BROADCAST® ENGINEERING

May, 1979/$2.00

Technology: A quantum leap

20th Anniversary Issue

Historical highlights and glimpses of the future

The signals in a TV plant are no better than the weakest link through which they pass.

Our TKA-105 Broadcast Routing Switcher offers performance specifications far in excess of the equipment signals it will route.

NEC, as the world's third largest semiconductor manufacturer, has developed a new, large scale television routing switcher. The heart of NEC's model TKA-105 is an 8 x 1 LSI video switcher and 1-in/6-out LSI video d.a. The application of LSI has allowed the use of up to 4 digital audio channels multiplexed with video through crosspoints consuming only 30 MW each. Optional VITS NTC-7 signal insertion on each input permits complete automated system testing and considerable savings in routine maintenance.

Each 2-wire controller is a microprocessor that confirms switching at all levels in the switcher via word exchanges to the four kinds of circuit boards. The TKA-105 was NBC's choice for the 1980 Olympics, NBC Burbank, NBC Chicago and the expansion of switching at NBC New York. If your routing requirements are for a matrix of 60 x 60 or larger, we invite you to explore the most advanced technology available.

Call us at 800-323-6656, 24 hours a day.

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Z6

EDITING SYSTEM

. . a fresh new approach to creative eedom. The Z-6 has more of what you re looking for than *any* other VTR editing ystem.

A Microprocessor Based Editing Control System

·6 HAS WHAT YOU NEED!

eliability — the Z-6 utilizes the computer in- ıstry's standard IEEE S-100 buss electronics the heart of your Z-6 is a tried and proven Z-) micro computer. Moreover your Z-6 inter- ce requires *NO* mechanical modifications to e VTR. Your transports are factory reliable.

ccuracy — with "micro-loc"* the Z-6 is lead lock" accurate. The frame of video you ılect is the frame of video you edit. "Micro- c"* is an exclusive Z-6 technique which ob- ates the need for SMPTE time code. For the st time control track editing is as accurate ; the "old standard".

xpandability — the Z-6 is software based. our Z-6 future is the future of the computer orld. Every Z-6 is state of the art year after ear and software upgradeable.

Z-6 HAS WHAT YOU WANT!

Features — the Z-6 comes with a 99 event memory. Bi directional shuttle controls, auto search, cruise control, event tag, rehearse, perform, review edit and many more features far too numerous to mention. . . there's even a built in electronic scratch pad for calculations. All the features of conventional editing systems plus many they haven't even thought of. The Z-6 was conceived and designed by professional editing people.

Human Engineering — the keyboard is simple. Each primary function has a dedicated button. No shifting or typing. The Z-6 keyboard is layed out logically. The CRT display is organized in a similar fashion. The status of your production is simply and accurately displayed throughout the editing process. Cursors prompt the operator to the next logical function and error messages appear when an illogical command is attempted. The Z-6 edits, it relies on you only for the *"creative decisions"*.

Flexibility — the Z-6 can edit the most demanding production you can give it, with consecutive event mode changes, simultaneous tape searching, event memory recall, automatic computation of times and durations, custom programmed pre rolls and post rolls, automatic return to last event edited.

However, if you are a novice, the Z-6 will operate like the simplest control track editing system you have ever used except it will be the most accurate. Forget the numbers, durations, roll times, events. Simply shuttle to the pictures and rehearse and/or perform the edit. The Z-6 can handle your novices *and* your pro.

THE Z-6 HAS IT ALL!

For the first time you have a first class production without the hardware hassle - it's that simple. YOUR EDITING SYSTEM SHOULD HAVE "Z-6 APPEAL"

*pat. pend.

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Professional Television Systems

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BROADCAST engineering

The journal of the broadcast-communications industry

May, 1979 ☐ Volume 21 ☐ No. 5

DEPARTMENTS

THE COVER

Satellites have brought tremendous gains to communications and broadcasting in the last 20 years. This 20th anniversary issue cover shows the next generation of international communications satellites, an INTELSAT V, scheduled to be launched late this year.

Irving Goldstein, vice president and general manager of International Communications (COMSAT), describes the history of communications satellites leading up to INTELSAT V in an article on page 66.

With 102 member nations, INTELSAT owns and operates the global communications satellite system. COMSAT, the US representative to INTELSAT, has a 25% share in INTELSAT.

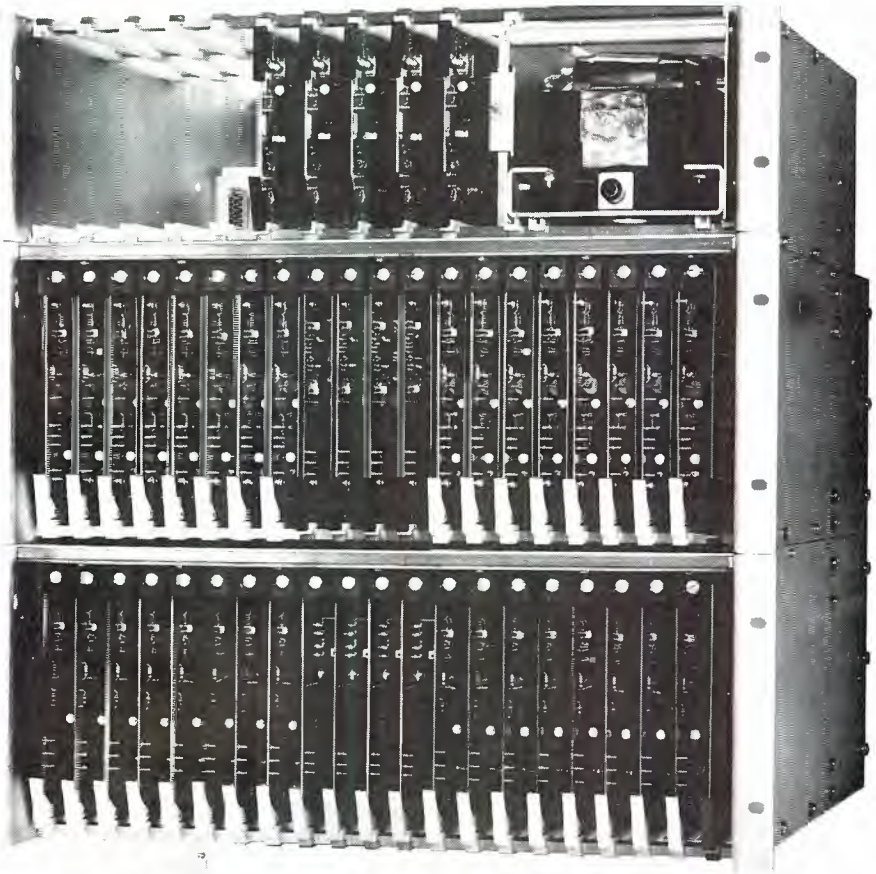
Each of the seven INTELSAT Vs being constructed will have a capacity of 12,000 voice circuits and two television channels, doubling the capacity of the INTELSAT IV-A's now in geosynchronous orbit over the Atlantic, Pacific and Indian Oceans. The Vs will operate in the 11- and 14-GHz frequency bands as well as in the 4- and 6-GHz frequency bands now in use. When fully deployed, as shown, it will be 52 ft long and 21 ft high and will weigh 2231 lbs.

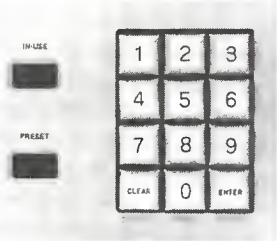
NEXT MONTH

- NAB/Dallas Replay
- Radio & TV developments
- Selected equipment emphasis
- Engineering workshops
- Exhibit roundup
- Exceptional photo coverage
- Selected technical articles

GRASS VALLEY GROUP

400 SERIES ROUTING SYSTEM





...solves your signal routing problems with world-famous Grass Valley Group quality, and at a remarkably reasonable price!

And the 400 Routing System specifications are unexcelled! For example, the audio section produces +24 dBm into 600 ohms *without* using transformers. And the design of the 400 System is *totally modular*: you may add to your basic system as needs arise, even adding as little as *one output at a time*! The cost is low, and the quality the highest; Grass Valley Group quality in the new 400 Routing System.

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BROADCAST engineering

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INTERTEC PUBLISHING CORP.

VERSATILE.

O'Connor Model-50. A fluid head with 378 combinations.

NEW, ADJUSTABLE BALANCE, QUICK RELEASE PLATFORM.

The Model 50-D Fluid Head can be ordered with one of six different platforms. Each has its special features and purposes, but our newest is the ultimate.

First, it has a unique camera mounting plate which can be attached to your camera in one of eight different positions. This is used to balance your camera on the head, greatly improving the head's performance.

Besides an adjustable camera mounting plate, the entire platform (with camera atop) can be shifted

back and forth on the head so that you can find the precise center of gravity for whatever particular gear you're using at any given moment, such as heavy lenses, large magazines, etc.

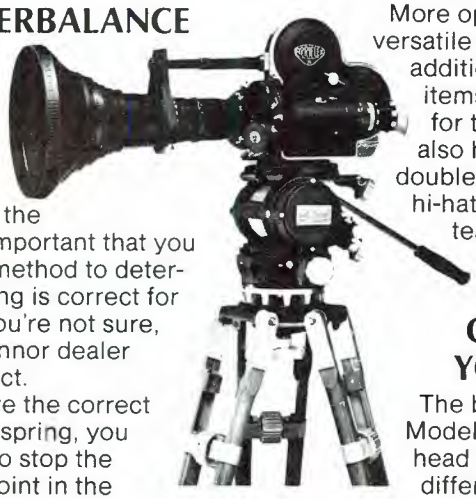
It takes only a second to release your entire camera with O'Connor's new quick release option. To prevent accidental releases, it has a built-in safety feature.

WITH BASES, WE'RE LOADED.

The Model 50 can be ordered with one of six bases. Besides two Pro Jr. types, Mitchell, Arri 16 and Arri 35, we also offer the O'Connor Claw Ball Base with the "ultra positive grip." The distinctive aluminum ridges

dramatically increase the holding power with far less effort needed to secure it in position. This Claw Ball design can also be adjusted ±15° to the horizontal plane within the top casting of the tripod to correct or alter your panning plane.

O'CONNOR COUNTERBALANCE DEFIES GRAVITY.



Three counterbalance spring options are available for the Model 50. It is important that you use the proper method to determine which spring is correct for your needs. If you're not sure, consult an O'Connor dealer or talk to us direct.

When you have the correct counterbalance spring, you should be able to stop the camera at any point in the normal tilting range and release the handle without the camera moving. And it should take no more effort to tilt it upward than it does to tilt it downward. We specifically design counterbalance into all our heads to correct this natural act of gravity so that your "tilts" are as steady as your "pans."

MORE CONTROLS FOR MORE CONTROL.

Like all O'Connor heads, the Model 50 is designed to provide maximum versatility. Separate controls for the pan drag, pan lock, tilt drag and tilt lock—all improve the flexibility and repeatability of camera movement.

O'CONNOR HAS MORE OPTIONS.

More options mean a more versatile system for you. In addition to some of the items already mentioned for the Model 50, we also have adjustable double video handles, hi-hats, cases, adapters, teak tripods and the ever amazing Hydro-ped.

ORDER IT YOUR WAY.

The basic O'Connor Model 50 fluid camera head can be ordered 378 different ways. If you're not sure how you want yours, maybe you should send for our brochure and price list to help you pick the equipment that's perfect for your needs.

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FLUID CAMERA HEADS

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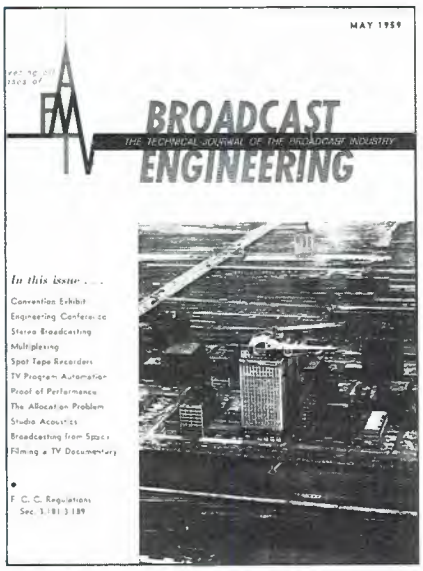

Twenty years ago this month a new publication was born, one designed to report on the technology of the broadcast industry. That first issue of **Broadcast Engineering** covered the 1959 NAB Convention and its 37 exhibitors, predicted that satellites might be used for intercontinental broadcasting, reported on a punch-tape television automation system and on the introduction of tape cartridges for radio. The 7500 readers of that issue received updates on the FCC's deliberation on FM and AM stereo (no system had been chosen), and on the possible use of directional antennas to solve television channel allocation problems.

And 20 years later...

Broadcast Engineering's goal remains the same—to cover and interpret the technological changes of the broadcast industry. Now received by over 34,000 readers, the largest audience in its field, this issue includes coverage of communications satellites, automation systems, tape's impact on broadcasting, and AM stereo (a system has still not been chosen). While many of the topics have not changed, the technical complexities and demands on our readers, the reason for **BE**'s existence, have taken a quantum leap. Our goal is to continue being the benchmark technology publication of the broadcast industry. The last 20 years have been great. The next 20 will be even better. Thank you for your support and readership.

George Langford

STATE OF THE ART

AMPEX 196 SERIES BROADCAST 1" HELICAL TAPE

This is the tape Ampex *had* to design to demonstrate the fantastic capabilities of our VPR-2, the machine that is revolutionizing professional video recording.

With Series 196, color brilliance is preserved and signal-to-noise ratio is unaffected even after multiple playback passes, lengthy still framing and heavy post-production editing. This tape is the ultimate match for the VPR-2—a brilliant combination that is unsurpassed in today's video recording industry. Available in SMPTE Type "C" or "B" formats. 34 min/66 min/94 min.

Contact Ampex Corporation, Magnetic Tape Division, 401 Broadway, Redwood City, CA 94063, 415/367-2011.

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industry news

Future for multiple TV networks

FCC chairman Charles D. Ferris recently stated that he sees a future in which multiple television networks, beyond the current three, could provide "an abundance of program choices" for the public.

Ferris noted that the FCC presently has a network inquiry underway which will be an extensive re-examination of the television networks. Ferris said the FCC may have a continuing role in the regulation of network business practices but hoped that competition from new networks would supplant FCC regulation as a promotion to program diversity. The first preliminary staff report of the inquiry will be available this summer.

Marconi Fellowship award

This month Dr. John R. Pierce, professor of engineering at the California Institute of Technology, will receive the Fifth Marconi International Fellowship of $25,000 for his work in satellite and space technology for the improvement of world communications. Dr. Pierce retired in 1971 from Bell Laboratories where he served as executive director, research, of the communications science division. He holds more than 80 patents for inventions in electron tubes and communication circuits.

The award was established in 1974 to commemorate Guglielmo Marconi's contributions to science, engineering and technology and is administered by the Aspen Institute for Humanistic Studies, Boulder, CO.

Teletext system tests

CBS has filed with the FCC for special temporary authority to conduct on-air tests of two separate teletext systems this spring at KMOX-TV, St. Louis. Gene F. Jankowski, president of CBS/broadcast group, stated that the technical tests of the two teletext systems will be "an effort to determine which system will provide the best and most reliable teletext services."

Teletext is the generic name for systems that transmit alphanumeric data (letters and numbers) and graphics to the home viewer. The signal is transmitted simultaneously with the television picture and is invisible to the unequipped home receiver.

John McKay, vice president and general manager of KMOX-TV, reported excellent progress is being made

Broadcast Quality Time Base Correction That's Easy to Handle

The 1600 CCD Time Base Corrector is specifically designed for broadcast quality electronic field production where lightweight and durability are essential. The 1600 combines high performance specifications and "easy to handle" portability with a surprisingly "easy to handle" low cost, to bring professional video standards to non-segmented V-locked VTR applications.

The 4 H line correction range with 55 dB p-p signal-to-rms noise performance, along with the available Image Processing feature, make the 1600 CCD Time Base Corrector the most unique approach to correcting time base errors for EFP or studio post production available today.

Write or call for more information on the "easy to handle" 1600 CCD Time Base Corrector from MICROTIME.

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on the installation of the teletext equipment as **BE** goes to press. **BE** will cover the progress of these tests as details become available.

Comments sought on Satellite Telecommunications Act

The FCC is seeking comments on its proposals to implement the International Maritime Satellite Telecommunications Act which designates the COMmunications SATellite Corporation (COMSAT) as the US participant in the INternational MARitime SATellite Organization (INMARSAT).

The commission asks for comments regarding:

- The ownership of earth stations and operational arrangements by which COMSAT and US domestic and international carriers will interconnect their facilities for the purpose of extending maritime satellite communications services in the US and beyond;
- Operational arrangements by which COMSAT will interconnect its facilities with private communications systems authorized by the FCC; and
- Regulatory safeguards to assure that COMSAT's participation in INMARSAT will not adversely affect its participation in the INternational SATellite Consortium (INTELSAT), and to prevent COMSAT from cross-subsidizing its maritime satellite services with its other communications services.

Ground wave field intensity study

FCC/OCE RS79-01, a report from the research and standards division entitled *Investigation of Methods for Converting the FCC Ground Wave Field Intensity Curves to the Metric System*, describes various methods of calculating ground wave field intensities in the Standard Broadcast band. The report, written by John H. McMahon, chief of the systems engineering branch, may be obtained by sending a self-addressed label to: Research and Standards Division, Dept. BE, Room 7202, FCC, Washington, DC 20554, Attention RS79-01.

Cable installation at JPL

The Jet Propulsion Laboratory (JPL) in Pasadena, which was responsible for the recent photographs of Jupiter and Mars, has been plagued by poor TV reception from the local Los Angeles TV stations. To solve the problem, JPL requested a cable TV installation from a Pasadena cable TV company. Falcon Communications connected coaxial cable to the space laboratory and utilized the existing closed circuit TV system within the complex.

"It is ironic that many of the solid-state equipment, chip amplifiers and earth receiving stations that are used so extensively today by my company and the cable TV industry, are a direct result of the NASA space program and the work of scientists at the Jet Propulsion Laboratory," stated Marc B. Nathanson, president of Falcon Communications. "I am proud Falcon Cable TV has played a small role in aiding America's space ventures," Nathanson concluded.

"Cinema Products has it all... The ideal equipment mix for film and electronic field production: CP-16R, MNC-71CP and Steadicam!"

Dennis Burns
PACIFIC FOCUS
Honolulu, Hawaii

Today, video and film is the way to go. With the Oscar-winning Steadicam, of course.

For the small-to-medium sized production company shooting industrials, documentaries, TV commercials, as well as docu-dramas and specials for television, Cinema Products offers the ideal film and EFP equipment mix. Lightweight, rugged and reliable production equipment, recording broadcast-quality film and tape. All covered by the standard Cinema Products full one-year warranty and around-the-clock* service backup.

To meet their extremely varied and demanding production requirements, forward-looking and dynamic production companies — like Honolulu-based Pacific Focus — make use of Cinema Products' easy-term lease/purchase program to maintain a versatile mix of the highest quality 16mm film and electronic field production equipment available today.

In addition to its existing CP-16R camera equipment, Pacific Focus has recently acquired two MNC-71CP video cameras with all the ancillary equipment needed to convert them to MNC-710CP studio/field production configuration.

"We shoot video or film, depending on what would best serve the needs of each particular project," says Dennis Burns, award-winning producer/cameraman and president of Pacific Focus. "In Hawaii, though, we produce on location almost entirely. So it's important that our broadcast-quality MNC-71CP cameras are rugged enough to take the kind of abuse that the CP-16R can take.

"Combined with the versatility and cost savings provided by Steadicam, which can be used interchangeably between our CP-16R and MNC-71CP cameras, there's no assignment we cannot handle!"

"The Steadicam camera stabilizing system lends itself to many innovative uses," says Dennis Burns. "For instance, by placing Steadicam on a special mount (built by Bud Weisbrod of Pacific Instrumentation – the CP dealer in Hawaii) and rigging it to a forklift, we were able to simulate boom/crane capabilities.

"And for shooting aerials, the same mount can be easily rigged to a helicopter or a fixed-wing aircraft."

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Viacom and Post-Newsweek to offer TV distribution system

Viacom International and Post-Newsweek Stations have announced plans for a television program distribution system using satellite technology and transmitting directly to television stations equipped with earth stations.

An RCA Satcom satellite and earth stations from RCA American Communications will be employed in the system. The receive-only earth stations have built-in scrambling and selected decoding capability for specific program reception at specific locations.

The system's effectiveness is due in part to the ability to reach only designated stations. The television signal is scrambled as it leaves the designated earth station uplink to the satellite. The video signal carries a code for each of the television stations on the receive list which activates a descrambler at the receive-only antenna.

Viacom will distribute television programs and motion pictures and the Post-Newsweek television stations will receive and/or record the programs. The first field applications are scheduled for later this year.

Canadian licensing policy

Communications Minister Jeanne Sauvé of Canada recently announced a new earth station licensing policy which will allow greater choice of TV programming and fuller access to other communications services carried on Canadian satellites. Under the policy broadcasters, cable TV companies and telecommunications common carriers will be permitted to own and operate television receive-only terminals. Common carriers also will be allowed to apply for licenses for transmit/receive stations to operate with Canada's new, higher frequency Anik C satellite system to begin service in 1981.

Fleming appeal for funds

Robben Fleming, president of the Corporation for Public Broadcasting, appeared before the Senate Appropriations Subcommittee requesting the appropriation of the total funds authorized for public broadcasting for fiscal years 1981 and 1982. Fleming stated that the full authorization was necessary "to preserve the tradition of having federal support always match audience and other private funds up to the full limit of the authorization."

The Public Telecommunications Financing Act of 1978 authorizes $180 million for 1981 and $200 million for 1982 with a match of $1 for each $2 in non-federal support. Fleming stated that public broadcasting's non-federal income is expected to exceed the $324 million and $344 million the 2:1 match would require for 1981 and 1982 appropriations and recommended

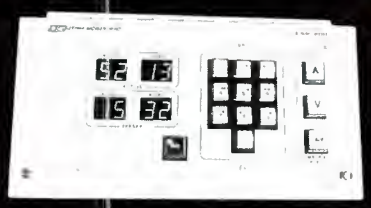
SWITCHERS DON'T MAKE MISTAKES...PEOPLE DO

That's why we've designed a whole new series of human-engineered control panels that are setting new standards for goof-proof switching.

Once you've designed audio and video routing switcher matrices as transparent and reliable as ours, there's not much room for further improvement at that end. However, there has been a need for improvement in the control end--particularly where operators must make accurate, quick-decision source selections. The panels described below are designed to eliminate the confusion too often associated with routing switcher control, while providing the control flexibility so important to present-day signal routing requirements.

For installation simplicity, each of these new panels connects directly to the system party line via loop-through coax connections. They provide continuous status readout and can be encoded to permit each input (or output) to be addressed by its name (VTR-2, CAM-4, etc.) rather than by an arbitrary matrix number.

We are also prepared to supply custom variations of these panels to suit your exact requirements.



CSP-200

Permits audio and/or video selection--including simultaneous A/V switching from different sources--on a single output bus. Available in recessed mount, one unit per rack panel and two units per rack panel versions

CSP-200 Custom

Custom variation of the CSP-200 panel built for Opryland Productions permits single keystroke takes on two preselected audio/video sources as well as normal touchpad entry.

CSP-300/R

Full Matrix Control Panel. Permits audio and/or video switching on any selected bus. Encoded version can be restricted to switch only on specific pre-assigned busses. Available in either recessed or rackmount versions.

CSP-10

Controls ten randomly assigned busses providing continuous status readout on each bus. Touchpad data entry with numeric readout permits error-free switching on any of the ten busses. (Availability, February 1979.)

CSP-20/CX-20

Permits button-per-source input selection on assigned bus. Basic panel accommodates 20 inputs. Expansion in 20-button increments is provided by adding slave panels. Permits fast single-stroke selection of any input. Button lamps provide continuous status indication from refresh memory. (Availability, March 1979.)

See us at Montreux, Stand No. 527

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that Congress appropriate the full amount to preserve the matching principle.

Employment study

According to the seventh annual FCC study of employment practices, minority employment increased over the past year from 13.8 to 14.3% of all broadcast industry personnel. The number of women employees totaled 49,656 compared to 45,300 in 1977. Minority personnel increased to 23,537 over the previous year's 21,934.

DICE system

Vidtronics now offers syndicators and producers the capability for converting program sources to any of the international standards, thus allowing for distribution throughout the world. The DICE (digital intercontinental conversion equipment) has the capacity to convert to any television standard including PAL, PAL-M, NTSC and SECAM.

The system is completely digital and provides high resolution and almost transparent conversions.

ACT president testifies on children's advertising

Peggy Charren, president of Action for Children's Television (ACT), recently testified before a Washington hearing of the Federal Trade Commission's proposed rules to eliminate advertising to children under eight years of age and to regulate commercials for heavily sugared foods directed to older children.

Charren stated that advertising targeted to children under 12 is a deceptive trade practice and that it is not until junior high school age that a child is equipped to make reasonable consumer decisions. "Before that age, all television advertising will inevitably deceive," stated Charren.

Canada to participate in WARC

Canada's federal government has approved recommendations for their participation in and proposals for the World Administrative Radio Conference (WARC) to be conducted for 10 weeks in Geneva beginning this September.

