewing image from any angle, low high.

The automatic setup cycling culty can be extended to as many five remote cameras with the use a separate computer-control unit CU), which accomplishes the task only 2½ minutes.

For More Details Circle (104) on Reply Card

Reel-Servo Mod Kit

R-MOD, the reel-servo modifica-n kit for quad VTRs from ecortec, has a new automatic arch feature which will be in-uded in all R-MODs at no crease in price.

R-MOD provides constant ten-n tape handling, improved lock-times, unrestricted remote con-l in tape shuttle modes, auto-tic stop at end of reel and a me accurate video tape timer for th RCA and Ampex quadruplex TRs.

To use the new automatic search feature, the operator watches the monitor and depresses the hold button on the video tape timer when he sees the desired playback image to which he wishes to cue. The R-MOD "remembers" this point. After the operator stops the VTR or in the shuttle mode he can cause the tape to automatically cue up to a preroll position by pushing the timer's hold button again. When the operator puts the VTR in the play mode the R-MOD will roll the tape and provide an edit pulse ahead of the selected edit point to turn on the electronic editor.

For More Details Circle (105) on Reply Card

Transmitter Remote Control

A modular system for digital remote control of AM, FM and TV transmitters has been introduced by **Time & Frequency Technology, Inc.** (TFT).

Called the 7600 Series, the new system is adaptable to ATS operation, and consists of three basic instruments which can be combined to provide from 10 to 80 channels of remote control. The system uses digital, pulse-code-modulated modems and can be linked by telephone wire, STL and SCA, or sub-audible telemetry.

The basic building block of the TFT system is the Model 7610 Digital Telemetry/Control System. It is a stand-alone unit with raise/lower functions and from 10 to 80 channels of telemetry. The 7610 can be expanded by addition of a Model 7615 Status and Direct Control System. This gives users 15 or 30 direct, on/off control functions and 15 or 30 status monitoring channels. The third system component is the Model 7640, a microprocessor-controlled Digital Data Panel. It displays up to 40 meter readings simultaneously, and includes automatic limit alarms. Automatic logging is available as an option.

Users can purchase a complete system or just the basic 7610 and add other system components in the field as needed. A complete line of accessories is available for transmitter interface.

A quick disconnect rear panel allows users to remove instruments without disturbing any of the wire connections between the system and the transmitter or sampling points.

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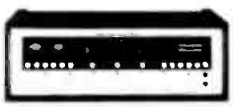
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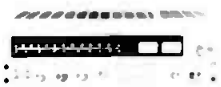
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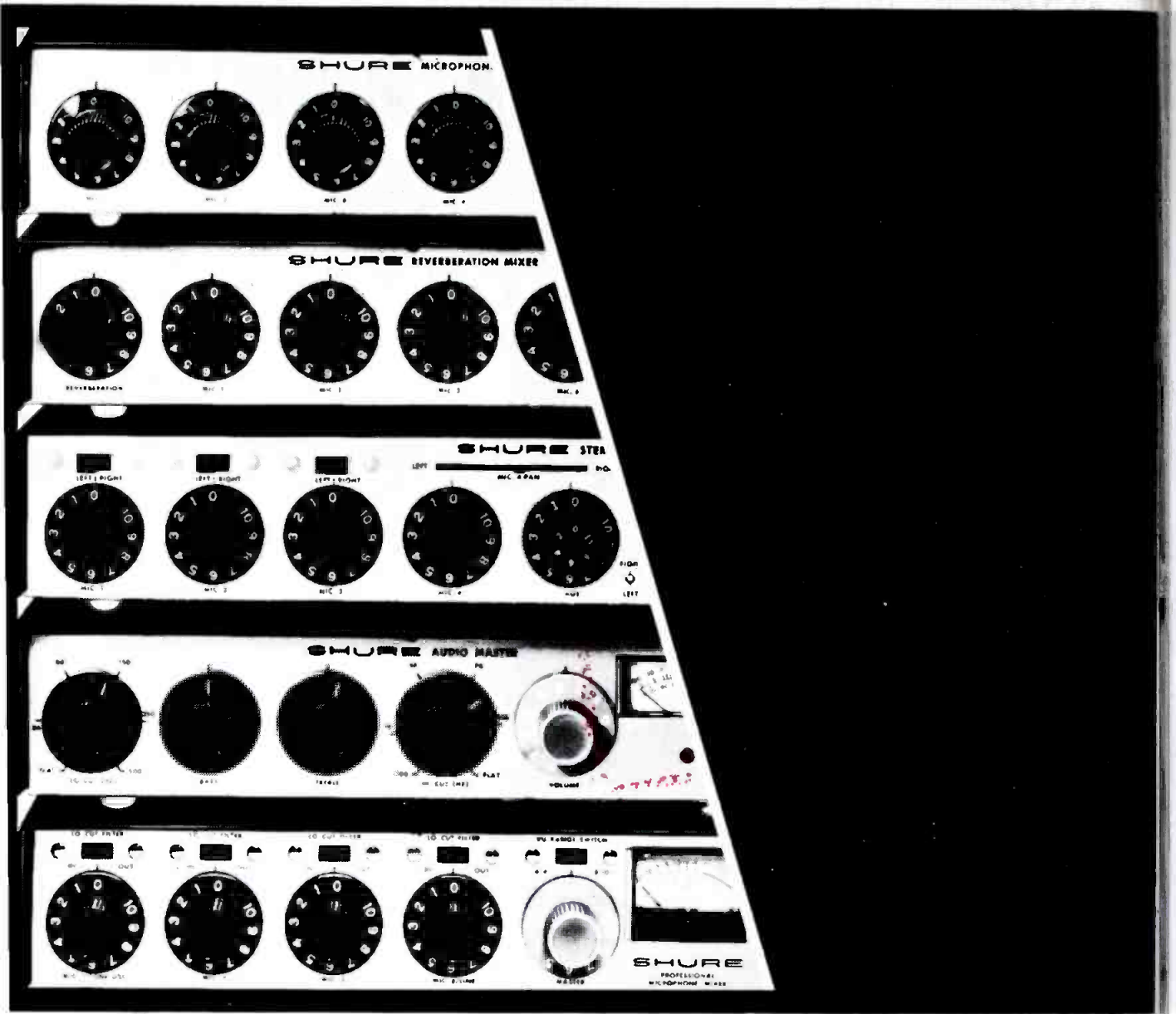

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