The major Canadian proposals are:

- that additional spectrum be allocated for mobile communications in the UHF band;
- that the standard AM broadcasting band be extended to provide for additional channels to permit coverage of areas in Canada not at present adequately served;
- that the amount of shortwave spectrum employed for international broadcasting be substantially increased;
- that additional radio spectrum be provided for Canadian and international requirements for radiocommunications by satellites;
- that additional spectrum be provided for the amateur radio service.

IN THIS BUSINESS IT PAYS TO BE SENSITIVE.

The new Canon J13x9B is the ideal lens system for every situation.

For example, when you're covering an impromptu interview in a poorly lit hallway. Or a nighttime fire. Or a crime scene. Or when the weather itself is so bad that it's news. These and hundreds of low-light situations call for a sensitive lens. That's why the zoom on the business end of your ENG camera should be a Canon J13x9B. At f/1.6, it's the most sensitive in its class. And the rest of its specs are impressive, too. Like its 13-time zoom ratio from a wide 9mm to 118mm. Its built-in fluorite element for more accurate color correction. And its minimum object distance as short as 0.8m (31.5"). The lightweight J13x9B is available with a money-saving modular accessory package, giving you all the flexibility you need in the studio or field—now and in the future.

Specify the Canon J13x9B when you order your new ENG camera.

It's the perfect lens system for all types of field production, including news, documentaries, sports or any portable application. Because we're always sensitive to your needs.

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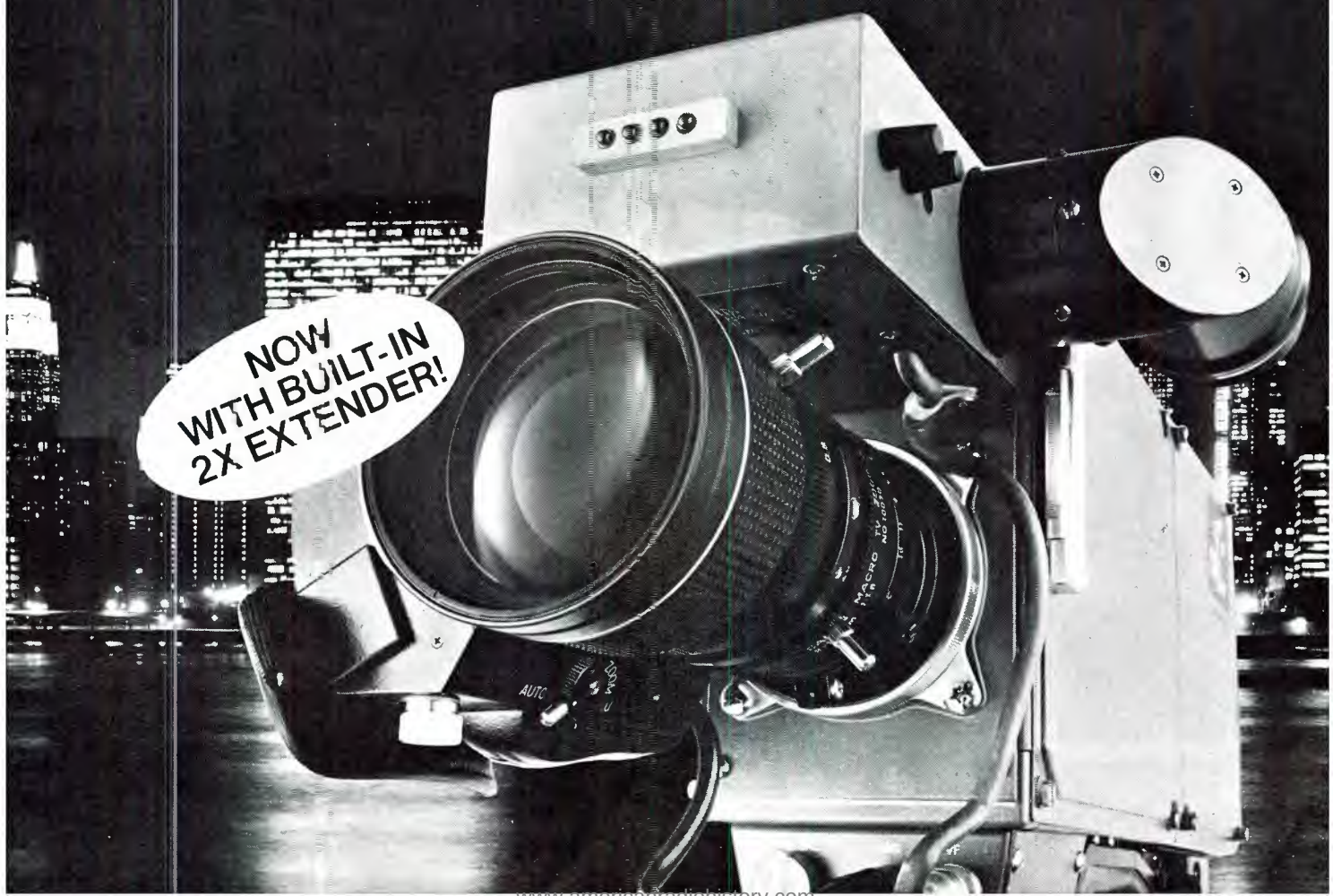

State broadcasting organizations and other associations

State associations

Florida Association of Broadcasters

On April 22 FAB joined with the University of Florida's College of Journalism and Communications in co-sponsoring B-Day in Gainesville. The 21st annual event offered an opportunity for station executives and broadcasting and journalism students to meet and talk about career possibilities outside the classroom.

Georgia Association of Broadcasters

The 45th annual GAB convention will open June 23, at Callaway Gardens. The program includes sessions on wage and hour, the re-write, how to improve sound, the Washington quiz, the Miss Georgia Holiday pageant and an equipment exhibit.

For more information, contact: GAB, 6065 Roswell Road, Suite 604, Dept. BE, Atlanta, GA 30328.

Kentucky Broadcasters Association

At the KBA's board meeting held February 16, the board voted to adopt the same resolution as adopted by the National Association of Broadcasters' board concerning the 9-kHz issue. It in part calls for an investigation by the FCC to determine the best possible method of establishing fulltime operation for all present and future broadcasters with a minimum of interference.

South Carolina Broadcasters Association

The SCBA board of directors have

The CSD-510 . . .

all the capability and accuracy you are likely to need

MASTER CLOCK SYSTEM DRIVER!

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Progressive Concepts in Television Technology

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Telex: 065-25420

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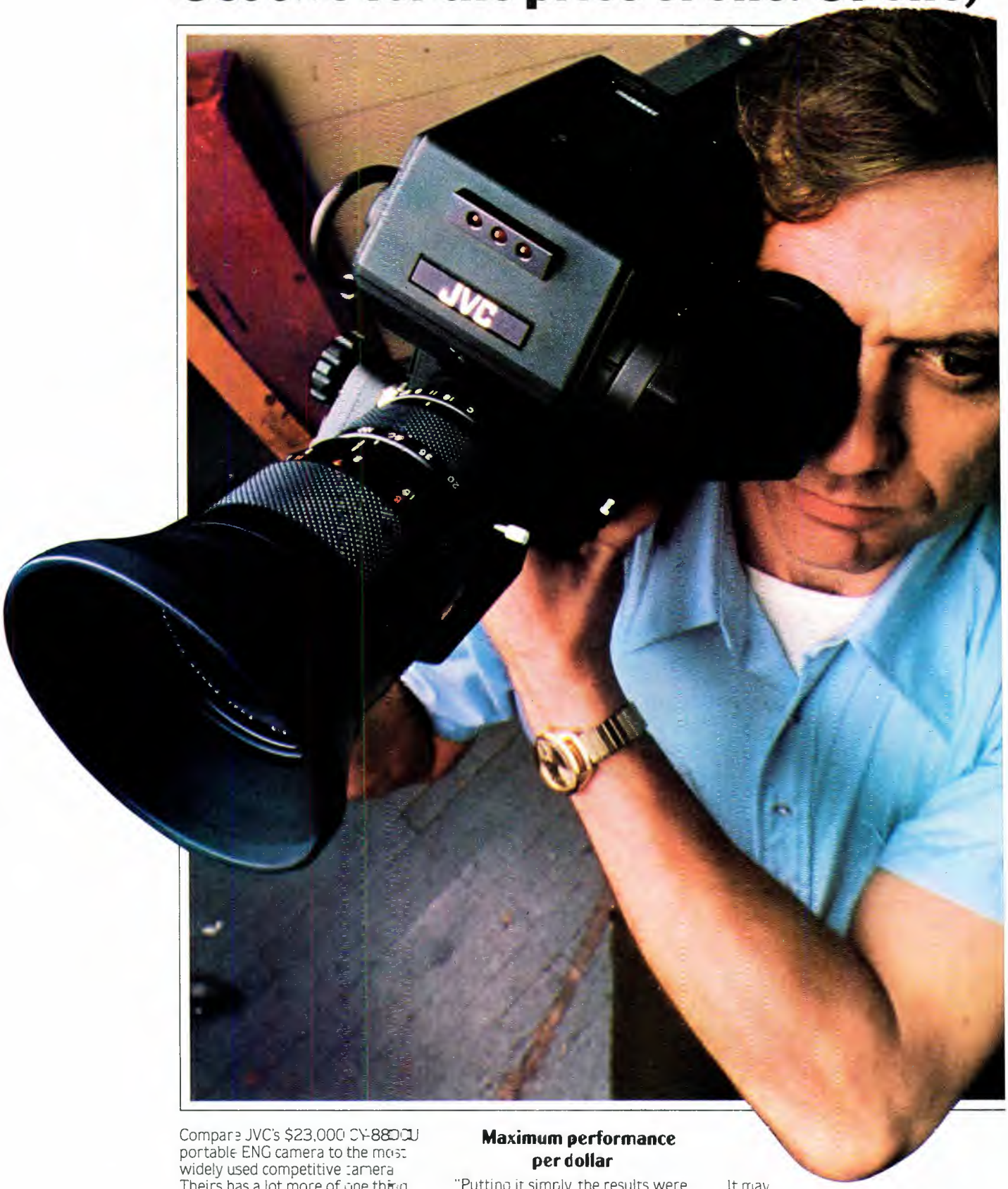
Get two for the price of one. Or one,



Compare JVC's $23,000 CY-8800U portable ENG camera to the most widely used competitive camera. Theirs has a lot more of one thing. cost. About double, in fact.

But there, for all intents and purposes, the differences end.

Because, in any ENG/EFP assignment where you find normal lighting conditions, you'd be hard pressed to see any difference in results.

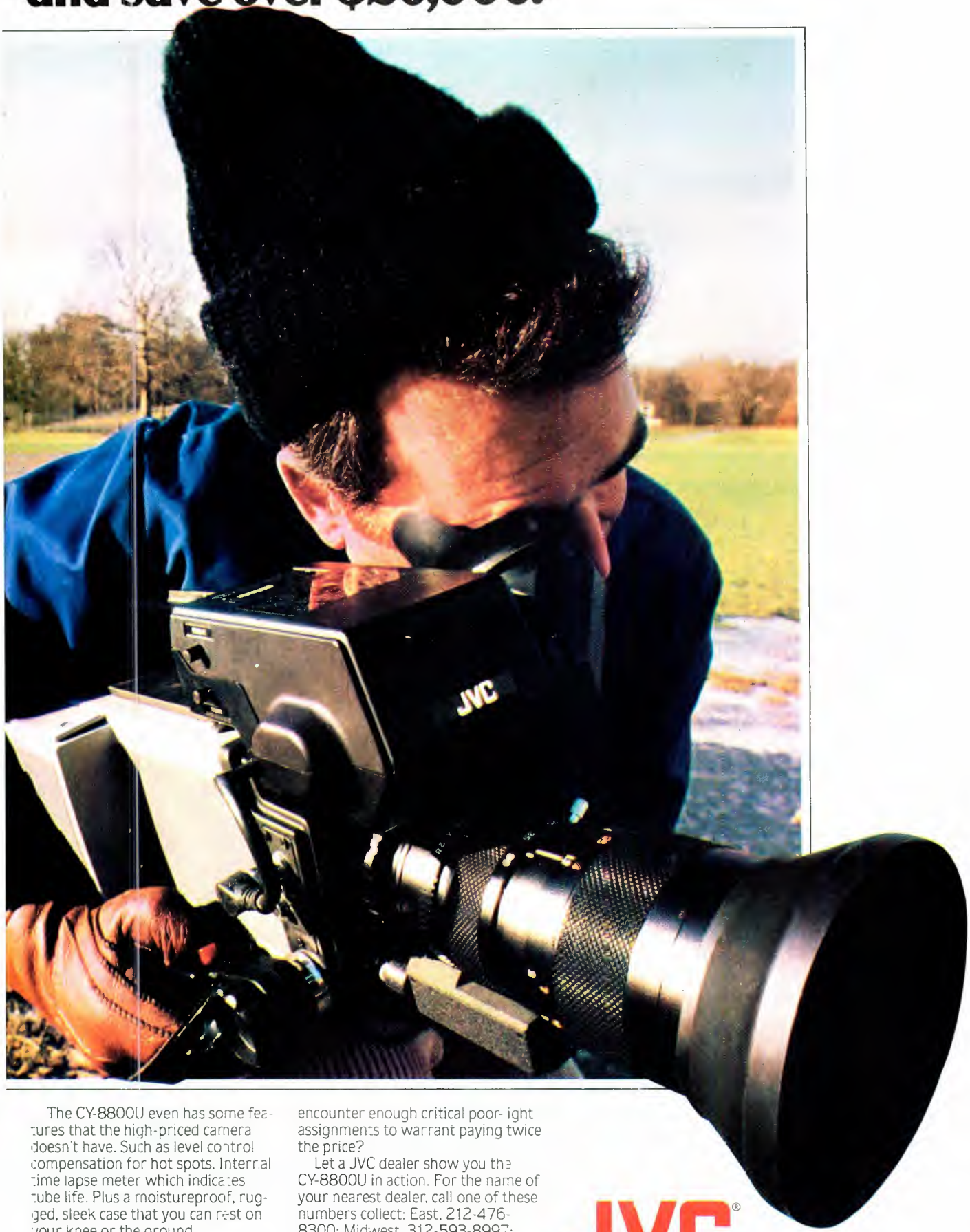
Maximum performance per dollar

"Putting it simply, the results were excellent," says well-known Producer-Director/Cameraman Lon McQuillin in his review of the CY-8800U. "Color quality is marvelous...There are few ENG cameras at any price that can top the JVC's performance, and then only when pushed into very poor lighting conditions...

It may well set the standard for the rest of the cameras in the category."

Behind that performance are high sensitivity and S/N ratio (50 dB). 500-line resolution. Sensitivity doubling (6 or 12dB). Auto white balance. And horizontal and vertical contour correction.

and save over $20,000.



The CY-8800U even has some features that the high-priced camera doesn't have. Such as level control compensation for hot spots. Internal time lapse meter which indicates tube life. Plus a moistureproof, rugged, sleek case that you can rest on your knee or the ground.

What do you really need?

Think about it. If you can get excellent results from JVC, do you really encounter enough critical poor- ight assignments to warrant paying twice the price?

Let a JVC dealer show you the CY-8800U in action. For the name of your nearest dealer, call one of these numbers collect: East, 212-476-8300; Midwest, 312-593-8997; South, 713-741-3741; West, 213-537-6020. US JVC Corp., 58-75 Queens Midtown Expressway, Maspeth, NY 11378.

JVC®

PROFESSIONAL VIDEO DIVISION

US JVC Corp.

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confirmed the 1979 summer convention to be held at the Camino Real Hotel, Can Cun, Mexico, June 22-26. For more information, contact: Carl Roach, summer convention committee, WTWE-FM, Dept. BE, Manning, SC.

National/International groups

Association of Maximum Service Telecasters

The MST filed with the FCC initial comments endorsing the benefits of source identification (SID) systems. MST emphasized that SID systems need not be operated on a radiated basis and pointed out the considerable potential of the vertical interval for other uses.

In other matters, MST took issue with the FCC's General Docket 78-369, Notice of Inquiry, concerning radio frequency interference, particularly Citizens Radio (CB) interference. Tom Paro, president of MST, recently wrote a letter to Charles Ferris, chairman of the FCC, in which he stated MST's position on the interference docket and suggested that the action most in the interest of consumers, and the most cost-effective, would be to adopt at least the 100 dB suppression requirement proposed in Docket 21000.

Society of Broadcast Engineers

Chapter 2—Pennsylvania

At a meeting on March 5, at the WVIA-FM-TV studios, Pittston, PA, Bob Griffiths, eastern regional manager for Telemet, presented a demonstration and program on fiber optics and fiber optic equipment. Griffiths reviewed the fundamentals and categories of fiber optics and equipment including the simple light-transmitting types used for dentistry, traffic control and video games. He discussed step indexing and the specification on LEDs and photo sensitive diodes.

Chapter 3—Kansas

The April meeting of the Kansas chapter was held in Wichita. The program, given by Southwestern Bell Telephone, centered around the technical aspects of the operation of the telephone company. How the phone company handles broadcast

Best In The Field

HITACHI SK-90

Outside the studio, the remarkable Hitachi SK-90 does it all. For EFP, it sports a studio style 5″ viewfinder. All key functions can be controlled with your choice of Remote Operating Unit (ROU) or Digital Command Unit (DCU). For ENG, slip off the SK-90's studio viewfinder, slip on the 1.5″ viewfinder and shoulder mount. Your SK-90 is now a compact, lightweight self-contained portable!

ENG with EFP image quality. And EFP with *total* remote control. SK-90 has the field covered!

Hitachi SK-90: portable ENG mode

Hitachi... Wherever video makes an impact.

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- Seattle (206) 575-1680

HITACHI
Hitachi Denshi America, Ltd.
175 Crossways Park West
Woodbury, New York 11797

Digital Command Unit (with coax/triax option)

Remote Operating Unit (features RGB out)

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loops and how long distance transmission takes place were discussed. Larry Wagoner hosted the meeting.

NRBA

Indefinite license bills

Two bills introduced into the Senate propose indefinite license periods for radio. Bill S-611, introduced by Senator Earnest Hollings of South Carolina, calls for an annual FCC audit of a random 5% for license terms while bill S-622, introduced by Senator Barry Goldwater of Arizona, proposes license terms subject to current revocation procedures.

S-611 proposes to retain the present procedures for renewals with other media holdings not relevant to comparative hearings and suggests that the Fairness Doctrine be retained. S-622 would eliminate comparative hearings altogether and delete the Fairness Doctrine except for the Personal Attack rules.

1979 Communications Act provisions

The Communications Act of 1979, if passed, would represent the first revision of communications law and policy in 45 years. Hearings on the act began late last month and hearings in the broadcasting sections are scheduled for May 14 through 25.

The general provisions call for interstate and foreign telecommunications to be regulated only to the extent that marketplace forces are deficient and/or "fail to protect the public interest."

Other major provisions include:

- Regulatory reform—abolish the FCC and replace it with the Communications Regulatory Commission (CRC), a body of five commissioners appointed by the president to non-renewable 10-year terms.
- Radio—deregulate radio stations in all markets immediately. Eliminate Fairness Doctrine, equal time and EEO regulation by the commission. Provide for indefinite licenses subject to revocation only for violation of technical standards.
- Spectrum resource fee—establish an annual spectrum resource fee to be phased in at 10% annually over a 10 year period. The fee is determined by the cost of processing a license and the scarcity value of the spectrum used. Revenues from the fees go to the US Treasury's general fund.
- Public broadcasting—abolish the Corporation for Public Broadcasting after 1983 and create the Endowment for Program Development, a private, non-profit corporation for production and aquisition of radio and TV programs and services.

Committee on 9 kHz spacing

Because of many conflicting views on the effect that the 9 kHz spacing proposal would have on the radio system, the National Radio Broadcasters Association (NRBA) will not take a position on the proposal until the facts are in. To expedite their

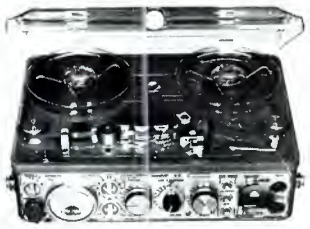
NAGRA

Your Participating Nagra Dealer and N.M.R.I. now join forces to bring you substantial savings . . . (limited time only).

REBATE

Starting May 1st, when you buy a Nagra Recorder from a participating dealer, you will receive a rebate check from N.M.R.I. for savings up to $580! Just fill out the money back rebate certificate your dealer gives you and return to N.M.R.I. with dealer's invoice. You will receive your refund, direct . . . in about 4 to 6 weeks. Offer valid in U.S.A. only.

NAGRA "4.2L"

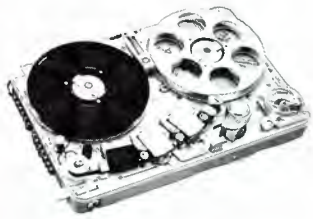


The Industry Standard, — Mono Sync Recorder.

Rebate

$425

NAGRA "SNN"



Mini Sync Recorder, 5¾"x4"x1"; 1 lb. 3 oz. Professional Performance.

Rebate

$260

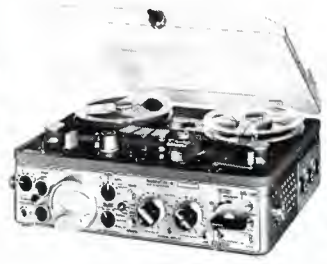
NAGRA "E"

The Economic, Mono, Broadcast Recorder. Rugged, Nagra Reliability.

Rebate

$240

NAGRA "IV-SL"



Two Track Stereo, Sync and Non-Sync, S/N Ratio 74dB!

Rebate

$580

IV-SD = $510

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Other associations

decision, the NRBA has proposed the establishment of a joint industry-government committee to study the effects of the 9 kHz proposal.

NAB

Action against FCC

In two separate cases the National Association of Broadcasters (NAB) has taken action against the FCC.

The NAB has asked for permission to join Metromedia in its case against the FCC. Metromedia petitioned the US Ninth Circuit of Appeals to review the commission's move authorizing Arlington Telecommunications Corporation (ARTEC) to import Baltimore TV signals and shift the burden of proof for any potential damage to Washington, DC stations from the cable system to the broadcasters.

NAB said such an authorization revises the standards governing the grant of waivers of its cable TV distant signal carriage rules.

The NAB also has asked the US Court of Appeals to review a Memorandum of Understanding between the FCC and the Equal Employment Opportunity Commission (EEOC).

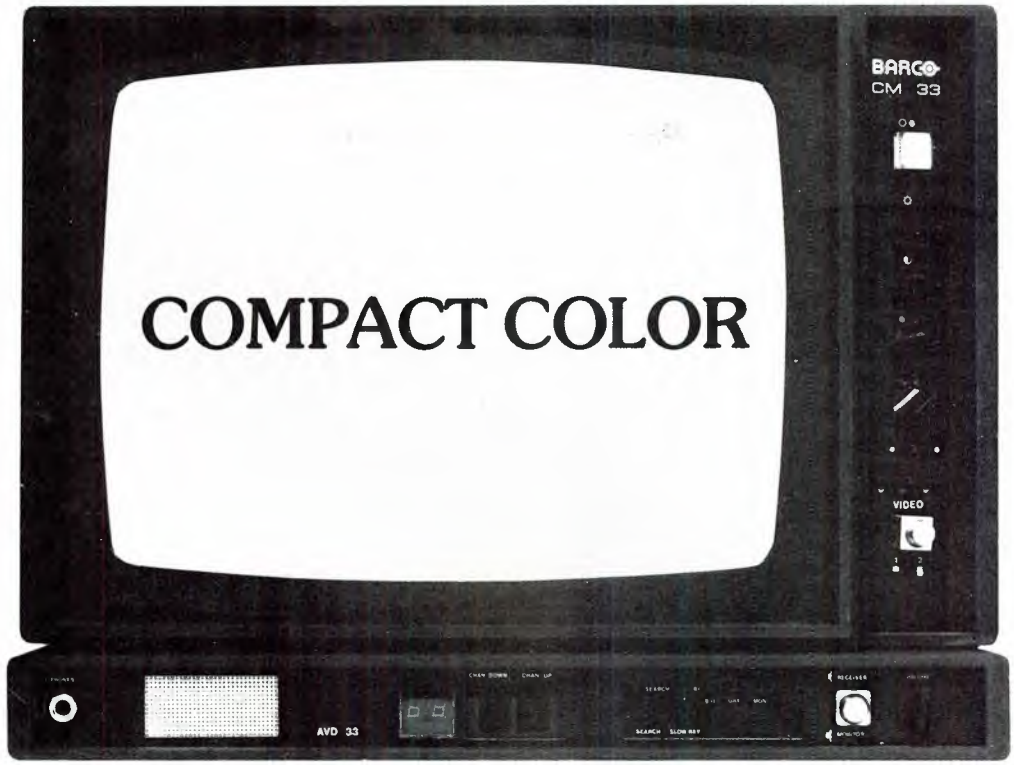
According to NAB the memorandum deprives broadcasters of their rights to due process in EEOC proceedings. The EEOC is trying to expand its jurisdiction below the Congressionally set limit of 15 or more employees.

Separator guidelines

The National Association of Broadcasters has announced the adoption of separator devices in both audio and video, before and after commercials aired during TV programs designed for children under 12 years of age.

Robert Rich, TV Code Board chairman, explained that the revised standard is to help reinforce a child's ability to differentiate between program and non-program material.

The guidelines, including the wording of the separator, expand on the Code's standard, 1X-6-B, and become effective September 1, 1979.



Now 14″ mobility with studio quality color. The Producer's dream come true!

The BARCO CM33

Now mobile production color can be monitored against studio quality instantly while recording is in progress.

It's possible with the BARCO CM33 high quality 14″ color monitor.

Designed for ENG, EFP and other mobile or closed circuit applications, the CM33 weighs only 31 lb. and is 100% modular for maximum reliability and simple maintenance. It is easily carried in one hand, or it can be mounted in a standard 19″ rack. It can also be supplied to operate on 12V or 24V DC. And a compact demodulator, the AVD 33, will shortly be available.

The high brightness "Precision in Line" tube and an optional screen shade permit clear viewing even in high intensity light conditions.

The CM33 is exclusively distributed and serviced throughout North America by E&O Systems Ltd. Delivery is from stock at a very interesting price. Ask us for full details and specifications.

BARCO

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E&O Systems Ltd., 2998 Scott Boulevard, Santa Clara, California 95050. (408) 727-1506.

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business news

RCA agreements

RCA American Communications has announced several agreements and actions including applying with the FCC for authority to construct a fourth communications satellite as a ground spare for launch in case of the failure of any operational satellite. The satellite could also be launched as a fourth in-orbit satellite providing customer service. RCA also has applied for FCC approval to obtain launch services from the National Aeronautics and Space Administration (NASA) in order to be prepared in case of need.

In an agreement with United Press International a new service which will distribute broadcast news services via satellite will be pioneered. Under the plan, which is subject to FCC approval, RCA will install, maintain and provide satellite transmission service to more than 600 receive only earth stations and utilize one of its Satcom satellites.

Roderick W. Beaton, president of UPI, stated, "The satellite relay to small antenna network that RCA and UPI have developed is a dramatic demonstration of a news company and a communications company working to improve the quality and reliability of broadcast distribution to the general public. I hope the FCC will give speedy approval to the RCA Americom filing."

The company also announced that the satellite system will now carry radio programming for ABC in addition to the NBC and CBS radio networks and the Associated Press and United Press International news services.

ABC has ordered two full-duplex (two-way) 8 kHz program audio satellite circuits for use between New York and Los Angeles.

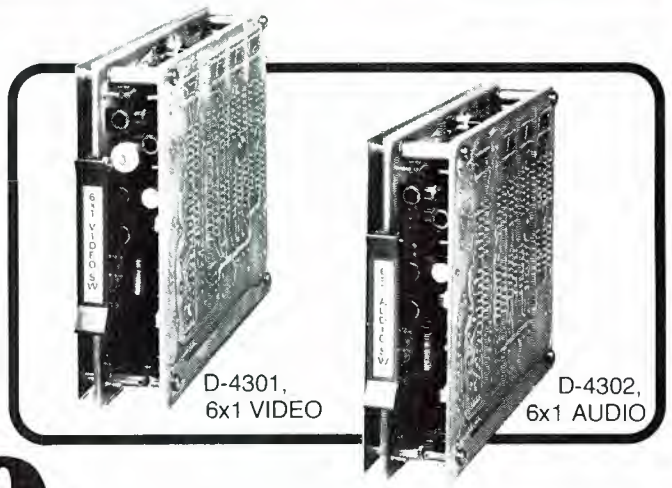
Electro-Voice to provide sound at Montreux

Electro-Voice has been named to supply the sound reinforcement for the 1979 Montreux (Switzerland) Jazz Festival. This is the third year the company has provided the service which consists of the installation of commercially available microphones, horns, drivers and enclosures as well as equipment not presently available.

Dictaphone division ends operation

At the NAB in Dallas, Dictaphone Corporation announced plans to end operations of its audio/electronics division in Mountain View, CA. William R. Krehbiel, president of the division, said the logging systems will be moved to the company's

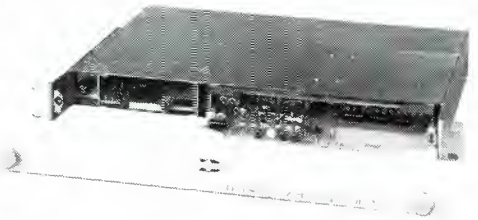
THE BETTER WAY



D-4301, 6x1 VIDEO

D-4302, 6x1 AUDIO

We make small routing switchers too!



D-4307, 16x1 VIDEO-AUDIO

Datatek has now added the D-4300 series video and audio switching units to its line of routing switchers. With building blocks of 6x1, 16x1 and 20x1, these switching units may be used for:

- Input preselects to production switchers to expand their capacities
- Switching inputs to vectorscopes and monitors
- Adding preview busses to existing switchers
- VTR input selection
- These units may also be stacked to make up small routing switchers at an economic price.

D-4304, 20x1 VIDEO

D-4305, 20x1 AUDIO

For More Information, Write or Call

DATATEK CORP

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main manufacturing facility in Melbourne, FL this July and its line of Scully professional recorders for the broadcast and studio recording industries will be sold to Ram Management Corporation which also operates Ampro Broadcasting.

The net effect from the transfer of the logging operations and disposition of the recording line will be accounted for in the first quarter and will not be material in that period.

Film processing for Winter Olympics

To aid the media coverage of the Winter Olympics at Lake Placid next year, the Lake Placid Olympic Organizing Committee (LPOOC) will offer processing for motion picture and television film in the Olympic Broadcast Center. In addition, Kodak will provide free processing of monochrome and color film for all accredited news photographers covering the winter games. The labs will operate from 8 AM to 2 AM daily during the Olympics.

Eastman Ektachrome video news film 7240, 7250 and 7239 as well as Eastman Ektachrome VN print film 7399 will be processed. Normal and push processing will be used for the monochrome still film and color processing will be for Kodak Ektachrome film and Process E-6.

Jupiter on cable TV

Live cable television coverage of the closeup examination of Jupiter and its moons by the National Aeronautics and Space Administration's (NASA) Voyager I was provided to the American public March 4, 5, and 6 via RCA Satcom I. The public was able to view Jupiter at the same time as the 106 scientists who make up the mission team at the Jet Propulsion Laboratory in Pasadena.

Reeves installation

Reeves Teletape has installed a fully equalized audio board in their facilities group mobile unit #4. The board is manufactured by Ward-Beck and features a 12-input, 4-output console including switchable high and low inputs.

GET YOUR SIGNALS UNCROSSED.

No matter how complicated your studio operation is, we can unsnarl your signals and send them on their way, with one of our nine off-the-shelf Switcher series.

Our microprocessor-based routing and machine control systems can satisfy your most complex requirements including automation. The variety of controls available plus single co-ax control cables is unequalled in the video industry.

And to minimize system downtime we've designed our Series 20X and 40X Switchers for optimum reliability and capability. And you can replace a channel module without shutting down the entire system.

For audio use, our solid-state Series AX Switchers make the old fashioned patch panel a thing of the past.

All 3M Routing Switchers can be built to nearly any input/output capability, with vertical interval switching and can be operated by many types of controls.

Studio operation is getting more complex every day. You can't fight it, so why not switch? Switch to 3M Routing Systems.

Circle the reader service card number at the back of the book for more information or call (612) 736-1032 for system design assistance. 3M Video Systems. Watch us in action.

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SALES/CONTRACTS

Ampex

Ampex has received an order from Gaylord Broadcasting for $1.4 million of equipment including 15 VPR-2 1-inch helical scan videotape recorders, an ESS-2 digital video production system and related units. The equipment will be used at the five television stations operated by the company: WVTV-TV, Milwaukee; KHTV-TV, Houston; KTVT-TV, Fort Worth; WUAB-TV, Cleveland; and KSTW-TV, Tacoma, WA.

The purchase also included 19 TBC-2 digital time base correctors, two HPE-1 editing systems, three SMC-60 slow motion controllers and a VPR-20 portable 1-inch helical VTR.

RCA

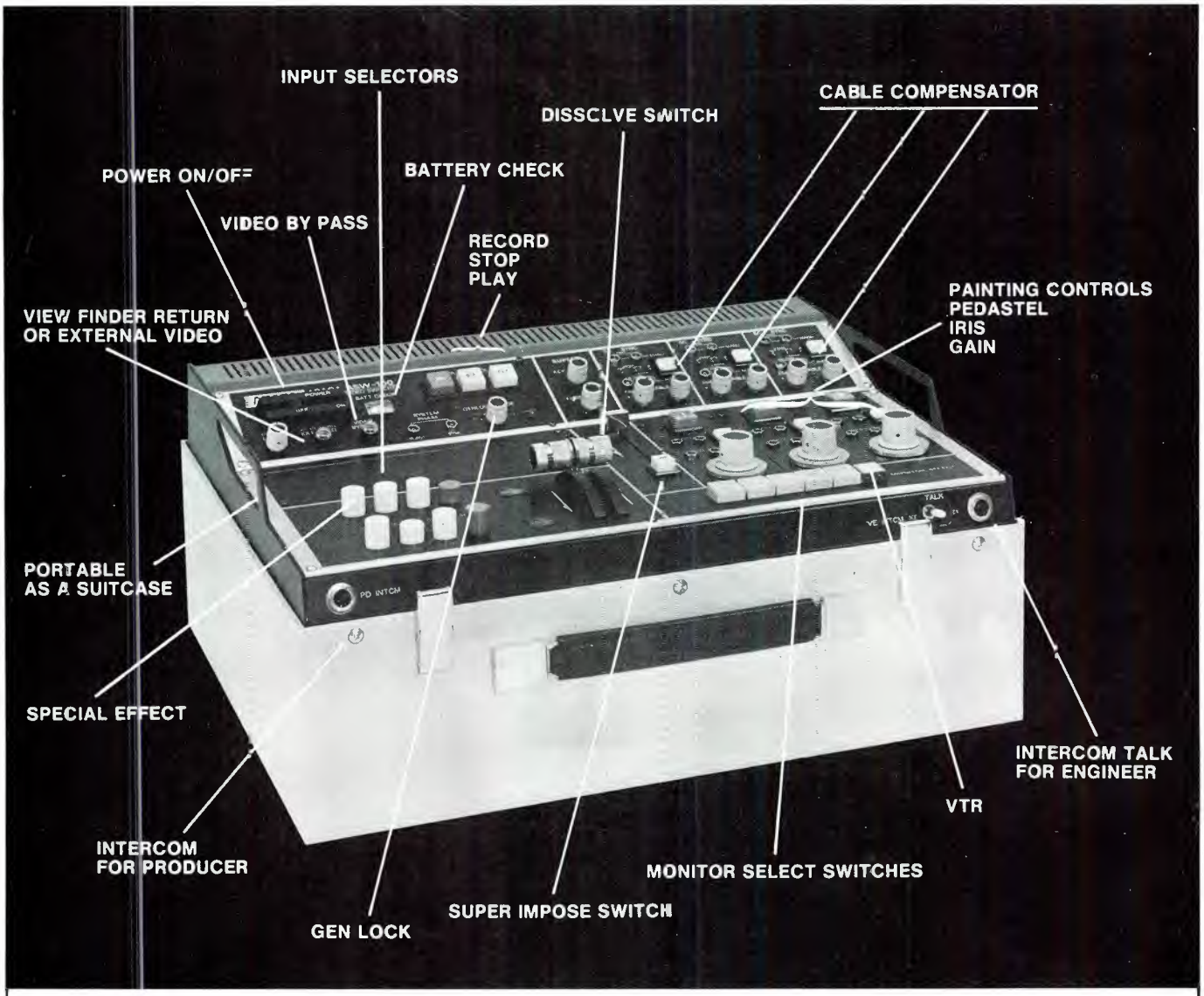
Radio-Television Belgrade (RTB) has installed $5 million of RCA color television studio equipment including 22 studio, field and portable production cameras, film originating systems and videotape recorders. Some of the equipment will be installed in RTB's studios with the remainder used to originate broadcasts from the Sava Centre, a conference and convention center in Belgrade.

Outlet Company

Outlet Company has announced plans for the purchase of WIOQ-FM, Philadelphia, from Que Broadcasting Company. The station will be the 10th broadcast facility owned by Outlet. The acquisition is for $5.5 million cash and $500,000 for a non-competitive covenant and is subject to FCC approval. The land, tower and building properties associated with the station will be purchased through a separate transaction.

Sony

Sony has delivered a second BVE-5000 computerized video editing unit to NBC, making the network the first user of the equipment in the US. The first system, delivered last fall, is currently used on a 12-hour-per day editing schedule for sports



At last! Portable Video Switcher-Battery Packed-or works on 12-Volt Car Battery or 120-Volt AC line!!

Customizes to your equipment. Compatible with any camera. Connects to VTR! The Asaca ASW-100. A portable switcher designed for the ENG and EFP cameras. Small and light. The hand-carry type with features ideal for "field production."

Powered by a battery pack, or 12-Volt vehicle battery or 120-Volt AC line; when from latter two, the switcher can also be powered along with multiple cameras and VTR.

The ASW-100 operates with up to three cameras. Designed for use with the Asaca-2000 camera. Compatible with any other camera. Full operations remote controls optional. Non-Asaca cameras containing internal gen-lock circuitry use black burst output, providing for each camera position.

The ASW-100 includes a "sync" generator. Internal gen-lock circuit permits VTR signals as a fourth input for editing or program modifications. Automatic phase control is within a plus or minus 15 degrees from all sources.

Switcher is vertical interval and processes composite video signal. Mixer-fader is included, capable of special effects.

Monitoring is optional with an AMB-100 unit. The instrument provides three mono-chrome source monitors and wave form monitor for use with external color line monitor. When the AMB-100 monitor is not used, a signal monitor can be connected to switching unit. Integral monitor switcher included in the ASW-100 will select the various sources for viewing on the monitor.

Combining with the Asaca ACC-2000 camera furnishes a full production system capable of expanding the mobile operation of any broadcaster or video producer while maintaining full broadcast signal quality.

For a free demonstration without obligation, write or phone our office nearest you.

ASACA®

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(312) 298-4380
155-B San Lazaro Ave., Sunnyvale, CA 94096
(408) 735-7350

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specials, advertising and promotional spots.

Video Corporation

Video Corporation of America has retained Morton D. Wax Associates for the handling of the public relations for the introduction of its new videocassette/videodisc rental services. The service will offer special programs and motion picture features through arrangements with Avco Embassy, major league baseball and others.

ProTech Audio

Robins Industries has agreed to sell its Broadcast & Sound product line to ProTech Audio. The agreement includes rights to manufacture all professional audio products formerly produced under the Robins Broadcast & Sound Equipment Corporation name and provides licensing or applicable patents. Engineering drawings, production drawings and procedures, specifications, special tooling, work in process, equipment and inventory were also acquired.

Micro Consultants

NBC has placed an order with Micro Consultants for 15 Quantel DPE 5000 NTSC digital effects systems and other digital video devices worth more than $2 million. The order also included four NTSC Quantel DFS 3100 digital framestore synchronizers, five Quantel DPE 5001 digital effects systems, four Quantel DFS 3001 digital framestore synchronizers and a Quantel DSC 4000 digital standards converter. Some of the equipment will be used for NBC's coverage of the 1980 Moscow Olympic Games.

FINANCIAL

Chyron

Revenues of $1,863,000 for the six month period ended December 31, 1978 were reported recently by Chyron Corporation. This figure compares with the $1,589,000 reported for the same period last year. Net earnings increased to $245,000 or 27 cents per share from $133,000 or 14 cents per share reported for the prior year.

Cohu

Cohu recently reported 1978 revenues of $19,024,989 with income of $520,081, or 30 cents per share. This compares with the 1977 revenue figure of $17,338,220 with income of $650,534 or 37 cents per share. Fourth quarter revenues were $4,992,039 with income of $158,230 or 9 cents per share.

Fairchild

Fairchild Camera and Instrument recently declared a quarterly cash dividend of 20 cents per share, payable to shareholders of record as of March 12.

Direct drive made Panasonic Series 9000 a great 3/4" editing system. Here's what makes the new 9000A an even better one.

The new Panasonic Series 9000A offers even more impressive performance, even more quality, and more professional features than the Series 9000 did last year. And we still have the lowest price tag in the business.

The new system consists of the NV-9500A editing recorder, the inexpensive NV-9200A player/recorder, and the NV-A950, the versatile editing controller that goes between them.

Together, they deliver the cleanest Panasonic frame-to-frame edits ever.

S/N ratios are our highest ever, 46 dB color and 50 dB black and white, thanks to new crystal-oriented HPF™ video heads. And in addition to those crisp, clean edits, you get reduced audio delay at the edit point. And substantially increased frequency response at the first generation.

That's not all. The new y increased frequency response works with a patented dubbing mode for even better dubbing quality. And still another of the many important improvements is a new tape guide path on the video head cylinder. It reduces tape edge movement for an even better RF envelope and an even better signal—the best yet from Panasonic.

You get all these improvements, plus professional features you can count on in a Panasonic editing system: Like controls that are completely solenoid-operated. A separate RF output for use with an external DCC. Even subcarrier and external sync inputs for use with a time base corrector.

The Panasonic Series 9000A ¾" editing system. The only thing that looks better than its performance is its price.

For more information, write: Panasonic Company, Video Systems Division, One Panasonic Way, Secaucus, N.J. 07094. In Canada, Panasonic Video Systems Department, Mississauga, Ontario.

Exterior cabinetry is simulated woodgrain.

Panasonic®
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meetings, events&seminars

May 15-18—The *63rd Technical Meeting and Exhibits of the Audio Engineering Society* will take place at the Los Angeles Hilton. Products from more than 170 firms will be exhibited; over 70 papers will be presented in 10 technical sessions. For more information contact Martin Polon, audio-visual director, Dept. BE, UCLA, CASO, Royce Hall 130, 405 Hilgard, Los Angeles, CA 90024.

May 20—Papers are due for the *National Telecommunications Conference* NTC '79 which is co-sponsored by the Communications Society, Aerospace and Electronic Systems Society and Geoscience Group.

Previously unpublished papers concerning technical disciplines such as communication electronics, communication switching, computer communication, geoscience and government regulation will be considered.

For more information, contact: Dr. Thomas P. Quinn, chairman, Technical Program NTC '79, Dept. BE, P.O. Box 31031, Temple Hills, MD 20031.

May 27-June 1—*The 11th International Television Symposium and Exhibition* will be held in Montreux, Switzerland. Technical developments in the area of international television including the effect of digital video techniques, the growth of satellite program distribution and broadcasting, the growth of cable television networks and the emergence of new services using the home television receiver will be covered.

An equipment exhibit will be held daily from 9 AM to 7 PM except on the last day when it will close at 1 PM. Exhibitors include Ampex, Robert Bosch GmbH, Fuji Photo Film, Hitachi Denshi Europa, Ikegami Tsushinki, 3M, Rohde & Schwarz, Sony, Thomson-CSF, Victor Company of Japan and many others.

For more information, contact: R. Jaussi, International Television Symposium and Technical Exhibition, Dept. BE, P.O. Box 97, CH-1820 Montreux, Switzerland.

June 11-13—Imero Fiorentino Associates have announced that the next *Television Lighting and Staging Seminar* will be held at the Audio-Visual Production Center, Falls Church, VA.

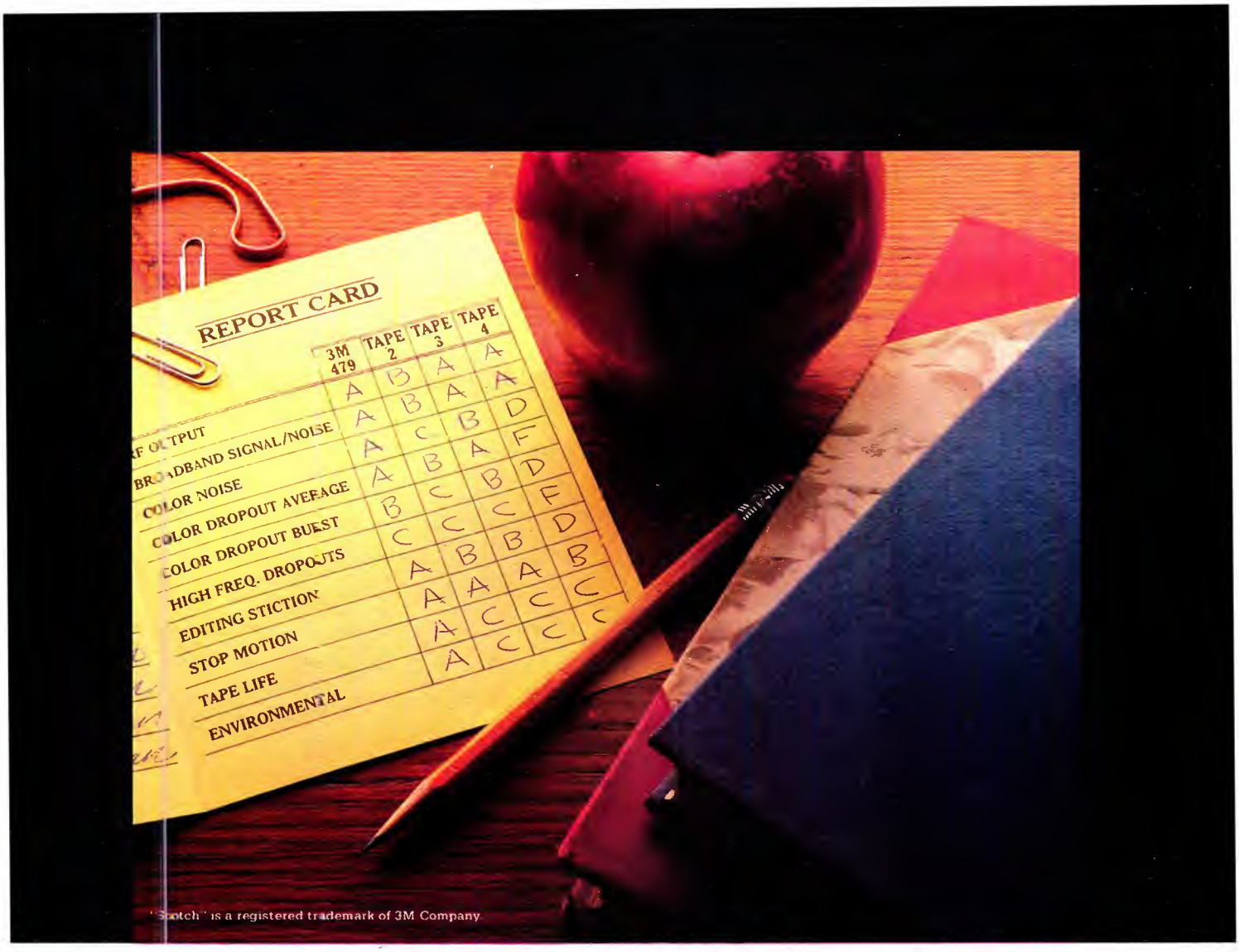
Lighting and production specialists, including E. Carlton Winckler, David Clark and John Leay, will provide practical instruction for improving picture quality and ease of studio operation.

For more information, contact: Imero Fiorentino Associates, Education Division, Dept. BE, 10 West 66th Street, New York, NY 10023.

June 12-14—A 3-day workshop outlining 20 steps in developing a video production system will be held at two locations: Midwest Visual, Chicago; and Electronic Synergy, Indianapolis.

Steps covered include determining the program approach; researching content; cost-estimation and budgeting; storyboarding, shooting script preparation; pre-production checklists and rehearsal; taping and logging tape; editing; validation; and distribution.

For more information, contact: Bob Hiller, Midwest Visual, Dept. BE, 6500 N. Hamlin Avenue, Chicago, IL 60645; or Greg Rogers, Electronic Synergy, Dept. BE, P.O. Box 20501, Indianapolis, IN 46220.



IN A TEST OF ONE-INCH VIDEO TAPES, WE ACED OUT THE COMPETITION.

When we tested the top four brands under strict lab conditions, the overwhelming performance leader was Scotch 479 Master Broadcast Video Tape. In fact, we came out on top in all ten performance categories.

If that isn't reason enough to make us your choice, maybe this is. We're the only one-inch supplier that winds your tape onto a special cushioned flange reel to protect against shipping and handling damage. And we pack and ship our tape in a flame-retardant case to give you even more protection.

We're the people who pioneered the development of video tape 25 years ago. And according to the pros who know video tape best, we're still the best video tape. Give or take an inch.

3M

Meetings, events & seminars

June 20-22—*The 12th Annual International Exhibition of Professional Recording Equipment* will be held in the Connaught Rooms, Great Queen Street, Kingsway, London.

More than 100 firms will be displaying their products of interest to those involved with recorded music and include EMI Tape, 3M, Audiomatic and ICM Cassettes Merchandisers.

For more information, contact: The Association of Professional Recording Studios, 23 Chestnut Ave., Dept. BE, Chorleywood, Herts WD3 RHA England.

August 13-18—*The 1979 National Electronics Service Convention*, a joint effort by NESDA/ISCET, will be held at the Marriott Hotel in Tucson, AZ. The overall convention theme is *Meeting the Challenge of Change* while the technical seminars and business management school theme will be *Coping With the New Technology*.

For more information, contact: Marti McPherson, NESDA/ISCET Administrator, Dept. BE, 1715 Expo Lane, Indianapolis, IN 46224, (317) 271-8160.

September 5-7—*The Second International Fiber Optics and Communications Exposition* will be held at the Hyatt Regency O'Hare in Chicago. Technical sessions will run from 8:30 AM to 11:00 AM each morning and from 2 PM to 4:30 PM each afternoon. Topics include *Basic Fiber Optics Systems, Future of Fiber Optics, Space Applications, Fiber Optics Market Potential* and *Fiber Optics in Medicine*.

The equipment exhibition hours are 10 AM to 6 PM Wednesday, September 5 and Thursday, September 6 and from 10 AM to 12 PM on Friday, September 7. Companies to display their products include Belden, Dupont, Hewlett-Packard, NEC America and Times Fiber Communications.

For more information, contact: Information Gatekeepers, 167 Corey Road, Dept. BE, Brookline, MA 02146, (617) 739-2022.

October 8-10—*The 1979 International Conference on Cybernetics and Society* will be held at the Denver Hilton. The purpose of the conference is to explore applications of world systems in areas relating to energy, environment, economics, technology biocybernetics, pattern recognition, man-machine and system science.

For more information, contact: Dr. James D. Palmer, (202) 426-4461.

September 16-19—The *19th annual BFM conference* sponsored by the Broadcast Financial Management Association will be held at the Waldorf-Astoria in New York City.

For more information, contact: Broadcast Financial Association, Dept. BE, Suite 910, 360 North Michigan Avenue, Chicago, IL 60601.

October 21-26—The *121st Technical Conference and Equipment Exhibit* of the Society of Motion Picture and Television Engineers (SMPTE) will be at the Century Plaza Hotel in Los Angeles.

The conference will feature five days of technical sessions on motion pictures and television and the SMPTE equipment exhibit.

For more information, contact: SMPTE Conference, Dept. BE, 862 Scarsdale Avenue, Scarsdale, NY 10583.

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people in the news

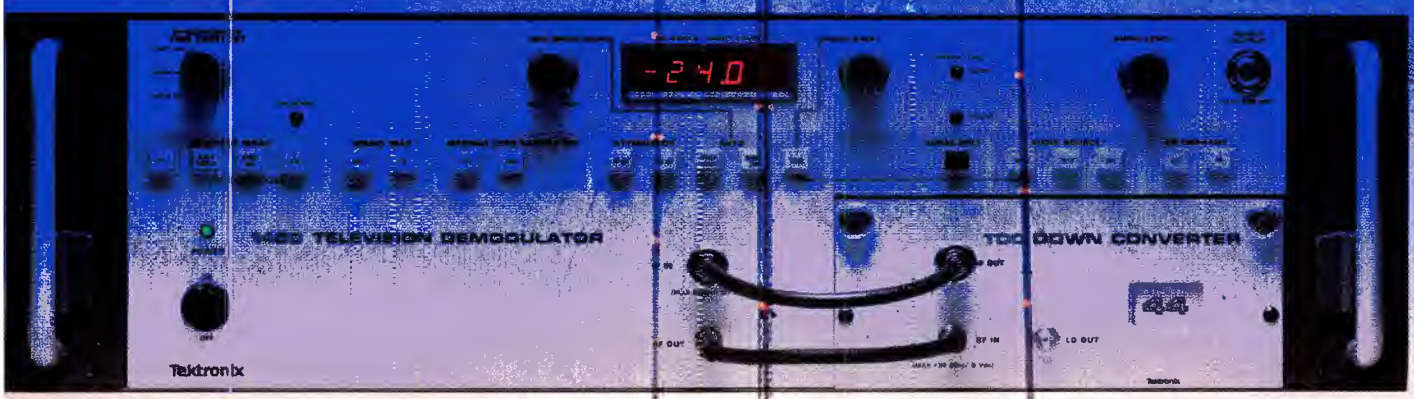
NAB Highlights

Over 7000 broadcasters descended on the NAB/Dallas convention to see the industry's latest wares.

Bud Schaafsma, chairman of the Mutual Broadcasting System executive committee, presents a plaque to Dallas Cowboy's president Tex Schramm on behalf of the Mutual Southwest Radio Network in appreciation of the Dallas Cowboy's cooperation and assistance in establishing the largest radio network in professional sports and the first Spanish radio network in the NFL.

BE editorial director Bill Rhodes (left) informally discusses industry topics with incoming Society of Broadcast Engineers president Bob Jones.

Clearly the Best.



1450—The Transparent Demodulator

One thing is crystal clear. You can't buy a better television demodulator than the TEKTRONIX 1450 System M Demod. Why? Because it's "transparent." The 1450 allows signals to pass through for inspection without altering their characteristics. In other words, if you use a 1450, you'll get the true picture of your transmitter's output.

You'll want to use the 1450 for other reasons, too.

Save time (and money) on transmitter alignment

- Synchronous detection eliminates confusing quadrature distortion.
- Precise bandpass characteristic and linear detector plus flat IF and video response give faithful signal reproduction.
- Split carrier sound detection speeds troubleshooting and alignment of the aural transmitter because no vision carrier is required.

Reduce equipment maintenance costs

- S.A.W. filter IF strip requires no adjustment; extends time between normal periodic recalibrations.

Improve your program sound

- Synchronous detection and dual video detectors operating in phase quadrature facilitate measurement of the incidental phase modulation of the vision carrier that appears as noise in the received sound.

You can use the 1450 anywhere — at the transmitter or off-air at a remote site — without attenuators or external amplifiers.

If you think there's a problem with the performance of your transmitter or antenna system but you're not sure, choose our 1450. The Transparent Demod will clear the air for accurate, reliable television transmission.

Call your nearest Tektronix Field Office and ask for a demonstration of our 1450 Television Demodulator. Or, for additional specifications, write Tektronix, Inc., P.O. Box 500, Beaverton, OR 97077

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For Demonstration Only Circle (37) On Reply Card

People in the news

At the BE suite (from left), Don Markley **BE** facilities editor, discusses a point with managing editor Cindy Nelson, and Ron Purky, chief engineer at WGIL/WAAG-Galesburg, IL.

A marching band promoted the Sunday evening session on *Games Broadcasters Play—or, How to Conduct Promotions that Comply with FCC Rules and Policies.*

This world "On-Air" chart at the Fidelipac booth illustrated the international audience at the NAB convention.

At the Broadcast Engineering hospitality suite a celebration was underway for **BE's** 20th Anniversary. From left, Cindy Nelson, managing editor; Bill Rhodes, editorial director; and George Laughead, publisher, blew out the traditional candles, while a large crowd sang "Happy Birthday, **BE.**"

when cost is more important than price

Value conscious broadcasters specify the Studer B67 because it outperforms its competitors on the really significant broadcaster criteria:

- Studer state-of-the-art quality
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- Speed and ease of user maintenance

If you're more concerned with *total* cost than just initial price, write to us for complete information on the superiority of the Studer B67 Broadcast Recorder/Reproducer. We'll show you why it's your best tape recorder investment.

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STUDER

WGBH engineers talk about the Ikegami HK-312

WGBH covers Boston Pops Orchestra concerts with Ikegami HK-312 cameras from Symphony Hall, Boston.

Eight Ikegami HK-312 studio color cameras are in service at WGBH, Boston, some dating back to October 1977 – long enough for intelligence on their performance. From recent interviews with key WGBH people, read these excerpts.

Pops without noise
Tom Keller, Director of Engineering:

"The HK-312s have such high sensitivity that we were able to reduce significantly our light levels at the Boston Pops and Symphony telecasts. Yet, despite the major light reduction, we experienced no visible noise with the HK-312s . . . With their remarkable reliability record, we can depend on 6 cameras for 6-camera coverage, and not 7 for 6 as in the past. After all, you can't stop a live orchestra performance for a retake if you've lost a camera."

2 IRE, but a complaint
Ken Hori, Senior Engineer for Advanced Development:

"We tested several camera makes for RFI within a quarter-mile of a 50 KW radio transmitter. The HK-312 measured 2 IRE, whereas most others were in the 5 to 7 IRE area, and some as high as 20 IRE . . . For symphony remotes we'd need 2 to 5 hours for warm-up, but nowadays we're set up in less than an hour . . . We like its straightforward design – example, its truly high signal-to-noise ratio as compared to other cameras that resort to reduced bandwidth to attain a comparable ratio but wind up delivering noise too . . ."

We did get one complaint from the maintenance crew. They said that because they rarely found the problem of a down HK-312, they would never get to know the HK-312 well enough to fix it.

Washouts and dropouts
Bill Fairweather,
Video Control Engineer:

"During a lighting seminar staged here by Imero Fiorentino Associates, an actor in a normally lighted scene held up a sheet of white paper with printing on it to show loss of detail in the case of more than 60 percent tv white reflectance. The HK-312, however, was able to retain enough detail for the printing to be readable on the monitor.

Next came a demonstration of the dangers of too much or too little light on a chroma-key background. The HK-312 held the key to such a low light level on the blank background that the lecturer grinned and said, "I guess WGBH has pretty good cameras!" and went on to the next subject."

The HK-312 is the camera that met WGBH criteria for performance, stability, and reliability. They also have HL-53s, high-performance portable cameras that interface with HK-312 CCUs and can operate portably with their own CCUs.

Adapters for triax cable, using digital techniques, make their cameras remote-usable at nearly a mile from base stations, yet easily revertible to multicore cable whenever needed.

In daily use, their HK-312s and HL-53s are interfaced with microprocessor-computer control units that automatically cycle them through all set-up adjustments, including black-and-white balance, flare and gamma correction, video gain, and eight registration functions, then recheck all those adjustments – all within 45 seconds. The cameras can also operate independently of the set-up computers, a feature that is an Ikegami exclusive.

If all of this suggests that the HK-312 is probably the best studio/field color camera in the industry, consider this: camera, set-up computer, and triax adaptor are not only operational, they are deliverable. For details or a demonstration, contact **Ikegami Electronics (USA) Inc.**, 37 Brook Ave., Maywood, NJ 07607, (201) 368-9171 / West Coast: 19164 Van Ness Ave., Torrance, CA 90501, (213) 328-2814 / Southwest: 330 North Belt East, Houston TX 77060, (713) 445-0100.

Ikegami HK-312

NAB/Dallas: The year's most exciting show

With President Carter speaking before the convention, and celebrated sports figures and commissioners heading a special panel on sports, NAB set all new records for attendance and exhibits. But the really exciting things that happened at NAB evolve around new equipment being exhibited and the level of purchasing activity that left many exhibitors almost dazed with its intensity.

The record attendance set at this year's NAB is testimony of the dynamic, vibrant quality of the present broadcasting industry. The attendance was as follows: 7128 broadcasters; 6312 exhibitor guests; 6087 exhibitors. The precise exhibitor count has not been tallied yet by NAB, but the approximate count is 330 exhibitors. The floor space devoted to this year's exhibits was 145,080 square feet. While the numbers are impressive, the real story lies in the fact that all of the figures this year set new records for interest in NAB. Consequently, interest in broadcasting, and in the purchasing of broadcasting equipment, is riding at an all new level.

New equipment displayed

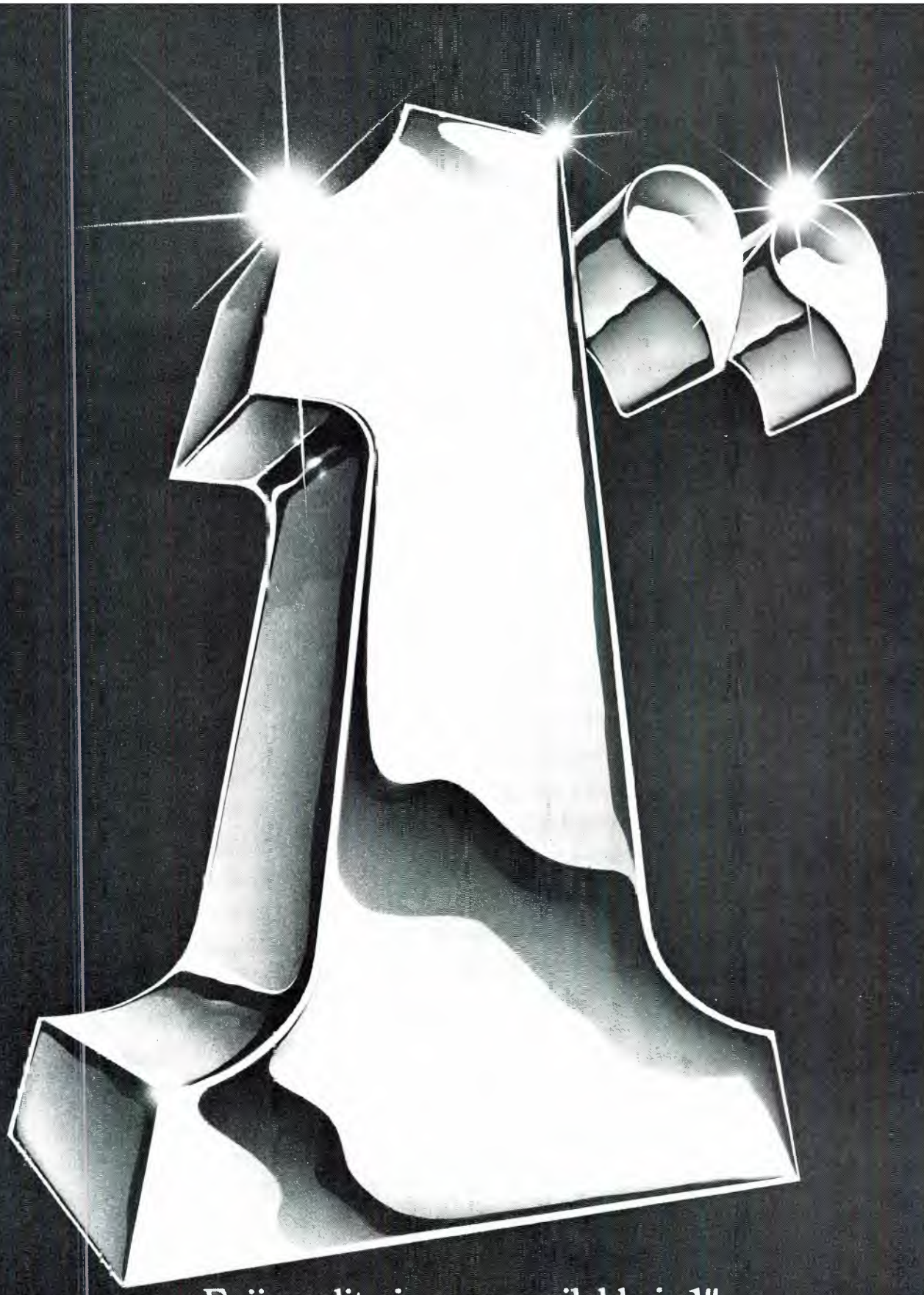
Virtually every exhibitor had something new to talk about. While this is traditional for this big broadcasting show some of the new devices totally surprised broadcasters.

One of the new devices was a "dark horse" that went unheralded at NAB, lost in the shuffle of late entry and limited promotion. However, the level of interest in this product—and actually the level of sales at NAB—warrants special merit. **BE** will not reveal the product now, but will devote special coverage to it in the June Wrap Up issue.

On a broader scope, there were some very striking displays at NAB/Dallas.

- **RCA** introduced a new solid-state transmitter line designed specifically for international marketing, satisfying all international codes.
- **Quantel** certainly had one of the most striking exhibits on the floor, demonstrating the complexity and full capabilities of the Quantel all digital video effects machine. In their hospitality suite Quantel exhibited a prototype digital slide library which can be expected as a production model, with suitable refinements, at next year's NAB.
- **Bosch-Fernseh** held a press conference at their suite and described a 32-cassette machine for 1-inch videotape which will be premiered at the Montreux show in Switzerland. Once this system is formally introduced at Montreux, **BE** will cover the system, complete with photographs and technical details. (Technical details also will appear in the June issue.)
- **Vital Industries** put on a spectacular display at their booths with a combination of taped and hands-

President Jimmy Carter spoke at the opening session of the convention, calling for regulatory reform and announcing his continuing support of minority ownership.



Fuji quality is now available in 1".

FUJI

Magnetic Tape Division of Fuji Photo Film U.S.A., Inc., 350 Fifth Avenue, New York, New York 10001

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on demonstrations of the Vital line of video effects equipment.

• **Sony,** at their hospitality suite, was able to display their experimental 1-inch digital VTR as a late entry at NAB. This system was not available when the show started, but arrived late and had to be promoted on the floor.

• **CDL,** using a live model and a Quantel digital video effects machine, put on a spectacular live demonstration of what a switcher and effects machine can do in terms of video displays.

At the entrance to the main exhibit hall the enormous booths of Ampex and RCA captured major audience attention. Throughout the show these booths were swamped with attendees clamoring for information on products, price and delivery. If one word had to be selected to describe the NAB convention in Dallas, it would have to be "spectacular." The exhibitors did an outstanding job in creating attractive displays and presenting their products using full command of hands-on demonstrations, taped presentations, and combinations of live demonstrations with stored video effects. **BE** congratulates the industry as a whole for an outstanding show.

George Bartlett (left) of NAB poses with Robert Flanders, McGraw-Hill Broadcasting, who received the 1979 Engineering Achievement Award at Tuesday's Luncheon at NAB/Dallas.

Outstanding sales reports

The one element which appears to have made NAB a truly exciting event this year in Dallas was the level of business activity reported by virtually every exhibitor at the show. One exhibitor reported that they had sold every piece of equipment on display, others reported record sales in specific lines. Others came to the show to exhibit new products and came away with entirely new marketing plans structured to sell their products to the industry. Still others introduced prototypes of instruments for the future for the purpose of generating pre-sale interest and obtaining feedback from broadcasters that would allow them to finalize their designs on circuitry and features.

All of these factors resulted in an exceptional level of business and industry excitement at NAB. But behind the scene lurks the basic philosophy of how broadcasters approach this show, and this philosophy explains part of the feverish activity seen at this annual event. This philosophy was dramatically illustrated by one chief engineer of a modest-size group for whom NAB is an annual affair of major proportions. This year he personally visited over 130 exhibits and tracked major instruments of interest to his network. His purchase decisions are based upon the research he does at NAB and upon his tracking of new products through the trade media and society papers. He also tracks the emulation of instruments that he likes by competitive firms. The results of his exhibitor survey are included in a substantial internal memo to his organization which fully describes the equipment that they are tracking. His purchasing decisions (at the show or subsequently) are based upon the contents of this internal report that tracks all instruments vital to his organization's continued prominence in the marketplace.

Other broadcasters expressed a similar interest in tracking major instruments at NAB, but do so less formally in terms of documentation. The interest by major networks was also evident at NAB; for example, Julius Barnathan, ABC president of Broadcast Operations and Engineering, was seen shuttling in and out of major exhibitor booths with his entourage, gathering information critical to their purchasing decisions.

It was this feverish activity in purchasing at NAB that made the show a gratifying experience this year. It expresses a level of health, vitality and continued growth of the industry. For this reason **BE** is planning a summary report on the economics at NAB in its June Wrap Up issue. □

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- Sony BVE 500A One Inch and 3/4" editing system
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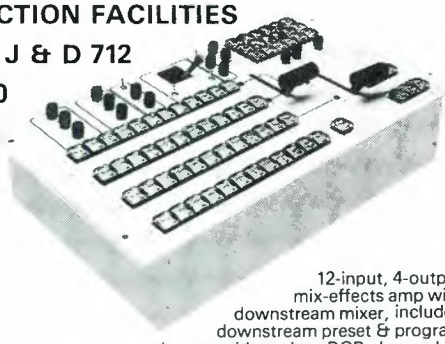

12-input, 4-output mix-effects amp with downstream mixer, includes downstream preset & program busses with cut bar, RGB chroma key

Standard Features

- 12 inputs including Black-burst and Color Background
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- Built-in Colorizer
- Built-in RGB Chroma keyer
- Four Switching busses
- Downstream Preset and Program Busses with cut bar
- Rack-mounted electronics
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- Color Matte
- Vertical Interval switching thru-out
- Illuminated Momentary Contact push buttons
- Internal, external, Chroma-key, and matte inputs to keyer
- Built-in pattern modulator with frequency and amplitude controls
- Full Tally
- Pattern symmetry control
- Illuminated Momentary contact push buttons for effects selection
- Normal/Reverse/Normal-reverse wipe transitions
- Pattern limit controls for presetting size of patterns or varying vertical and horizontal aspect ratio
- Loop-through inputs
- Input amplifiers with clamping
- Synchronous/Non-synchronous inhibit
- Modular construction with front access plug-in modules

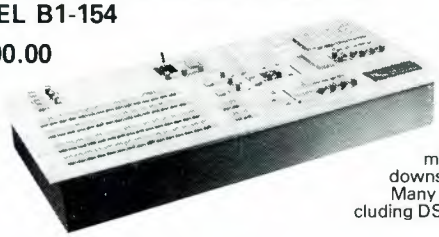
Options:

Downstream Keyer

FOR MODERATE SIZE FACILITIES

MODEL B1-154

$10,990.00

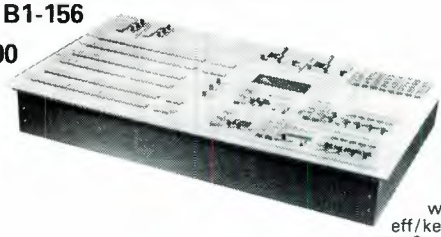


15-input, 4-bus mix/eff/key amp with downstream mix/key amp Many optional features including DSK & quad-split, etc.

FOR SOPHISTICATED FACILITIES

MODEL B1-156

$21,795.00



15-input, 6-bus with two full mix/eff/key systems & dir. pgm & pre busses: many options available, DSK, quad. etc.

MODELS 154 & 156

STANDARD FEATURES

1. **Switcher Models 154 and 156** are of the same basic design and utilize the same electronic sub assemblies. These switchers have the same standard basic features, differing only in the number of busses and in the number of mix/effects units. The basic standard features include 32-pattern mix/effects, color black and color matte background generator, and a mix/key unit in the case of the Model 154.

2. **Input Amplifiers**
   - loop through high impedance input • gain equalization for 1000' cable • 22° sub carrier phase control • clamped inputs (10% to 90% APL) • sync addition on non composite signals if desired.

3. **Tallies**
   - isolated dry contact relay closure on all inputs (2 amps at 50 v.)

4. **Mix-Effects Units (Includes Keying Function)**
   - **One** (1) used in Model B1-154
   - **Two** (2) used in Model B1-156.

   Fades (or Supers), Wipes, Keys may be produced.
   Positioner Joystick for each M/E positions patterns.
   - **Pattern Modulation** may be accomplished by an internal waveform generator. Modulating sources may be either (1) sine wave, (2) square wave, (3) saw tooth, or (4) an external customer generated source.
   - **Mix Key** and **Wipe Key** available.
   - **Soft Wipe** and **Soft Key** available with adjustable variations.
   - **Push to Preview** obtained by depressing knob on clip potentiometers (provides for M/E monitor output).
   - **Wipe Mode**—3 interlocked buttons select "NOR", "REV" or "N/R".
   - **Hard Wipe, Soft Wipe** or **Border** can be selected with degree of softness made by "Edge" control adjustment.
   - **Border** may be **Colorized by adjustment of "Hue" and "Luminance" control.**
   - **Symmetry of Pattern** may be adjusted by "SYM" knob.
   - **Preset Wipe Limits** are set by potentiometers. "H" and "V" vertical preset limits activated by Pattern Limit button.
   - **Spotlight** alternate action push button produces a 6 db. level difference between "A" and "B" input channels in the "Wipe" mode. (Operates on all patterns.)
   - **Pattern Assignment** is made by depressing "**ASSIGN**" button. Pattern select feature may be "locked" to pattern matrix by depressing the "**ASSIGN**" button a second time on the same pattern. Patterns assigned appear on LED display on M/E control panel.
   - **Non-Synchronous Inputs.** An "NS" indicator is provided. Tearing is prevented by not allowing a non-synchronous signal to be switched except at extreme position of fader handle where a "cut" transition occurs.
   - **Key Input Sources** may be either (1) "A" bus video for self keying, (2) preview Key bus, (3) chroma key, or (4) an external key source.
   - **Key Invert** selector provided to accommodate either positive or negative video as a keying source.
   - **Key Fill** may be either "A" video for self keying or a colorized matte.
   - **Mix/Key** provided a lieu of second Mix/Effects system for Model B1-154 switching system. Provides for all mix and keying functions of mix/effects system (as previously described) except for the pattern effects.

OPTIONAL FEATURES

May be added at any time (required control panel wiring already installed)

Chroma Keyer (C.K.) **$950.00**
• **Hue**—selects hue of keying color • **Gain**—adjusts the amplitude • **Clip**—adjusts the clip level for keying • **Camera (4 x 1) input switcher**—selects RGB output of any one of 4 cameras to feed C.K.

Down Stream Keyer (DSK) **$1,275.00**
• Keys in titles, inserts, or fades to black with or without insert • Color matte background • Key sources: (1) Mix/Effect, (2) Chroma Key, (3) External • Push to Preview (Monitor)

DSK Border **$1,200.00**
• **Border**—black edge around insert • **Shadow**—black edge on right side and bottom of insert

Quad Split **$1,190.00**
Provides four (4) variable size quadrants from ten possible sources with variable width border.

Aux Busses—(Model 156 only) **$2,100.00**
Two remote outputs are available—remote control panel and amps required.

All Beaveronics Switching Equipment Carries a Two Year Warranty

OTHER ITEMS AVAILABLE FROM BEAVERONICS

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- Routing switchers with AFV

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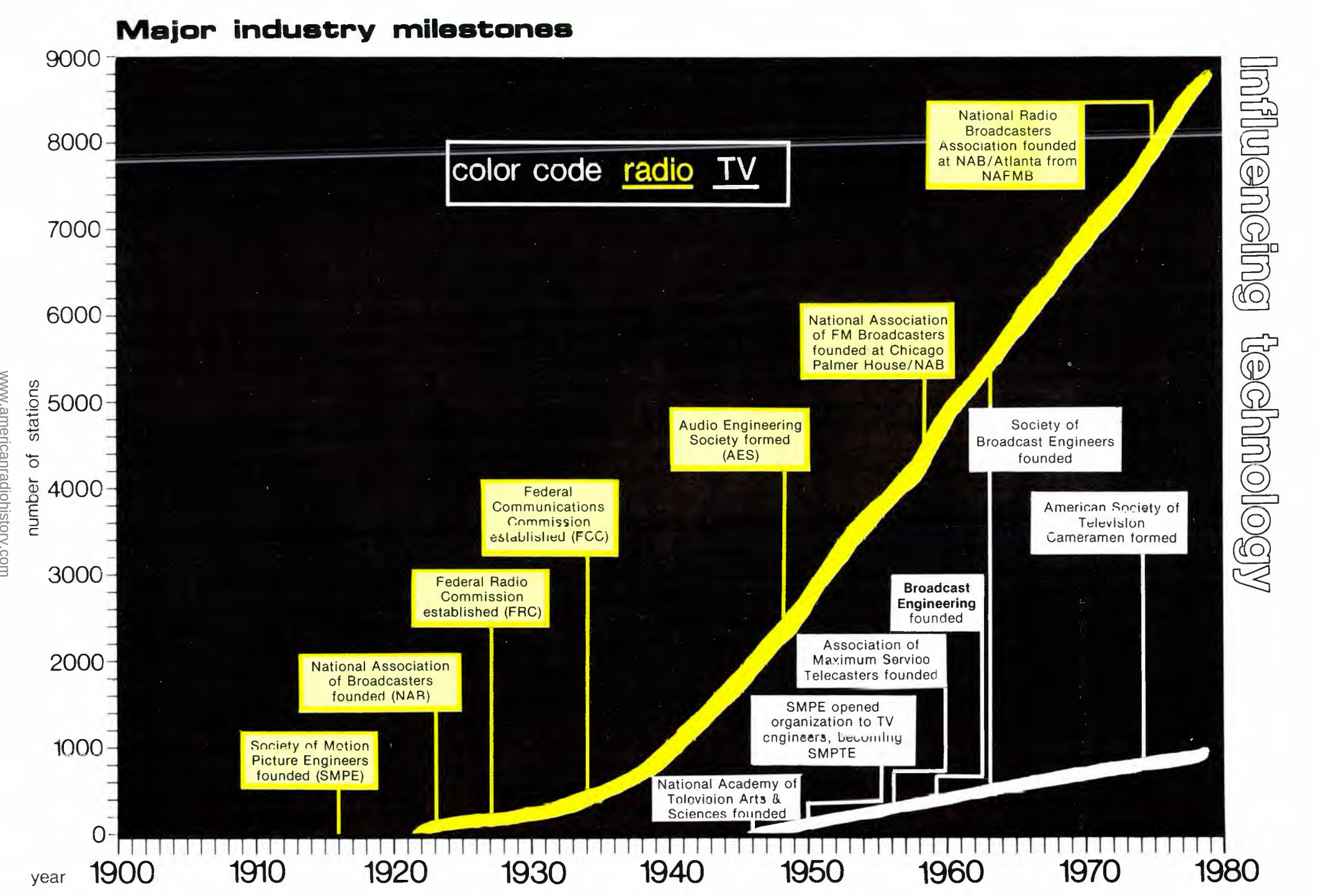

The last 20 years at the FCC

The 20 years since the first issue of **Broadcast Engineering** appeared have been ones of constant change in broadcasting field and at the Federal Communications Commission.

The year 1959 marked the founding of the magazine and the silver anniversary of the FCC. The FCC chairman at that time was John C. Doerfer. Current chairman is Charles D. Ferris and there have been six chairmen in between. The only commissioner still serving who was on the commission in 1959 is Robert E. Lee, who has served since 1953.

In 1959 the commission employed 1281 persons and operated with a budget of $9,781,000. Today there are 2231 employees and a budget of $70,446,000.

Twenty years ago there were 5405 licensed broadcast stations (3377 AM, 767 FM, 776 TV). As of February 1979, there were 9643 stations licensed (4549 AM, 4101 FM, 993 TV).

In those 20 years, in addition to the dramatic increase in the number of broadcast stations, there has been a correspondingly impressive advance in the engineering and technology of broadcasting. Some of the events of the last 20 years are mentioned below.

AM freezes—In May 1962, faced with a serious interference problem in the AM service, the commission imposed a freeze on AM applications that lasted until July 1964. Following a comprehensive study of its broadcast regulatory scheme, the commission changed its basic allocation rules from a system that tolerated modest amounts of interference, to the so-called "go, no-go" policy in which each broadcast applicant was required to demonstrate that there would be no prohibited overlap with existing AM stations before the application was accepted for filing.

A freeze was again imposed from July 1968 to July 1973 to enable the commission to develop standards designed to insure that assignments would be made which satisfied bonafide service needs. Lifting of the freeze was accompanied by adoption of new standards requiring that each applicant demonstrate its proposed service would provide a first or second AM service or a first primary service to a substantial area.

FM reorganization—Also in 1962, the commission revised its commercial FM rules to divide the country

The FCC building stands on the corner of NW M Street and NW 20 Street in Washington, DC.

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SPACE REQUIRED FOR KLYSTRON CHANGE	4 ft. in front of cabinetry.	8 ft. in rear of cabinetry.	8 ft. in front of cabinetry.
KLYSTRON TUNING	From front control panel.	From rear of transmitter.	From front of transmitter.
CONTROL CIRCUITRY	Plug-in octal relays mounted on front panel. Spares avail. from several mfgrs.	Solid state. Spares avail. only from original mfgr.	Hard wired relays of many types buried in transmitter. Spares only from orig. mfgr.
METERING	Complete metering of all important circuits. No meter switches.	Lacks several meters used by Townsend.	Lacks several meters used by Townsend.
HIGH VOLTAGE CONTACTOR	Vacuum type.	Vacuum type.	Air type.
HEAT EXCHANGE REDUNDANCY	One for each amplifier.	One for entire transmitter.	One for entire transmitter.
BEAM POWER SUPPLY REDUNDANCY	One for each amplifier.	One for entire transmitter.	One for entire transmitter.
AMPLIFIER REDUNDANCY	Designed for emergency multiplex.	Not designed for emergency multiplex.	Not designed for emergency multiplex.

into three zones (instead of the previous two). Zone I includes part or all of 18 Northeastern states plus the District of Columbia; Zone I-A covers Southern California, and Zone II covers the rest of the country.

Three classes of commercial FM stations were also created. Class A stations are assigned to all zones; Class B stations to Zones I and I-A; and Class C stations to Zone II.

Until 1962, FM stations were authorized on the basis of protecting the predicted service contours of existing stations, but in that year the commission changed the FM assignment scheme to one requiring minimum mileage separations between stations. The following year the table of assignments for commercial FM stations was created. Nearly 3000 FM channel assignments were made to nearly 2000 mainland communities. Assignments in Alaska, Hawaii, Puerto Rico and the Virgin Islands were added in 1964.

FM stereo—Although stereophony dates back to experiments performed over wire lines by telephone engineers in the 1880s, real development in this area came only with post-World War II technology in which multiplexing techniques were applied to FM broadcasting. In 1959, the National Stereophonic Radio Committee was created to examine the many proposed systems of FM stereo and submit a final recommendation to the FCC. In the summer of 1960, six systems were field tested over KDKA-FM in Pittsburgh, with receivers set up at Uniontown, PA. The system of stereo transmission proposed by the General Electric Company and the Zenith Corporation was adopted, with broadcasting authorized to start June 1, 1961.

Satellite communications—The first live transatlantic telecast by satellite was relayed by Telstar I on July 10, 1962. The picture was of the American Flag fluttering in front of the sending station at Andover, ME. More panoramic telecasts, showing life in widely distant places, were exchanged between the US and Europe 13 days later.

The Communications Satellite Act of 1962 provided for the US portion of a global satellite system to be operated by a private corporation, the Communications Satellite Corporation (COMSAT), subject to federal regulation. COMSAT is owned partly by common carriers and predominantly by the general public. Early Bird (INTELSAT I) on April 2, 1965, became the first commercial satellite to be put in orbit by COMSAT and its foreign partners in the International Telecommunications Satellite Consortium. The following year, some 80 hours of television were transmitted between the US and Europe. Early Bird has since been replaced and retired.

When INTELSAT II went up over the Pacific on January 11, 1967, satellite communications were established between the US Mainland and Hawaii, making live network TV transmission available for the first time. Television currently makes up only a small part of the traffic on the international communications satellite system. Telephone and tele-

type communications, including data transmissions, dominate the traffic.

Auxiliary broadcast services—The on-the-spot news and sports coverage taken for granted on television and radio is another technological development of the last 20 years. Broadcasters take portable or mobile transmitters to the scene of events to relay aural programs back to the station for live coverage of sporting events, parades, conventions, fairs, disasters and other newsworthy events. The remote broadcast pickup stations use frequencies in the 26,153 and 450 MHz portions of the spectrum.

TV stations also use small portable transmitters operating in the 2, 7 and 13 GHz (microwave) portions of the spectrum for visual coverage of out-of-studio events.

Matters under consideration—The coming months and years are likely to bring more significant changes in communications industry regulation as the commission considers such matters as:

- FM quadraphonic sound transmission;
- AM stereophonic broadcasting;
- Limitation of clear channel stations;
- TV receiver performance standards;
- TV technical improvements; and
- Radio frequency interference.

The FCC solicits citizen comments on all of these issues.

Office of Science and Technology—The FCC, recognizing that present and future developments in communications will require intensive study of applied and basic science and technology, has redesignated its Office of Chief Engineer to the Office of Science and Technology and renamed the title "Chief Engineer" to "Chief Scientist."

This change becomes effective May 1, which coincidently corresponds with the anniversary issue of **Broadcast Engineering.**

The new office will undertake the responsibilities of the Office of Chief Engineer in planning and conducting technical, engineering and scientific studies and programs designed to assist the commission in making informed decisions regarding telecommunications matters.

It also will be responsible for developing technical standards for electronic equipment and directing the commission's type approval, type acceptance and certification programs; formulating and recommending FCC policies on frequency management in coordination with the Executive Branch; conducting interagency coordination in the use of specific frequencies; participating in the technical aspects of international telecommunications activities; and licensing experimental stations, other than broadcast, to provide for new uses of the radio spectrum.

In the future the FCC will continue to be presented with problems of tremendous complexity. It will be required to make decisions of far-reaching impact in an effort to keep pace with the explosion in this country's communications technology. □

NAB: Fulfilling its charge

By Vincent T. Wasilewski, NAB president

An anniversary of service to an industry is always an event worth note and celebration. **Broadcast Engineering** deserves special congratulations for maintaining the creativity and flexibility to provide valuable information to station management, technicians and engineers, production and recording studios and cable facilities for 20 years.

Broadcast Engineering was born during the adolescence of the radio and television industry—an industry in which 20 years qualifies it as a pioneer. The National Association of Broadcasters also grew up with the industry and had a modest beginning with a handful of members. Today it represents over 4600 radio and 570 television stations, including all the major networks.

NAB came into being in 1922. The non-profit trade association was organized "to foster and promote the development of the arts of aural and visual broadcasting in all its forms; to protect its members in every lawful and proper manner from injustices and unjust actions; to do all things necessary and proper to encourage and promote customs and practices which will strengthen and maintain the broadcasting industry to the end that it may best serve the public." NAB has and continues to fulfill its charge.

Working through NAB, radio and television stations have accomplished many things which could not have been achieved individually. NAB represents the industry before Congress, at the White House and before regulatory agencies like the Federal Communications Commission and the Federal Trade Commission.

NAB has grown with broadcasting—helping to set up other groups along the way to further strengthen and unify the radio and television industry. The association initiated the first department of radio advertising in 1941. This was the beginning of the independent organization now known as the Radio Advertising Bureau. It also helped set up the Television Bureau of Advertising. Few realize that the NAB even established American Women in Radio and Television.

The pioneers who organized NAB were concerned primarily with the growing pains which beset all fledgling industries. In the case of radio, these growing pains were manifested in the undisciplined use of the air waves. Without adequate channels of frequency separations, radio was becoming a hodge-podge of sounds in the night and appeared unlikely to be able to fulfill its role as a great medium of mass communication. However, radio and television have both met that challenge despite a growing body of regulations. The Code of Federal Regulations now contains 1000 pages of regulations applicable to broadcasters. A recent study by the General Accounting Office, rating the various federal agencies by the paperwork they impose, places the Federal Communications Commission in the winner's circle with an annual requirement of 30 million manhours of paperwork. So it is obvious that NAB's role has had to change with increased government interference into the business of broadcasting.

Sooner or later, every broadcaster comes up against a question that cannot be answered, a problem that cannot be solved or a regulation that just does not make sense. Helping broadcasters is what the NAB is all about. The association's service has played an important part in making the broadcasting industry in the United States the largest and most efficient in the world.

Within the past five years NAB has been responsible for easing the bureaucratic burden placed on licensees. For example, NAB pushed for the FCC rule change to allow broadcasters to use automatic equipment. The typical radio station had 10 first class engineers on its payroll when NAB began that campaign. NAB also has led the opposition to proposals at the FCC which would have required stations to keep and make available tapes, discs and scripts of every one of its news and public affairs programs—an outlandishly wasteful proposal.

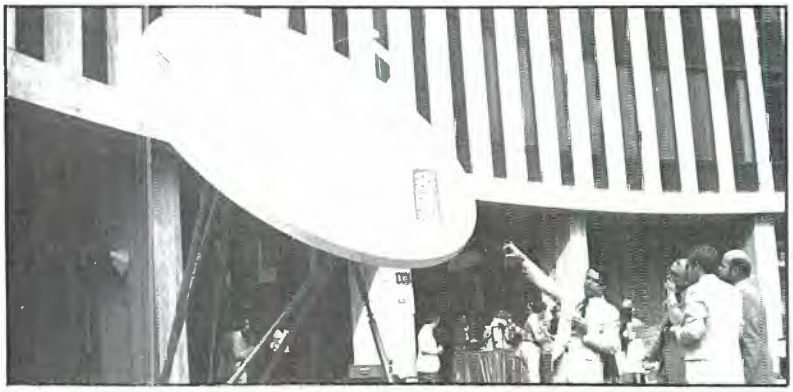
In the area of advertising, NAB's code prohibits hard liquor ads and contains strict guidelines for beer and wine commercials. Because of the code's sensitivity to alcoholic beverage advertising, broadcasters did not lose over $155 million a year for beer and wine advertising. NAB has also helped to defend attempts to ban over-the-counter medicine advertising. NAB has been successful in having the FCC, the FTC and the courts reject the concept of counter-commercials which would have, for example, required broadcasters to carry a coffee commercial followed by a message urging viewers and listeners not to buy coffee. NAB soundly defeated legislation which would have, in effect, banned broadcast ads for saccharin and saccharin products.

In 1976, NAB helped to persuade the Armed Services to drop its prohibition against paid advertising in radio and television. NAB accomplished the same with the US Postal Service.

NAB presently is involved in an extremely important advertising issue—whether television should be allowed to advertise to children. This issue is being debated at the Federal Trade Commission. If TV broadcasters lose this one, it could mean a threat to the First Amendment rights of all forms of commercial speech.

In the engineering department, the NAB has saved stations thousands of dollars. For example, the association standardized recording and reproducing to assure complete interchangeability. NAB has pioneered the AM stereo field and holds an engineering conference each year with the world's largest display of broadcast equipment and workshops on the most controversial and difficult engineering problems.

NAB has persuaded (through cogent argument) the FCC to abandon or modify more than 500 rules and regulations resulting in saved time, cash and paperwork and allowing broadcasters more time to better serve the community. Obviously, there is still a long way to go. NAB's Government/Legal Report to the Board of Directors in January 1979, consisted of 104 pages. That report reviewed literally hundreds of issues in which the NAB is involved—everything from refund of fees to license renewal to the Fairness Doctrine to restrictions on programming to minority ownership of stations. With the many challenges to the American free system of broadcasting, NAB will continue to unify the industry to present its case as persuasively as possible to the courts, regulatory agencies and to Congress. □



This earth station on the NAB plaza picked up a signal relayed via satellite from Mutual Broadcasting headquarters in Arlington, VA, triggering an igniting device that burned the mortgage.

20th Century technology sparks age-old rite

The traditional mortgage burning ceremony took on a new twist August 2, 1978, when a flame triggered by a satellite 23,000 miles above the earth touched off the National Association of Broadcasters' 10-year-old document. The ceremony was held on the plaza in front of the NAB building.

Clair R. McCollough, former NAB Board chairman, who headed the committee that guided the building's construction, sent an electronic signal by telephone circuit to the Mutual Broadcasting System headquarters in Arlington, VA. It then was relayed to the Western Union satellite earth station in Glenwood, NJ, traveled 23,000 miles to the Westar I satellite above the equator and retransmitted back to earth. The signal was picked up by an earth station on the NAB plaza which triggered an igniting device, burning the mortgage. The procedure took less than half a second.

Also participating in the ceremony was NAB Board chairman, Donald A. Thurston, president of Berkshire Broadcasting, and president Vincent T. Wasilewski.

NRBA... Why?

By James J. Gabbert, NRBA president

Though FM today enjoys a position of considerable stature, being the "class act" of the radio air waves, there was a time when FM was not even considered radio, and was thought of as a toy for engineers and other audiophiles. The AM broadcaster had a thriving business. The FM broadcaster had a hobby. As a matter of fact, it was easy to recognize the FM people in any collection of broadcasters in the early days. They were the poor ones.

That was the climate for FM broadcasters in the late 1950s when a group of the hardier ones met at the Palmer House in Chicago during an NAB convention. Out of this meeting came the NAFMB, the National Association of FM Broadcasters, who took up the task of educating the broadcast industry itself and the satellite industries that support broadcast, about FM. Their achievements were significant in that they were able to establish FM as a broadcast medium by forcing the ratings companies (and eventually Madison Avenue) to recognize that a consumer was a consumer, whether he heard your message on AM or FM.

As success breeds success, the NAFMB grew rapidly in the 1960s, accomplishing much along the way. But then it inadvertently found itself addressing problems that faced AM as well as FM radio broadcasters, such as increasingly burdensome federal regulations aimed at television which affected radio because no distinction is made on a federal level (or for that matter any level) between television and radio. Indeed, at this point in time (1975), the NAB, using its radio membership as a counterbalance to soften regulation against its all-powerful television interests, considered it heresy that radio should be treated separately. Totally committed to achieving an identity of its own for radio, the National Association of FM Broadcasters (NAFMB) became the National Radio Broadcasters Association (NRBA) in 1975, with some startling results.

While all the FM broadcasters lobbied for FM recognition, the transition to all-radio NRBA spawned an organization which had the potential of becoming a powerful political voice in broadcast. It doesn't take much imagination to see that by sheer numbers, radio broadcasters would siphon off some of the power held by the television networks and certainly, in time, the balance of power would swing from previously dominant television to radio.

By sheer numbers radio siphons off TV network power

Whereas TV has a lot to lose by deregulation in the form of increased competition from cable, Multiple Distribution Systems, and satellite-to-home transmissions to name a few, radio will definitely benefit. There are many sticky issues that must be dealt with before any definitive resolutions can be made regarding deregulation—the rewrite of the Communications Act of 1934, spectrum use fees, 9 kHz AM spacing, fulltime for daytimers, the clear channel issue, 150 kHz FM spacing and, very basically, the number of radio stations the marketplace can

James Gabbert, NRBA president (K101, San Francisco), and Abe Voron, executive vice president/ government affairs, were pleased with the NRBA 1978 San Francisco Conference & Exposition.

The NAFMB had already grown rapidly since its late 1950s inception by the time this photograph of the 1971 board of directors was taken (top). But the growth escalated after the organization began addressing the problems of all radio broadcasters as the NRBA in 1975. This photograph (bottom) was taken at the September, 1978, board meeting.

accommodate without wreaking economic havoc on those that already exist.

There are no easy answers and NRBA's (indeed the whole radio industry's) task is monumental. NRBA's posture through all of this is that government should regulate frequency assignments, power, modulation and technical standards. But as far as programming is concerned, the people should decide what they want, and they should have the option to choose for themselves rather than having government, in the form of the FCC, decide what they should or should not hear.

The NRBA is a volunteer organization with only four fulltime employees, and operates on an annual budget of approximately $350,000 (compared with the NAB's $6,000,000 annual budget). When one considers the David and Goliath comparison, the NRBA versus the NAB, the NRBA's accomplishments become even more impressive. Just look at the changes over the past four years. Finally, radio again is recognized as a medium in its own right. As an industry, it has the best years yet to come. □

The SMPTE: Dedicated to advancing technology

By Alex E. Alden, SMPTE manager of engineering services

To celebrate its 34th anniversary in 1950, the Society of Motion Picture Engineers took an exciting step into the future—it recognized the newborn television industry by opening its arms and facilities to the growing discipline. For almost three decades, the Society of Motion Picture and Television Engineers has fulfilled its responsibilities as the technical society for the industry. The name change resulted in a substantial gain in membership from the ranks of television engineers; the society now proudly claims as members many systems development and operations engineers as well as broadcast management personnel.

Although the society had presented technical papers on television at its conferences since 1938, the issuance of a FCC ruling in 1941 permitting television broadcast prompted formation of an engineering committee on television. This early effort was directed primarily to the use of motion pictures for television, with little or no attempt to participate in the electronics field which was considered the responsibility of other organizations.

As in all rapidly expanding disciplines, the need for standards forced the initiation of procedures to allocate properly standardization priorities and efforts to avoid redundancy. In 1951, the society joined forces with two organizations specifically concerned with broadcast television: the Institute of Radio Engineers (IRE, now the IEEE) and the Radio Manufacturers Association (RMA, later known as RETMA and now EIA). They formed a coordinating committee known as IRS. As the Joint Committee on Inter-Society Coordination (JCIC), it was expanded to include the National Association of Broadcasters (NAB) and the National Cable Television Association (NCTA).

In addition to this liaison, the society works closely with the USA Advisory Committee for the International Radio Consultative Committee (CCIR) and the European Broadcasting Union (EBU).

Besides standardization SMPTE exposes the industry to new techniques

Today, the society's contribution to television is through its annual television conference and national technical conference at which numerous technical papers on new and current technology are presented with exhibits of new equipment and techniques, and standardization by its engineering committees.

Four committees are actively drafting new proposals as well as constantly reviewing current standards to make certain they continue to be necessary and useful: The Committee on Television Video Technology, the Committee on Audio Recording and Reproduction Technology, the Committee on Video Recording and Reproduction Technology, and the Committee on New Technology. Committee membership is not restricted to society members and participation by those concerned with the subjects is welcomed.

The SMPTE can look back proudly over the last 63 years, and more specifically, the last 20 dealing with television broadcasting. Many awards attest graphically to its outstanding contributions. In 1958, the society was presented with an Oscar for technical achievement. More recently, it was awarded by the Academy of Television Arts and Sciences for the development of the time and control code for the quadruplex videotape system. In 1978, the academy presented a second citation for the development and standardization of the 1-inch Type C helical videotape system, which is now becoming a valuable tool of the broadcast industry.

The list of achievements continues to grow as the SMPTE engineering committees accept new responsibilities prompted by the rapidly growing and ever-changing television industry. Upon completion of standardization for the quadruplex videotape system, which subsequently became the backbone of the broadcast industry, the society initiated a similar program for helical recording and videodisc systems. Outstanding progress has been achieved in the standardization of the colorimetry of the television chain, essential to the repeatability of color reproduction of program

material from the studio to the home. Established SMPTE standards cover such items as viewing conditions for checking of films intended for broadcast, colorimetry and set up of studio monitors, and identification of image areas which the home viewer is receiving.

In addition to the important task of standardization, the society—through its annual fall technical conference, winter television conference, and monthly sections meetings—brings to the industry an exposure to new and developing techniques. For example, topics have included digital television and electronic newsgathering.

An important part of the society's program is the recognition of outstanding individual contributions to television through the presentation of annual awards such as the Progress Medal, Samuel L. Warner Memorial Award, David Sarnoff Gold Medal, and the Herbert T. Kalmus Memorial Award. Among the recipients of these awards are pioneers such as Earl Sponable, Alfred Goldsmith, Peter Goldmark and Charles Ginsburg.

As an extension of its standards program, the society has developed test materials, films, tapes and slides which are used as tools for defining and measuring equipment and performance. Many are used daily all over the world.

The society views the television discipline as one of the few national enterprises that was planned on a systems basis. There is no doubt that this planning and engineering contributed to its rapid growth. Perhaps in the not-too-distant future, there will be an expansion to this system or another broad system devised by engineers which will rival the television's impact.

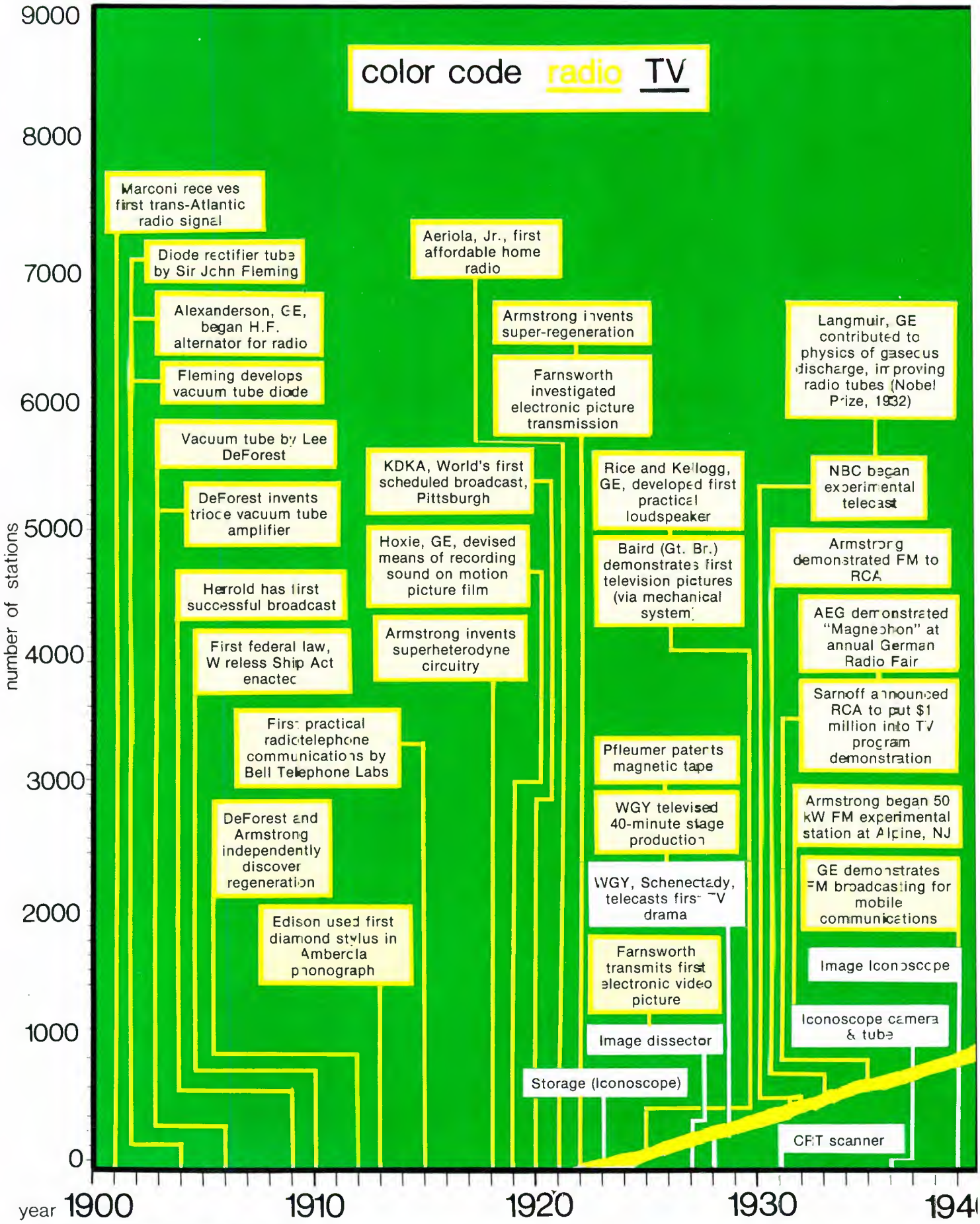
Although the initial effort of electronics engineers was devoted to telegraphic communication, it rapidly expanded into audio and then video transmission. The joining of electronics with photography had dual origin—in the sound motion picture and in television. Today, it is possible for electronics to do more than convey a message in the form of words, sounds, or pictures. Electronics has developed an almost unlimited power to duplicate and amplify man's senses and to equal and sometimes surpass many of his abilities.

Cognizant of the serious need for continuing improvement of picture and audio reproduction in television as well as theaters, the society is ready to offer its facilities to any program dedicated to the advancement of its technology. □

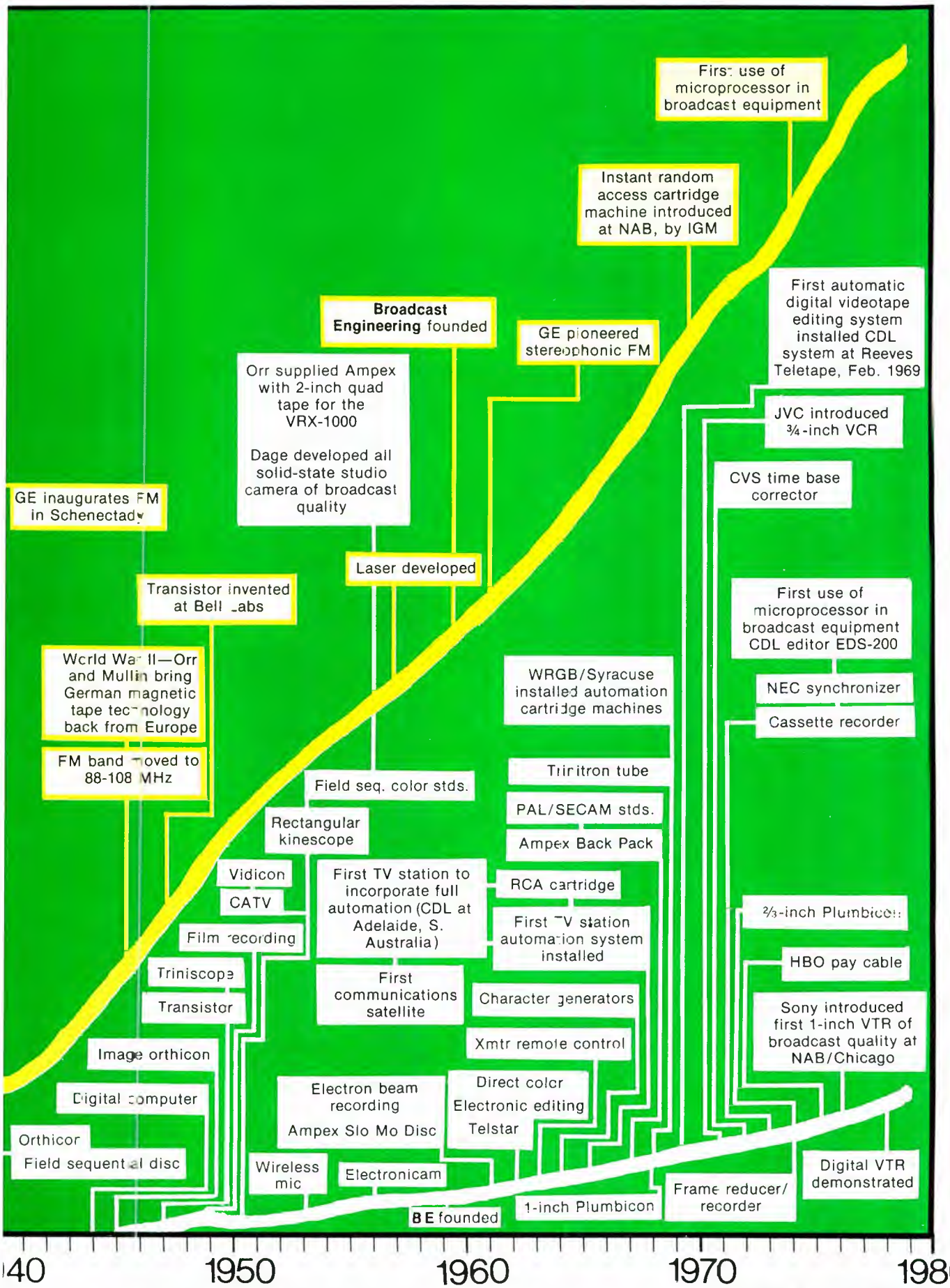
Ken Mason of Eastman Kodak and president of SMPTE presents an Honorable Mention Journal Award to Ioan Allen while John A. Schneider, president of CBS/Broadcast Group looks on. The award, presented at the 118th Technical Awards in October, 1976, was for Allen's contribution in the development of the Dolby System.

Joseph Flaherty, vice-president of engineering at CBS Television, presents a technical paper on the use of the 1-inch helical system at CBS at the 119th SMPTE Technical Conference in Los Angeles.

Developing technology



Major industry milestones



The progression of videotape recording

By **Charles E. Anderson,** video engineering section manager, Ampex

1976 marked the 20th anniversary of the introduction of practical videotape recording, and much has been written and related about events leading to that introduction at the 1956 NAB conference in Chicago.

The rotating 4-headed recording method was soon labeled quadruplex recording, or quad for short, and the problem that has plagued quad all of its career—banding—was immediately seen and cursed even in early monochrome recorders.

In 1957, one year after the unveiling of the videotape recorder, a rotary head was shown on which the quadrature could be adjusted and the heads spaced precisely 90 degrees apart on the head wheel. This cured a major geometric problem and allowed tape interchange, but it did nothing for the jitter, or time base instability, problem.

During 1958, RCA started deliveries of the TRT-1A that had been introduced at the 1958 NAB show. The same year, the first meeting of the SMPTE Video Tape Recording Committee was held and a plan formulated to precisely define the quadruplex format in order to insure interchangeability of tapes made on various quad VTRs.

Work continued on ways to tame the rotational instability of the rotating head, but it was not until the 1960 NAB that Ampex engineers were able to demonstrate the Intersync head wheel servo that brought time base errors down to a peak-to-peak value of 0.15 μs from previous peak-to-peak errors of up to 60-70 μs. It was a vast improvement, but still not good enough to record and play back color signals directly.

The breakthrough came via Charles Coleman of WBBM-TV, Chicago, who devised a voltage variable delay line whose delay could be varied ±0.5 μs by means of an error voltage derived from a comparison of off tape sync against station or reference sync. Time base errors were now brought down to 30 ns. Rights to the device were acquired by Ampex and Coleman was hired by Ampex as well.

Thirty nanoseconds were still not good enough for the long-sought goal of reproducing the color signal directly, so Coleman and an associate, Peter Jensen, developed a unit similar to Amtec, except that it had a shorter delay line and compared off-tape color burst to reference burst to generate a correction voltage to drive the delay line. Direct color playback became a reality when the new Colortec was demonstrated at the 1961 NAB show in Washington, DC.

The engineers then turned their attention to improvement of signal quality. The original FM carrier frequencies used for recording monochrome signals were totally inadequate for color, so initially different frequency values and greatly reduced deviation were chosen to reduce offensive moire patterns; however, the reduced deviation made for a noisy picture and so was not totally satisfactory.

The engineers pushed the state-of-the-art again and managed to move the carrier frequencies upward from a range of 5.5 MHz to 6.5 MHz to the range of 7 to 10 MHz, yielding markedly superior performance.

By 1967 all the basic techniques were in place and attention was turned to solving systems problems and refining the basic techniques. In 1967 the VR-3000 light portable quadruplex recorder was introduced, and it remains in production at present.

It is hard to pinpoint an exact year when helical recording started to reach maturity, but several important events should be noted. In 1971 the European Broadcasting Union issued a *Statement Concerning Helical-Scan Television tape-machines for 625 Line/50 Field Systems*, in which the EBU's desires for a helical-scan VTR suitable for broadcasting were defined. This document provided a design goal at which several manufacturers aimed and had great impact on future designs.

The introduction by Sony Corporation of the ¾-inch cassette recorder in 1969 was also an immensely important event. It proved to the world that a helical VTR can

Editor's note: Ampex leadership in the development of audio and video technology has attracted its share of recognition outside the marketplace over the years. Two Emmys were awarded by the National Academy of Television Arts and Sciences in 1957 for development of the first practical videotape recorder and in 1967 for development of high band color videotape recording. The television citation was received by Ampex for capturing on videotape the famous Nixon/Khrushchev *Kitchen Debate*.

BE covers videotape recording

Jan 1961: system standards
Jul 1961: 2-head
Nov 1961: time base correction
Apr 1962: half-speed operation
Jun 1962: moving X-ray images
Jul 1962: stereo color television, portable
Nov 1962: frame-lock device
Dec 1962: general
Jan 1963: portable
Sep 1963: general
Oct 1963: general
Nov 1963: general, NTSC color recording, helical
Jan 1964: portable
Feb 1964: cueing devices
Mar 1964: portable using 1-inch tape,
Apr 1964: general
May 1964: portable, photographic recorder
Oct 1964: general
May 1965: NAB convention
Dec 1965: solid-state
Mar 1968: head tip wear
Jun 1969: Sony 1-inch EV-310
Mar 1971: automation
Jun 1972: demonstration of Norelco unit
Aug 1972: summer Olympics
Oct 1972: minimizing errors
Dec 1973: helical versus quad
Mar 1974: international cassette conference
Jul 1974: review
Aug 1974: review
Nov 1974: editing for helical VTRs
May 1975: video spotlight
Apr 1976: 20-year revolution
May 1976: NAB review, 20-year revolution
Jan 1978: SMPTE conference on 1-inch
Feb 1978: 1-inch standards
Mar 1978: 1-inch standards, production w/film techniques
Apr 1978: digital
Aug 1978: digitizing programs
Dec 1978: future of

Charles Anderson (right) receives congratulations from Alexander Poniatoff after being named first winner of the Alexander M. Poniatoff Award for Technical Excellence. Anderson was selected for his technical contributions to the development of the first practical videotape recorder and subsequent improvements in videotape recording during his 16 years as an engineer with Ampex. In the background is the AVR-1, a third generation videotape recorder that Anderson helped develop.

Harold Lindsay, the chief engineer of the Ampex team that developed the first practical professional audio recorder in the US, is shown in this 1948 picture running tests on an early production model of that first recorder, the model 200. Now retired, Lindsay is a special consultant to Ampex's magnetic tape division.

The first broadcast via videotape occurred November 30, 1956, when CBS Television aired *Douglas Edwards and the News* from New York City. CBS Television City, Hollywood, replayed the 3-hour delayed broadcast on the West Coast the same evening and in the months following the other networks followed CBS' lead.

Video recording

be reliable and tapes will interchange between machines. Hundreds of thousands of such recorders are in service in all sorts of applications.

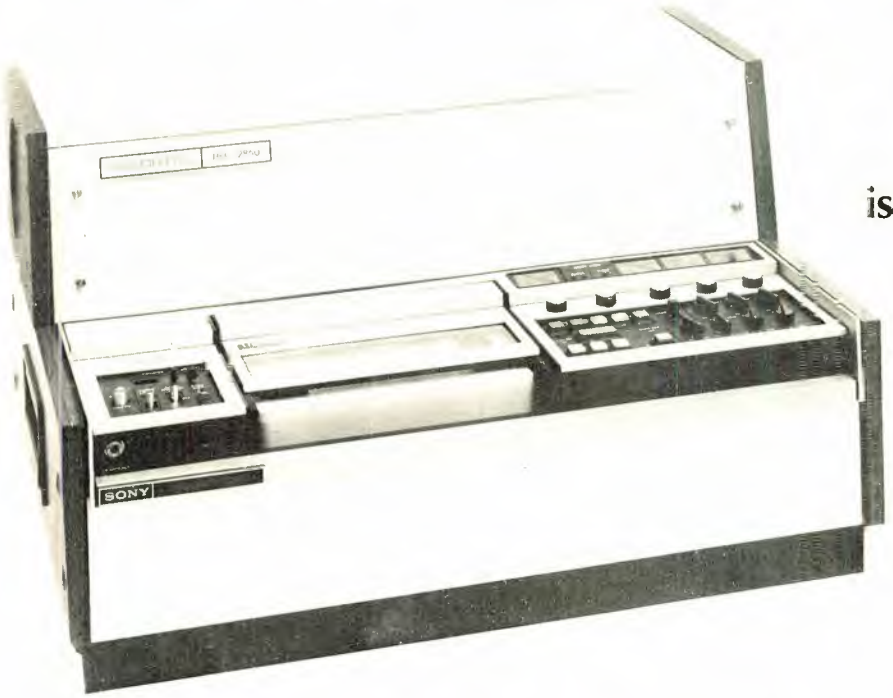
A significant development was shown at NAB 1975 by Consolidated Video Systems. They demonstrated the first digital time base corrector, and it had enough correction range to easily accommodate the large time base errors typically found in helical VTRs and allow direct recovery of color signals.

In 1975 Fernseh introduced its BCN series of 1-inch helical recorders at Montreux. Ampex and Sony introduced 1-inch helical recorders at NAB in 1976. All were claimed to be suitable for broadcast service, but all three formats were different and interchange of tape between them was impossible, although the Sony and Ampex formats were tantalizingly similar. All three formats worked well, and it was clear that at least helical had matured.

Several users of recording equipment asked the Society of Motion Picture and Television Engineers to see if some sort of common 1-inch helical format could be worked out, and during 1977 many SMPTE engineering committee meetings were held to see what could be done. The Fernseh format was different enough so that it was defined separately as the B format, but excellent results were obtained in hammering out the C format that was similar to, but not identical to, either the Sony or Ampex formats. In December of 1977 SMPTE announced agreement in principle on the C format, and several manufacturers announced plans to supply equipment conforming to the C format.

And so, the two histories drew together again. Today, hundreds of 1-inch helical-scan recorders have been sold by several manufacturers, and they are finding their way into a variety of non-broadcast and broadcast applications; however, there are over 10,000 quad recorders in service and more being sold, and there is no doubt that quad will remain the primary international exchange format as well as the desired post-production format for many years. There is also no doubt about the viability and vitality of 1-inch helical recording, and it will fill many of the roles historically filled by quad recorders in the years ahead. □

"Quad" Quality in ¾" Format



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Circle (53) on Reply Card

Communications satellites: A revolution in international broadcasting

By **Irving Goldstein**, vice president and general manager, COMSAT

In the last 20 years communications satellites have brought revolutionary changes to communications in general, and to international broadcasting, in particular. Satellites have meant not only live coverage of world events, but also more service to more people at lower costs. The fact that the phrase "live via satellite" is commonplace, testifies to the impact of satellite communications. "Live via Satellite" has characterized the evening news and special events such as World Cup Soccer, the Olympics, the installation of the Pope, and President Carter's peace seeking journey to the Mideast.

On the international level, it is the cooperative efforts of governments and private entities in over 100 nations participating in INTELSAT, the International Telecommunications Satellite Organization, which makes international television broadcasting a reality. In the United States, COMSAT, the Communications Satellite Corporation, has been charged with this responsibility and is the US participant in INTELSAT. Such cooperation did not come about, however, of its own accord but was the product of concerted effort and planning.

Historically, the broadcasting potential of satellite communications was first demonstrated in 1960, with the launching by the United States of ECHO I and II. These satellites bounced radio signals across the Atlantic, and hence were known as passive satellites. This type of satellite, however, was not the most appropriate for communications purposes; it was superseded by a more technologically advanced active repeater satellite, TELSTAR I, which was launched two years later and which demonstrated that color television signals could be broadcast across the oceans.

Later, in 1962, with the potential of international communications becoming increasingly apparent to the United States, Congress passed the Communications Satellite Act, which, among other things, created COMSAT. President John F. Kennedy foresaw the coming changes in broadcasting and communications. In signing the Communications Satellite Act he observed: "The ultimate result will be to encourage and facilitate world trade, education, entertainment and many kinds of professional, political and personal discourses which are essential to healthy human relationships and international understanding."

As a consequence of this legislation, COMSAT was charged by Congress with responsibility for the establishment, in cooperation with organizations in other countries, of a global commercial communications satellite system as quickly as possible.

US initiative under the Communications Satellite Act combined with growing international interest in this new technology lead to the formation of INTELSAT in 1964. Beginning with only a handful of member nations, INTELSAT has grown until today more than 100 countries participate in the ownership and operation of the INTELSAT global satellite network. Since its inception, INTELSAT has made high quality reliable international telecommunications services available on a regular basis to all areas of the world.

Acting as a technical manager of INTELSAT during its initial growth period, COMSAT developed INTELSAT's first geosynchronous commercial communications satellite, Early Bird, thereby making a reality the concept envisaged some 20 years earlier by Arthur C. Clarke, the noted British science fiction writer. In 1945, Clarke had observed: "An 'artificial satellite' at the correct distance from the earth would make

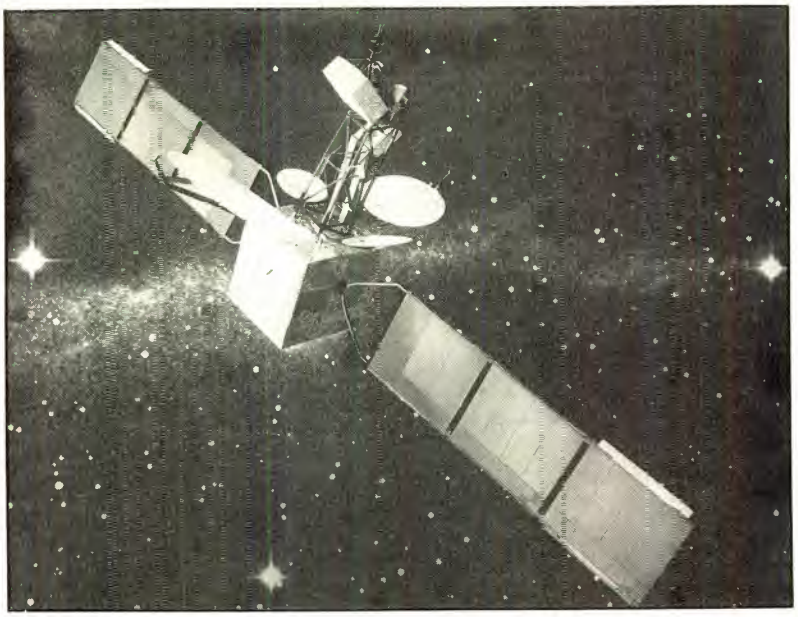
BE covers satellite communications

May 1966: ABC proposal
Sep 1966: TV relay
Feb 1967: NCSCT meeting
Apr 1967: unauthorized interception of SCA
May 1967: for network relay
Oct 1967: program proposed
Dec 1967: Pacific II
Feb 1968: satellite-to-home broadcasting
Oct 1968: CBC CE addresses
IEEE, COMSAT shot fails, earth stations
Feb 1974: broadcasting from Jupiter 10
Jun 1976: broadcasting from Viking
Sep 1977: general
Dec 1977: domestic
Jan 1978: Mutual Broadcasting & Western Union
Feb 1978: conference on
Aug 1978: COMSAT service
Sep 1978: COMSAT service
Nov 1978: Scientific-Atlanta tracking terminal, Mutual applies for satellite use, COMSAT's UN experiment
Dec 1978: Canada funds, Chinese see earth stations, future of, Scientific-Atlanta earth station order

one revolution every 24 hours; i.e., it would remain stationary above the same spot and would be within optical range of nearly half the earth's surface. Three repeater stations, 120 degrees apart in the correct orbit, could give television and microwave coverage to the entire planet."

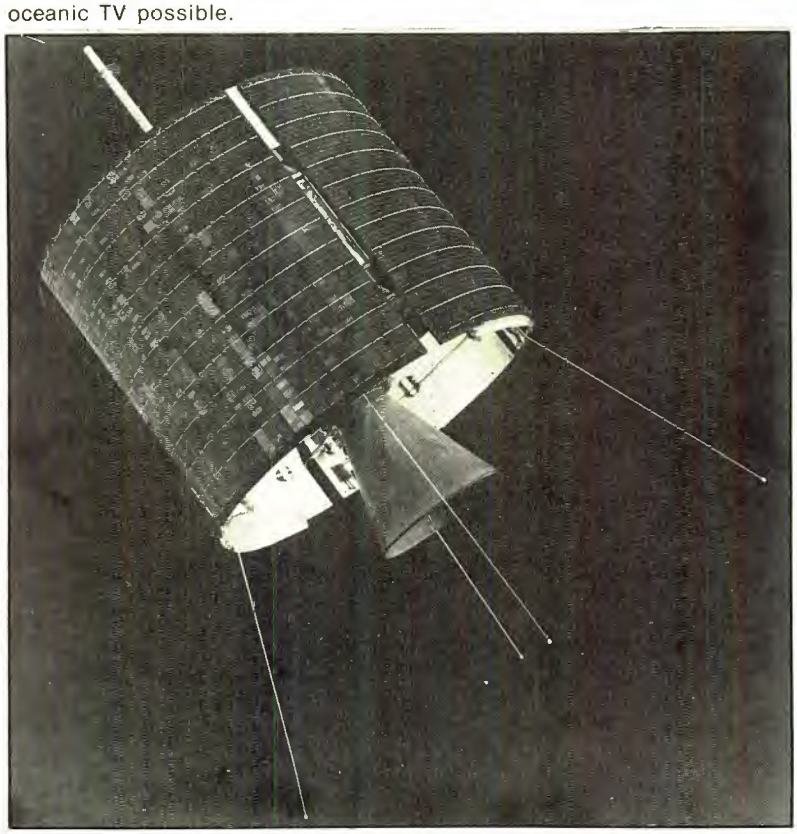
In early 1965, Early Bird (also known as INTELSAT I) was launched from Cape Kennedy and placed in synchronous orbit 22,300 miles over the coast of Brazil in April 1965. This launch marked the first step towards a worldwide network of satellites linking people of many nations. Early Bird, the only mode of live transatlantic television, in July, 1965, provided the first live telecast via INTELSAT satellite to the US, a US versus USSR track meet.

Although a dramatic improvement over the ther available transatlantic telecommunications facilities, Early Bird was nonetheless limited in capacity and capability. For example, in order for the only television channel to be operative, all 240 voice channels had to be shut down. Today, however, technology permits the simultaneous transmission of both voice and television with significantly increased capacity. Further, the costs of Early Bird were quite high when compared to today's rates. For example, the 1965 rate for a color television transmission between New York and Paris was $13,070 for the first 10 minutes and $240 for each additional minute. Today's rate is almost one-tenth the original charge, $1,618.50 for the first 10 minutes and only $55.50 for each additional minute. Lastly, the anticipated life of communications satellites has more than quadrupled. From a predicted life of 18 months



Intelsat V satellites, planned for launch beginning this year, will employ two advanced frequency reuse techniques.

Intelsat I (Early Bird), the world's first commercial communications satellite, was placed in service in June 1965. It established the first satellite pathway between the US and Europe and made live trans-oceanic TV possible.



Communications satellites

for Early Bird, today's satellites are expected to be operational for seven years.

Following the introduction into service of Early Bird in the Atlantic Ocean region, there still remained the challenge of developing a global network. This challenge was met only a few short years later. An INTELSAT II satellite was successfully launched and placed in synchronous orbit over the Pacific in 1967, and in 1969 an INTELSAT III satellite was launched for Indian Ocean region service, thereby completing the provision of global coverage. Fortuitously, global coverage capacity was augmented just in time for what has been estimated as the largest TV audience in world history to see man set foot on the moon. That which had been a vision by Arthur C. Clark some 20 odd years before, and a formidable legislative mandate less than a decade previously, was now a reality.

Establishing an international network was only the beginning however. Development and maintenance of succeeding generations of satellites, providing expanded services at lower costs, with enviable reliability records has been a continuing challenge consistently met by INTELSAT.

Currently, the INTELSAT IV and IV-A satellite series provide communications and broadcast service over the Atlantic, Pacific and Indian Oceans. With greatly improved signal handling capacity, each INTELSAT IV-A can relay up to 6000 phone calls and two television programs simultaneously. The availability of expanded satellite capacity for broadcasting, combined with a growing reliance on live international television to put people in touch throughout the world with major happenings, is reflected in the increased use of INTELSAT for television. The demand for international television transmissions to be carried via INTELSAT registered more than 50% growth during 1978.

Satellite transmission has also expanded the horizons of closed-circuit television. A variety of dramatic special purpose telecasts via satellite have demonstrated a large potential for public and commercial applications in the financial, industrial, scientific, educational and governmental communities. This has generated new attention to television for sales and promotion purposes, and for training programs, briefings, consultations and conferences. For example, highly successful auctions of industrial equipment and art have been held via satellite, thereby expanding the audience from room-size to international proportions. Also, a major raw materials company has telecast dedication ceremonies at its new iron ore mine in Sydney to simultaneous meetings with potential customers in New York, Tokyo and London. In addition, companies with shareholders in many countries are using satellite closed-circuit TV in conjunction with their annual shareholder and other important meetings.

Besides the advantage of immediacy, communications satellites offer the ability to transmit TV signals to a large number of receiving points simultaneously. Such a capability reduces the cost to each receiver and eliminates the need to ship film or videotape. No longer must one contend with packing, declaration and documentation, insurance, customs, brokers, transfers to and from airports and the other associated red tape and headaches.

Quite recently, decisions have been made in the US which will facilitate the provision of international satellite services directly to broadcasters. As a consequence of the FCC's response to the request of Spanish International Network (SIN), COMSAT will be able to provide satellite television services directly to US broadcasters and other users. Thus, for COMSAT as for the American public, the impact of "Live via Satellite" is just beginning to be felt.

Growth in technology, imagination, capability, and expertise guarantees continued growth and success of satellite communications. Indeed, the extent of future growth of satellite communications is limited only by the imagination of man. The time which has elapsed from the introduction of Early Bird in 1964 to the launch of the present satellite generation has been short; yet the effect on the world community has been startling. It is international broadcasting which has caused a considerable degree of this dramatic change, and will continue to do so, thanks to communications satellites. □

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Circle 455 on Reply Card

Broadcast business automation

By **Jack Finlayson,** manager, Broadcast Computer Service

Since its inception, the broadcast industry has been famed for its fantastic technical advances, but when it came to the automation of business functions, it had to be dragged into the computer era.

I believe there were two main reasons why the industry was so reluctant to automate logging, availing and other business functions. One was that, early in the 1960s, there were several attempts to computerize these areas which turned out to be very expensive failures. Perhaps the most important reason was that the computer industry completely underestimated the complexity of the problem.

The early attempts by computer programmers were basically modifications to standard inventory programs. They thought that with a few changes made, a program that could inventory 1,000,000 pairs of shoes could easily handle a few thousand spots.

They failed to realize the difficulties of rotations, product protection, time limitations, copy rotations and preemptible selling methods. They all seemed to take the approach of working backward from the billing and accounts receivables. This was primarily because inventory and A/R programs were available at the time for other businesses, when scheduling programs were not. It wasn't until broadcasters began to work with programmers on the front end of the problem with the log, that real progress began to be made.

In the mid 1960s there were a few stations working with IBM unit record machines such as the 402 and 403 to print logs, invoices, and various other reports.

These unit record systems used keypunch cards; by punching a card for each spot ordered, they were able to sort and total them in a variety of ways creating the reports. The shortcoming of this approach was that the cards had to be manually placed to create the log, and the system had no capability to actually schedule the spots, rotate them, protect them against competing products. The unit record machine merely used the same card sorted differently for a variety of purposes.

Two men who were among the earliest to develop these types of programs were Joe Coons and Bill Cole. Later, both formed their own companies and developed computerized systems based on small station computers.

The first truly computerized system that became nationally marketed was BCS, (Broadcast Computer Services). This system was developed at KVOR, in Colorado Springs. KVOR had been conferring with Kaman Sciences on an accounting program for payroll, general ledger, and balance sheet. During discussions, it was decided to try to do the entire job from logging through billing to accounting. Tom Lawhorn, a systems analyst at Kaman, had had some radio experience and working with KVOR's manager Jim Vinal and myself, was able to develop a rudimentary logging system. This system was initially put to use at KVOR in early 1968.

The system used an algorithm developed by Lawhorn, which was able to log spots based upon contract entry. It started and stopped them according to the contract, protected against competing products, limiting commercial times to FCC and NAB Codes, and handled copy assignments.

In addition, the system created sales projections, invoices, accounts

BE covers automation

May 1959: for television
Sep 1959: program system
Oct 1959: design considerations
Jul 1960: at WKRC-TV
Mar 1961: transmitter logging, simple programmer
Feb 1963: music system
Mar 1963: program logging
Apr 1963: correction, tape cartridge use
Sep 1963: planning for systems
Jun 1964: radio system
Oct 1964: for television
Feb 1965: general
May 1965: making money
Jun 1965: transmitter site
Aug 1965: 20 cps tone generator
Feb 1966: general
Mar 1966: tape control
Jun 1966: system
May 1967: radio station
Jul 1967: time-tone generators
Aug 1967: radio equipment, radio system, radio requirements
Jun 1968: spurious frequency components
Oct 1968: logging & record handling, at WRGB
Nov 1968: at WTMJ
Jan 1970: station design for the 1970s
Feb 1970: talking with computers, Vietnam NET moves on
May 1970: CATV, punched card broadcasting
Jun 1970: NAB convention report
Sep 1970: means to an end
Oct 1970: techniques
Dec 1970: give & take proposition
Jun 1971: general
Jun 1972: update
Aug 1972: election
Jul 1974: general
Aug 1976: audio control
Oct 1976: TV
Nov 1976: no surprises
Dec 1976: no surprises
Nov 1977: new systems, radio
Mar 1978: future of
Apr 1978: general
Jun 1978: EBS interface
Jul 1978: at WINS
Oct 1978: general
Nov 1978: general
Dec 1978: general

receivable, and income analysis, all through a single contract entry. Although crude by today's standards, it was truly a *computerized* traffic system. In 1969, BCS began to sell the system to other stations including KFAB, Omaha and KJR, Seattle.

In late 1968, BCS, in conjunction with KOOL-TV of Phoenix, developed and installed its TV system. The BCS system was a batch system, whereby keypunch cards were punched throughout the day and then transmitted at the end of the day to Kaman's large scale CDC Computer.

The next major breakthrough came in 1970 when Data Communication Corporation of Memphis developed and installed its BIAS system at WMC, Memphis. BIAS came about when Manry Gregner, manager of WMC and Jim Frommel, business manager, went to the First National Bank of Memphis to see if their large Burroughs computer could be used to run the BCS system.

Norfleet Turner, an officer of the bank, became interested in the opportunity and the bank's computer department, in alliance with the Burroughs Company, began development of the system for WMC and formed DCC.

The BIAS system differed from BCS in that it was an on-line system with in-station terminals directly connected to the BIAS mainframe in Memphis through the entire day. BIAS has since become the largest supplier of TV business systems.

Also, in 1970, the IBM-Metromedia BITS system was put into operation at KTTV, Los Angeles. This system had been co-developed by Metromedia and IBM back in 1967.

This used an IBM 360 computer which Metromedia had installed at their corporate headquarters in Los Angeles. The system was not in-

Automation firsts

This station in Adelaide, South Australia, was the first successful attempt (1965) to automate a complete TV programming facility. It featured an automatic program controller with magnetic drum memory, permitting mechanical schedule preparation, automatic all day switching and machine control, and as a consequence, mechanical billing, accounting and reporting.

Technicians complete Metromedia's first broadcast automation (Communications Data Link) hookup between the traffic and operations system at WTCN-TV in Memphis.

Central Dynamics Corporation and Kaman Sciences Corporation installed the hard-wired link between the BCS 1100 traffic and accounting system, and the CDL APC-610/200 switching system in 1975. WTCN used the switching system that it had already had for one year. The total traffic-to-operations system was tested at CDL's Montreal plant before installation at WTCN.

The 2-way Data Link has permitted the two computers to transfer data between the business and technical areas and has increased the accuracy and data transfer rate between sales/traffic and technical operations.

Business automation

stalled at other stations due to the size computer required.

Several other groups, working with IBM, attempted to modify the system to make it workable on smaller hardware, but failed to develop a satisfactory system. About the same time, Bill Cole and Joe Coons had developed systems that could run on small computers, which could be installed in stations at a cost that was economically feasible.

These systems were previously designed for radio, though, they now have had the necessary improvements and modifications for television.

Bill Cole's Columbine system was converted from unit record equipment to IBM's system 3 in 1971. Since then, it has been adopted to systems 32 and 34.

The Jefferson Data system was also being developed during the period of 1969-1971. Jefferson Data's system differed from all the others in that it used a distributive processing method. This method uses a mini-computer at the station for data entry, editing and other applications. The mini also is used as a terminal to transmit data to a large scale, central site computer.

Their first radio system went into their station, WBT, Charlotte, in 1970. In 1971, they installed the TV system at all of the Jefferson Pilot stations. BCS also switched to this distributive processing method in 1970 and installed its first such system at WFLA in Tampa, FL. Jefferson Data now has developed an entirely in-house version of its system. The first installation currently is being completed at KRON-TV, San Francisco.

Cox Broadcasting formed Cox Data Services in 1969 and they began development of an on-line system at that time. Their original system used a Honeywell 1648 as the host computer. Cox had been a pioneer in various types of broadcast computerization at their flagship station, WSB, Atlanta. The first non-Cox station to go on line was KSD, St. Louis, in June of 1972. Cox later developed the first successful in-house TV system on a Data General Nova 2 and installed it at WGAL, Lancaster, PA, in 1975.

In 1972, Joe Coons, who had been working for IGM in their computer division formed what was to become Paperwork Systems Incorporated

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Circle (58) on Reply Card

(PSI). KLEB, Golden Valley, LA, was the first station to install the system. The system was entirely in-house using a Data Point 2200 mini-computer.

That same year, the first nationally successful on-line radio system was marketed. This system, called Compunet, was developed by Ed Stevens, who, like Jim Vinal, pioneer of BCS, had been a manager of KVOR in Colorado Springs. Compunet used in-station terminals on-line to a large Control Data Corporation Computer. CDC purchased Compunet from Stevens and others, and in 1978, also purchased PSI from Joe Coons. The division has been renamed Station Business Systems and offers both on-line and in-house systems.

The radio market also was successfully entered into at this period by Marketron. This in-house system has proved to be very successful in the larger radio markets. Marketron was the first to provide demographic programs as well as the standard traffic and billing.

All of these systems have made quantum jumps forward in both software and hardware since their inception. Computer applications have spread from the traffic and accounting areas to virtually every department in the station.

In 1974 BCS, Central Dynamics Ltd. and Metromedia's WTCN in Minneapolis developed and installed an interface between the station's traffic system and the CDL automated switching system. The log was sent to the control room switcher, scheduled the events, and the "as aired" information sent back to the traffic system. This automatic update of the billing information made WTCN the first completely automated station.

Other recent developments by the major companies include news inventory and retrieval programs, the first of which was developed at KRON-TV, San Francisco; cassette and slide inventories; file library management and amortization programs; avail submission and demographic search programs; automatic inventory maximization; and electronic newsrooms.

As this history illustrates, broadcasting was late in accepting business automation, but once it did, the strides forward have been amazing. And, as the old saying goes, "You ain't seen nothing yet". □

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Circle (62) on Reply Card

The role of film in TV programming

By Eastman Kodak staff *

Film production came to the TV industry by the late 1940s. Among the first programs was a 3-camera, 16mm film show called *Public Prosecutor* produced by Jerry Fairbanks in 1947-48. Independent film producers provided many programs for the networks at that time. By 1952, an average of 16 prime time network programs were originated on film every week. These included *The Roaring 20s, Phantom Pirate, The Cisco Kid* and *Rin Tin Tin*. The latter two programs were originated in 16mm film.

A significant contribution film made to the broadcast industry at that time could be summed up in a word: residuals.

To appreciate just how significant that word was, consider this: only 39 episodes of the famous Jackie Gleason *Honeymooner* series are available for distribution.

By the time **Broadcast Engineering** was founded, much if not most prime time entertainment programs seen on the networks was originated in Hollywood by the same studios making movies for theaters. This was reflected in the quality and entertainment value of these programs. Some people still talk of the "good old days" when dramas were seen live. However, the reality was that Hollywood—and that means the film production industry—won the battle for ratings and critical approval hands down.

News was becoming increasingly important to local stations, and film was used for nearly all of it. The sound cameras were comparatively bulky by today's standards and had to be used on a tripod. Most news photographers carried an additional small, hand-held, silent camera to film segments not requiring sound and to shoot cutaways. The photographic sound track recorded single-system in the camera did not have the quality or flexibility of the magnetic sound tracks on today's news films.

Like entertainment film programming, news was black and white. Reversal films were used—just as for home movies—so the film shot in the camera was what was run at the station. But, processing machines for reversal were bulky, expensive and time-consuming compared to processing film as a negative. This prompted the introduction of a small, table-top machine in which the reversal film could be processed to a negative. The negative film was aired by reversing the polarity of the telecine chain. The simplified process permitted many more stations to install their own processing equipment.

By the early 1960s the switch to color programming was gaining steady momentum. NBC obviously had a vested interest. They were owned by RCA, which manufactured color TV receivers, *Bonanza* was their showcase for color for many years. Around that time Eastman Kodak Company introduced a new, faster color negative film. It was a real boon to TV producers, who could originate programs with less light and set-up time, and work with script situations that previously would have been prohibitive.

By the fall of 1965, almost all of NBC's prime time schedule was produced on color film. CBS was a year behind reaching that plateau, and ABC followed the next season.

The result of other developments, such as the Cinemobile, was the freeing of the film camera from the constraints of the studio. Location filming became part of the state of the production art.

With the increasing trend to color in entertainment programming, local stations were anxious to add that capability to their news menus. Their appetite for color was satisfied in early 1966 with the introduction of Eastman Ektachrome EFB,

*We acknowledge the contribution of Fred Godrey and Robert Hufford of the motion picture audiovisual markets division, Eastman Kodak Company, for their assistance in compiling the information that is the basis for this article.

BE covers film

Jul 1962: in stereo-color TV
Aug 1964: at KCRA, moon-shot camera
Oct 1964: mixer for camera amplifier, rear-view projection
Nov 1964: ultrasonic cleaning, processor for magnetic-striped film
Dec 1964: automatic sound-slide newsfilm projector
Feb 1967: direct recording process
May 1967: handling of color, SMPTE color TV test
Dec 1967: alignment of optics
Jul 1968: in space
Nov 1968: processor conversion, TV octopus
Jul 1971: in local origination
Sep 1971: in local origination
Oct 1971: in local origination
Jun 1974: lighting for
Apr 1978: future of
May 1978: processing
Nov 1978: processing
Dec 1978: future of
Mar 1979: at KTVY-TV

and news

An associate producer of *Evening*, a magazine show on KGW-TV, Portland, uses a film camera to shoot a report on an area poet.

7242, tungsten film and its daylight balance companion film, Ektachrome EF, 7241. Compatible packaged chemistry was also marketed.

Once one TV station in town was running and promoting news in color, the others had to quickly follow or lose their news audience. Within a few years some 70% to 80% of the TV stations programming local news had converted to color.

Most stations installed color processing equipment rather than using outside labs. As a by-product, many stations were able to get into the business of producing color film commercials. When these installations were made, Kodak had a processing expert at the station to assist in the start-up of the process and to insure that it was yielding proper color balance. Training the station's processing people in quality control procedures was an essential part of this visit.

In 1971 Cinema Products' CP-16 camera hit the news-gathering industry like a bombshell. It was small and light-weight with innovative features designed to make news coverage easier and more reliable. Subsequent models featured built-in sound amplifier and reflex viewing. Other news camera manufacturers brought out improved, lightweight cameras. All at once news photographers were unshackled from their tripods. Shooting from the shoulder, they could easily and quickly go where the action was and then stay with it. The term "photojournalism" took on new meaning in the broadcast industry, and the prognosis for the talking head was terminal.

By the mid-1970s local news was running an hour in many markets, and many stations were also producing magazine programs reflecting the growing strength of local production capabilities. Local television was producing many more visuals, and while ENG can often get news on the air faster, film is still a more flexible production medium.

What has evolved is a distinct "film-look" on entertainment TV, which even many videotape producers say they are striving to copy. At the mid-point in the current television season, some 86% of all prime time entertainment programs were being originated on film.

Because of the development of improved 35mm production equipment, most entertainment production still is being originated in this format. However, some producers are realizing cost and mobility benefits by using 16mm color negative film. For example, Schick Sunn Classic Productions, in Salt Lake City, produced some 50 hours of prime time programming on 16mm color negative film this past season. The 16mm color negative is also the staple for the network magazine programs and for some network documentaries.

Even as this article is being written, exciting new developments in film-to-videotape transfer technology are assuring the eventual marriage of the two media. For example, the use of flying spot scanners for such transfers has led to a substantial improvement in the quality of the end product. One reason is that the transport system used to make the transfer is safe enough to allow producers to run their original 16mm or 35mm negative film.

The future? Local production will continue to increase. And a significant amount of this production will be originated on film.

As for national programming, new distribution technologies, ranging from the videodisc to satellite transmission, should kindle a hot flame under the production industry, and not only for prime evening network entertainment. Films also will be produced for pay TV, for direct distribution to stations through such vehicles as Operation Prime Time, and for videodiscs and cassettes.

These beliefs are based upon many factors, but two stand out. One is that film origination has intrinsic advantages as a production tool because there is nothing between the camera lens and the recording medium. Even with advancements in solid-state technology making smaller video cameras possible, the fact remains that the image processor, in effect, is carried in the video camera. The result is that film production probably always will provide quality and creative advantages.

The other factor speaking for the future of film production in the broadcast industry is history. From the time the first film programs were shown on network and local television, there has been steady progress in advancing and utilizing the art and technology. □

Magnetic tape's impact on broadcasting

By Richard Ziff, 3M Company

Modern broadcasting is held together by tape—audio and video magnetic recording tape.

It's hard to imagine now that the industry got along for a quarter of a century without the stuff. It wasn't until the Germans put audiotape to work during World War II that broadcasting began to grow its magnetic central nervous system.

Before the Germans developed their "Magnetrophon" recorder, tape recording had been strictly a laboratory technology. An imaginative writer in the early 1800s reasoned that sound might be magnetically recorded on "a piece of string dipped in glue and coated with iron filings." A crude recording device, developed in 1893 by Valdemar Poulsen, a Danish engineer, used wire to store magnetic impulses that could reproduce sound.

But the introduction of Scotch 100 magnetic tape in 1947 launched the recording tape industry in the United States. This first commercial product employed black iron oxide, coated to a paper backing. A year later 3M Company, its developer, introduced a superior recording tape combining red iron oxide and a more durable acetate backing.

Initially, it took a lot of tape to reproduce a limited amount of sound. Broadcast tape recorders in 1947 operated at a speed of 30 in/s. By 1949, decent quality could be attained at 7-½ in/s—a 4-fold improvement—and that speed is still the industry standard.

The story of magnetic recording tape's first big break is right out of show biz. Bing Crosby liked to pre-record his network radio shows on discs. Then he would saunter out where the blue of the night meets the gold of the day, leaving his producers to go bonkers as they edited from disc to disc, with severe losses in quality. In 1948 a 3M executive convinced Crosby to give magnetic tape recording a try. It proved an instant success.

Shortly after, the broadcast industry was thrown into turmoil when Congress voted to let the states decide when (and if) they would go on daylight savings time. For a historic 22 weeks the American Broadcasting Company pre-taped 17 hours of network radio programming daily to be replayed at periods appropriate to widely varied time zones.

And so magnetic tape came of age in broadcasting, and the relationship flourished. The next decade produced tremendous gains in sound recording quality. Better magnetic oxides improved signal-to-noise ratios by as much as 6 dB. Tensilized polyester replaced acetate as a tape backing, permitting the development of thinner, longer-playing tapes.

Endless-loop cartridges, with tape speeds slowed to 3-¾ in/s, became standard throughout the broadcast industry. They remained the standard for more than two decades until the announcement in March, 1979 at the National Association of Broadcasters Convention in Dallas

BE covers magnetic tape

Jan 1961: specifications approved, international standards
Sept 1962: editing
Feb 1962: fundamentals
Mar 1962: fundamentals
Apr 1962: recording
May 1962: playback, for Ampex VR-1000 VTRs
Jun 1962: testing
Jul 1962: heads
Mar 1968: operation & preventive maintenance
Apr 1968: care & handling of
Jul 1968: testing of, tip engagement
Sep 1968: logging
Jan 1978: SMPTE conference on 1-inch
Mar 1978: production w/film techniques
Dec 1978: future of

that a new type of endless-loop cartridge system was being introduced by 3M Company.

Called the "CentraCart" Radio Cartridge System, it departs from the traditional concept of tape cartridge configurations to produce sound quality equal to that of professional reel-to-reel systems. At the same time, the new system retains the convenience and ease of operation of the endless-loop cartridge for radio broadcasting.

Meantime, the television side of broadcasting was growing up. In 1956, researchers from 3M teamed again with Bing Crosby Enterprises and engineers of the Ampex Corporation to open a new frontier—videotape recording.

In less than a decade, tape recording technology had advanced from reproducing audible pulse frequencies of 20,000 per second to video magnetic frequencies ranging to 5,000,000 per second, or higher. Another revolution in broadcast technology was underway.

Recently, 3M introduced "Metafine" tape coated with fine metal particles—not oxides—that double the output of previous tapes and offer improvements in signal-to-noise ratios of as much as 10 dB. The new tape promises eventual benefits to audio, video, digital and any other type of recording in which the magnetic medium is used.

And so the work on ever-improved tape performance contin-

Tenor Lanny Ross of radio and movie fame is at the mic during production of the first radio program transcribed on 10 recorders at once. This was the final step in 3M Company experiments to prove the feasibility of making master transmissions in quantity on magnetized tapes. This photograph was taken October 1947, at WMIN, St. Paul.

The Scotch 111 recording tape, introduced in 1948, was to become the industry standard.

Magnetic tape impact

ues to this day. Scientists and engineers continually are asked to create higher density magnetic oxides on thinner, stronger backing materials. One lab director muttered that the ultimate magnetic tape would have no coating or no backing and be able to record forever.

But pending that dream, research continues on basic oxides and metal particles, on new coating methods and slitting techniques that can provide closer tape tolerances. The goal remains: more information per square inch of tape, at lower prices per minute of technically perfect programming.

Less cost—more quality. One of the most familiar goals in broadcasting. □

Discovering magnetic tape

By John Mullin

The most unforgettable moment in my life was the one when I stood before my Magnetophon Tape recorder and pressed the "Playback" button for the first time in the presence of Bing Crosby; John Scott Trotter; and Bing's producers, Bill Morrow and Murd McKenzie. Everything was at stake. By invitation I had been present with my colleague, Bill Palmer, to record the first radio show of the 1947-48 season in the NBC/ABC studio complex in Hollywood. And now we were to hear the result of our efforts and to be judged by perhaps the most critical ears in the world of radio and recording.

Prior to our invitation to come to Hollywood from San Francisco to record and possibly, just possibly, to edit our tape into a complete show, the producers had looked into every alternate means of recording sound that showed any promise of success. Mostly, these boiled down to variations of disc recording methods and photographic sound-on-film systems. I am sure ABC held out little hope for success in testing our apparatus.

The tape came up to speed—then,
Opening theme—Crosby: *Blue of the Night*
Applause
Introductory Patter:
Crosby and Carpenter
Song—Crosby:
My Heart is a Hobo
Applause

Murdo McKenzie signaled me to "cut." I pressed the "Stop" button. There were surely no more than two seconds of silence, which seemed more like minutes to me, and then a shower of compliments. One small machine, one of a pair, side by side on a makeshift table—the only two of their kind in the United States arranged to record and reproduce magnetic tape with such remarkable fidelity—had, in a listening demonstration lasting almost exactly five minutes, upset the entire future of sound recording in this country.

Why only this pair of machines, and how did they happen to be here? Let me go back to 1943. I was in England at the time, in the US Army Signal Corps, but assigned to the RAF and working as a Liaison Officer concerned with interchange of technical information. A problem had come up where a certain Signal Corps radio receiver was found to be highly subject to interference from a type of high powered RAF radar transmitter. We were working to reduce vulnerability of the receiver. It was an urgent program and some of us plugged away through the night.

We had been listening to the BBC as we worked until sign off time, and then we fished for something else on the radio. Germany came in loud and clear. The music was appealing: Strauss and Lehar melodies played by a full orchestra, solo arias from Viennese operettas. What? At this hour? More full orchestra—a male chorus singing songs of the Rhine and so on through the night. How could they do it? The sound was so flawless that we were convinced we were hearing live performances. The usual deficiencies of record scratch and other tell-tale distortions were completely absent.

The mystery was solved some time after the invasion of France. The operations center of our particular group, the Technical Liaison Division of the US Army Signal Corps, was set up in Paris and our first objective was to ferret out developments in which the Germans may have been active during the war and at the time of their retreat.

While going through one installation, which was certainly awesome and reminiscent of the more spectacular moments of a Frankenstein movie, I struck up a conversation with a British Army Officer. We soon concluded from the information we were able to put together that the installation had been a dismal failure, but we also found we had a common personal interest in music and sound recording.

He asked me if I had seen or heard of the Magnetophon, a magnetic tape recorder which the Germans had developed and which he assured me performed with a fantastic dynamic range from full orchestral crashes to virtual silence without background noise and incredibly low distortion. I told him we already had about six such machines back at our laboratory in Paris but that they were quite poor in dynamic range, since their background noise was not as good as a 78 RPM shellac record and their distortion had been found to be

"I had a second chance to build a complete remote control facility and..."

KDTV Chief Engineer George Ledoux sticks with a winner

"I ordered a second helping of TFT 7600."

George Ledoux, Chief Engineer of San Francisco station KDTV, had an idea—trade frequencies with a lower frequency educational station to provide better coverage and TV dial identity for KDTV. So, channel 60 became the educational channel for the College of San Mateo and the college's channel 14 became KDTV. Part of the trade provided, as a gift, all KDTV transmitter equipment to the college. TFT remote systems were a major part of the package. Thus, George had a second opportunity to select all new remote equipment. **HE SELECTED THE SAME TFT GEAR HE USED BEFORE!** Here are George's reasons why:

On Capability

"... The TFT systems do what they're advertised to do. They work perfectly from the first plug-in and go on working no matter what kind of data parameters I include. The instant status lights and direct ON/OFF controls are great. They give you an extra dimension of control and data assurance. Single-man calibration saves us time and minimizes the chance of error. They've also got a double-scan/compare data transmission technique that makes the system almost foolproof."

On Flexibility

"... The engineering of the gear is so clean that I can get into the equipment and customize it for my own needs... like building up audio channels, combining status inputs to trigger special alarms—whatever I want to do. TFT has always been very helpful in working with me on these things—whether or not they sell any gear as part of the deal."

On Expandability

"... The TFT 7600 system is designed to grow right along with our needs. I can add channel expanders, fail safe units, automatic path selectors, multi-site selectors, computerized monitoring, anything I want—it's all available from TFT. There's even a software package available for computations of things like VSWR.

On Service

"... I know what it's like to disconnect and code over 300 wires on other systems. TFT's detachable rear panel design is just great although I've never had to use it because the equipment has never needed maintenance."

George Ledoux and many knowledgeable engineers like him can speak from experience on the reliability of TFT remote systems. And, when it comes to quality, our specs will speak for themselves. Call or write for a set today.

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Circle (63) on Reply Card

Bing Crosby was an influence upon videotape recording. His Crosby Enterprises organization, of which John Mullin was an engineer, developed a fixed head video recorder. But when Ampex developed a superior product, Crosby decided to stop independent developments and sold the Electronics Enterprises Division of the organization to 3M. It became 3M's Mincom Division in 1956.

John Mullin checks his original red oxide tape on the Magnetophon which he modified to make the first taped U.S. radio network program by Bing Crosby in 1947. Here he was pictured at the 1978 AES Convention in Los Angeles, also flanked by the 3M 32-channel pre-mix digital recorder which utilizes a digital mastering tape developed by 3M.

Discovering tape

very inferior in the tests we had made.

He urged me to go to the studios of Radio Frankfort and hear the performance of a machine for myself. Thinking this chap must have a tin ear, I bade him farewell and began to drive down the mountain. As my assistant and I reached a fork in the road, with all intentions of turning westward, I reconsidered. Suppose he had something there after all. So we turned eastward.

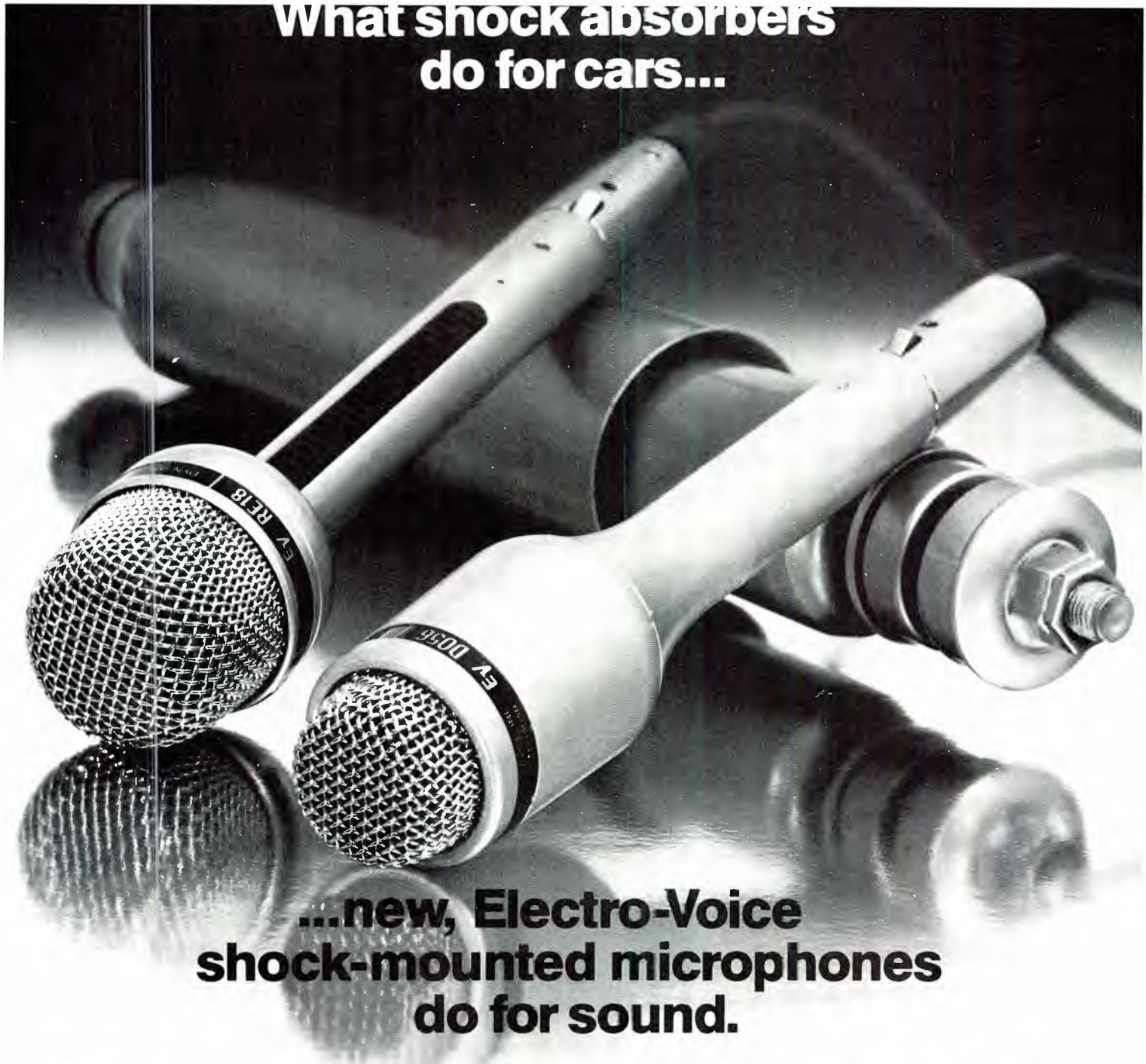
The British Officer had told me that Radio Frankfort had vacated the city during the heavy bombing raids and had relocated in a large house at a resort spa north of the city, a small town called Bad Nauhiem. I drove there, found the house and confirmed that the radio station, as he had informed me, was now being directed by the US Armed Forces Radio Service. The German staff was still operating and maintaining the equipment.

I asked if I might hear one of the tape machines they were using. An order was directed to one of the technicians and I was taken into a room in which there was a large loudspeaker and two of the Magnetophons. The mechanism appeared to be the same as the ones we had in Paris, but there was an obvious difference in the electronics.

The technician placed a roll of tape on one of the machines and started it. Suddenly, out of complete silence, an orchestra bloomed into being with fidelity such as I had never heard in my life. From deep resonant brass to the shimmering of the flute it was all there. It was clean! It was free from any noticeable distortion. And if that were not enough, the dynamic range was fantastic compared with anything I had ever experienced.

My assistant photographed all the schematic diagrams and instruction manuals, even though they were in German. I had talked the officer in charge out of a few rolls of the type of tape they were using, my gold oak leaves helping to convince the lieutenant that we needed the tape for further investigation of the Magnetophon back at our laboratory in Paris. □

What shock absorbers do for cars...



...new, Electro-Voice shock-mounted microphones do for sound.

DO56 Omni – The DO56 shock-mounted omnidirectional microphone is virtually impervious to mechanical noise. Its isolated capsule eliminates the possibility of capsule/case collision making the DO56 the ideal microphone whenever there is lots of action. The excellent "G-factor" margin makes this new microphone less susceptible to the bell-like clang typically heard from other shock-mounted microphones when they are accelerated or decelerated rapidly. Plus, a built-in blast filter reduces "P-popping" dramatically to keep your audio clean.

The DO56 also offers attractive styling, making it ideal for broadcast applications where visual appeal is a necessity. The memraflex grille resists denting, keeping the DO56 looking like new indefinitely.

RE18 Super Cardioid – Where ambient noise rejection is mandatory the companion RE18 super cardioid combines the best performance features of the famous RE15 and RE16 with superb mechanical noise isolation. Acoustic performance is the same as an RE15, while a refined small-profile blast filter resists "P-popping" as much as the larger RE16.

Unlike "multi-port" directional mikes, E-V's exclusive Variable-D® design insures uniform frequency response at *all* angles, for uncolored pickup on and off axis. And Variable-D reduces the bass-boosting proximity effect found in Single-D cardioids, for consistent sound quality at any working distance.

Electro-Voice Warranty – Both microphones are covered by Electro-Voice's unique two-year unconditional professional microphone warranty. For two years E-V will replace or repair these microphones, when returned to Electro-Voice for service, at no charge – no matter what caused the damage.

These are microphones to depend on, in the studio or in the field. If they weren't, E-V couldn't offer this warranty. When your application calls for a shock-mounted microphone, test one of these at your E-V professional microphone dealer.

Electro-Voice®
a gulton company

600 Cecil Street, Buchanan, Michigan 49107

Circle (64) on Reply Card

Solid-state devices that changed history

The invention of the vacuum tube diode by Fleming in 1904 and the triode vacuum tube amplifier by DeForrest in 1906 launched radio into a new era. Early stations latched onto this technology and began developing their own tubes using in-house capabilities, including glass blowers. However, when industry took over and began to make quality tubes of many varieties, instrumentation grew by leaps and bounds.

Then, in December 1947, Dr. William Shockley of the Bell Laboratories changed the course of history by demonstrating to his colleagues a newly discovered device exhibiting the "transistor effect." From this demonstration at Bell Laboratories in New York City on June 30, 1948, sprang one of the most important inventions of the 20th century—the working transistor. For their development efforts Bell Telephone scientists John Bardeen, William Shockley, and Walter H. Brattain received the Nobel Prize in Physics in 1956.

The transistor launched a new era in science and technology: Advances in making transistor junctions soon led to devices such as integrated cirucits, microprocessors and large scale integration. And still the R&D continues.

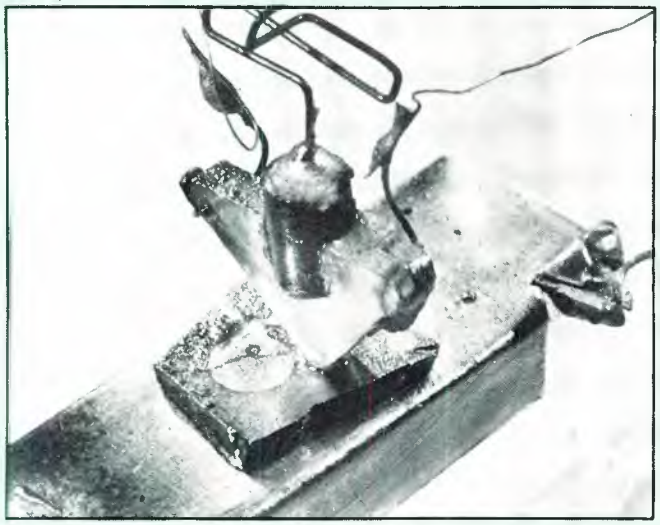
Broadcasters and broadcast equipment manufacturers were ready and willing to adapt transistorized technology to instrumentation for compactness; long-term, low-maintenance service; space savings; high flexibility; and reduced cost. These advances in instrumentation have been reported consistently since **Broadcast Engineering** began its pioneering publication in 1959. When the first automation efforts occurred, **BE** was there; when the first satellite was launched for communication purposes, **BE** was there; when microprocessors began to be used in broadcast instrumentation, **BE** was there to report the products.

The microprocessor for dedicated instrumentation is now a technology that's revolutionizing broadcasting equipment, but there's more to come. LSI is beginning to make its impact, and interfaces to central computers is becoming fairly commonplace. Still, there are many advances to be made in using computerized controls for broadcasting purposes, both in technical operations and in the business phase of broadcasting.

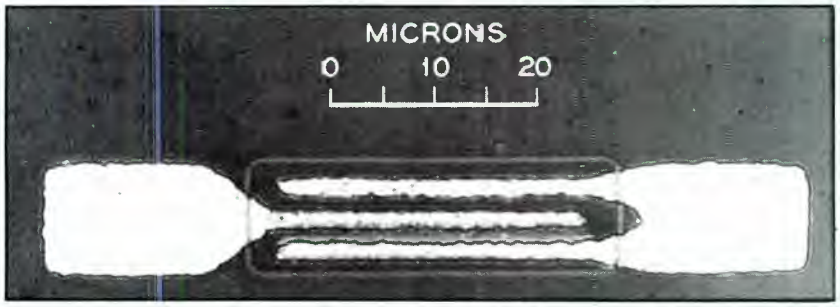
Digital for video is certainly at hand. At the March NAB in Dallas Sony introduced its digital video recorder, Quantel introduced its experimental video film library, and Bosch-Fernseh introduced its digital cassette library—all designed to satisfy the industry's growing curiosity about how digital and video can become practical broadcasting tools. The industry stands poised, but the SMPTE convention in San Francisco last February indicated that digital for television will not become truly practical until perhaps the 1985 period.

Nevertheless, the industry is on the threshold of a new era in digital communications. And all this excitement stems from the development of the solid-state devices that permit signal handling capabilities with ever growing complexity. □

The first point-contact type transistors assembled at Bell Laboratories on December 23, 1947, amplified electrical signals by passing them through a solid semiconductor material, basically the same operation performed by present junction transistors. (*Photograph courtesy of Bell Labs*)

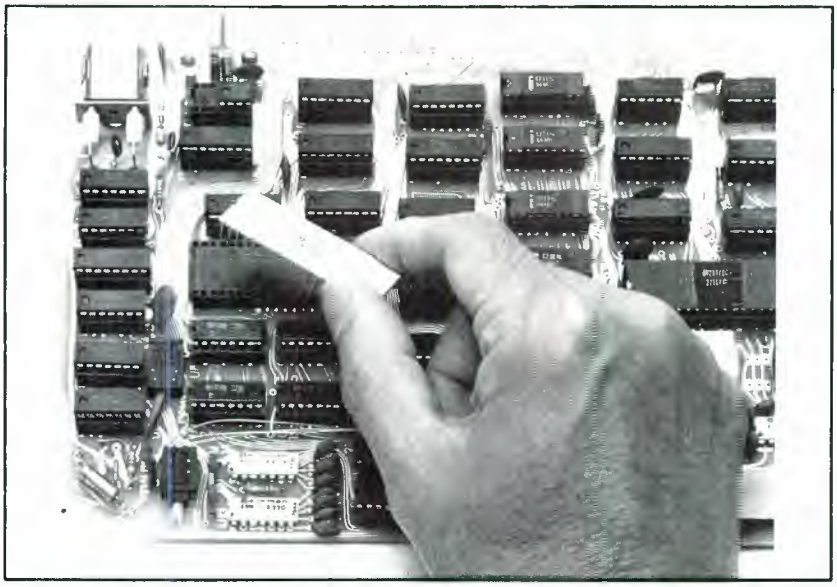


Dr. John Bardeen, Dr. William Shockley and Dr. Walter H. Brattain are pictured with apparatus that led to the invention of the transistor in 1948. The trio received the 1956 Nobel Physics award for this invention. (*Photograph courtesy of Bell Labs*)



A top view of a silicon transistor with a cut-off frequency of more than 7 GHz shows the interdigital arrangement of the two base contacts flanking the center emitter contact. The light rectangular outline around the aluminum contact fingers is the boundary of the boron-diffused base region. (*Photograph courtesy of Bell Labs*)

This CDL editor (EDS-200), introduced at the NAB convention in 1973, used the Intel 4004 CPU and appeared to be the first instrument for broadcasters and producers to use microprocessors.



Microprocessors, such as the Z80 shown hand-held next to a plug-in card for the Cetec 7000 automation system, are revolutionizing instrumentation for broadcasters.

Case study: A look at video

By **Birger Anderson**, producer-director, Computer Image

Most of the dazzling, electronic video effects seen on television commercials and broadcast promotional material today are the result of pioneering and development by Computer Image Corporation of Denver.

It all started back in the mid 1950s when Lee Harrison, III, started dreaming about combining art and electronic technology to allow artists and animators another medium with which to communicate—television. He began creating such a system after adding an engineering degree to his fine arts degree in 1959.

"We made an electronic beam behave like an artist's paint brush," Harrison said, inventor of ANIMAC, SCANIMATE and CAESAR computer animation systems and now president of Computer Image Corporation in Denver, CO. "With the breakthrough of being able to manipulate video signals with precise control over position, timing, color and intensity we helped change the look of television commercials and broadcast promotions during the 70's" Harrison stated.

Ten years of experimentation with computers, video and associated electronic controls resulted in over 19 patents in a field so new that the patent office had to set up a separate category under the heading of "Electronic Image Generation and Animation." The engineering of this new technology earned Computer Image Corporation an Emmy in 1972.

The first machine designed during the development stages in the 1960s was called ANIMAC. This device was capable of 3-dimensional animation, but represented a greater complexity than required by the animation industry. It was a combination analog and digital system, with the analog portion controlling the video signals of the imagery and the digital handled the precise timing of all elements. The video produced animation was then recorded on B&W film and color added during laboratory processing.

The next breakthrough was the development of a surface characteristics camera, which was operational by late 1969. This was the forerunner of the SCANIMATE system and could be manipulated to distort a planer surface into the third dimension. The first commercial production was done on a prototype in 1970 at Denver.

Whereas ANIMAC generated its own images, the next generation system, SCANIMATE viewed a piece of B&W artwork in the form of high contrast line negative. By using scan conversion the system was able to directly effect the manipulation of the television raster. This system was an entirely different approach to most computer animation methods which use mostly digital technology. Using strictly digital technology to animate an existant or non-existant object requires that the object has to be mathematically definable in order to program the computer to generate an image. This often is a time consuming and costly process but by using a strictly analog system such as SCANIMATE, the most simple form of art work can be transformed into complex, free flowing patterns or animates representing existing or non-existant objects without complex programming. The SCANIMATE system was a commercial success and a number of machines were built during the 1970s and are presently in use producing commercial animation at Computer Image Corporation, Denver; Image West in Hollywood; Dolphin Productions, New York City; and Far East Laboratories in Tokyo.

The third system to be developed at Computer Image Corporation is the CAESAR system, (Computer Animated Episodes Around Single Axis Rotation). It is capable of animating multiple characters in full color with lip sync over art or live backgrounds and you can see a finished scene the same day.

The procedure used to produce animation on Scanimate is similar in many ways to the one used with CAESAR. What differs is the way the operator controls the system and the type of animation attempted.

Inclusion of a digital computer in CAESAR makes its operation simpler, and enables precise timing and positioning of the animation as well

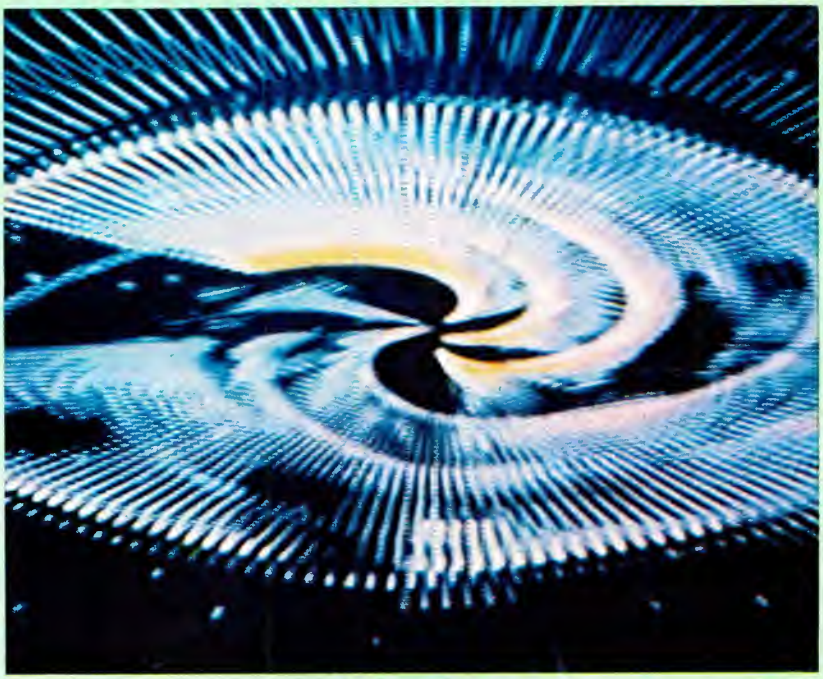
animation

as the production of long sequences. There is only one production CAESAR in operation and it is at the Denver facility. The experience gained while creating animation for a broad array of clients has given birth to a computer animation system of great power and versatility.

Although the emphasis was on developing and producing video electronic hardware during the early years production of software also was carried on. The first broadcast commercial for television was done in late 1969 for Home Federal and broadcast in the Chicago area. Since then thousands of television commercials and broadcast promotions have been done using the two systems or SCANIMATE and CAESAR together at the Denver facility.

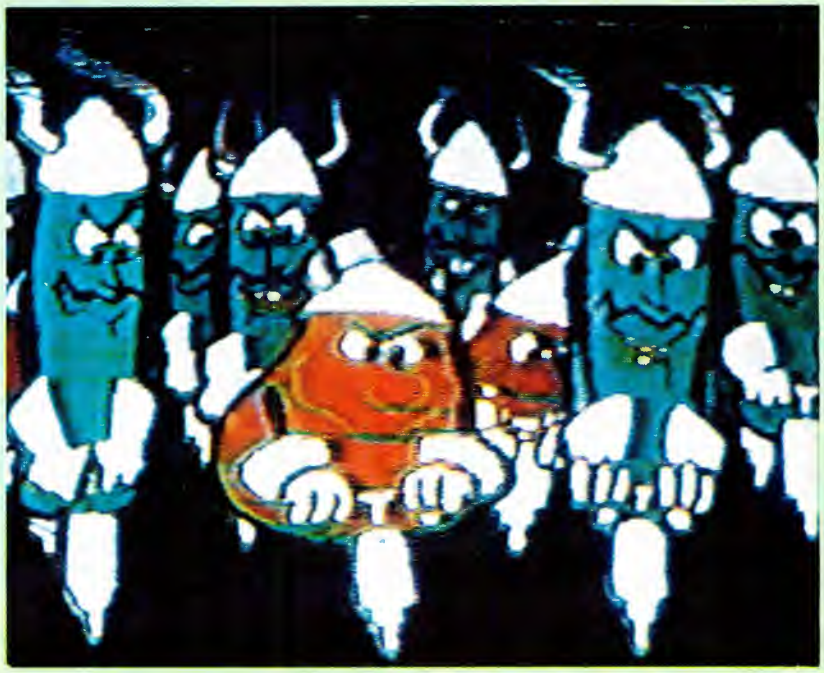
With the present emphasis on production, research and development is not being ignored. Both animation systems are continually updated and improved to give better quality and shorter production time.

A breakthrough was unveiled at the recent '79 NAB Convention in Dallas: full-color animation with images compression and rotation. The demonstration used a videotape of a KOLN-TV station promo for *HEE HAW* and *The Muppet Show* that combined live action from the shows and graphic animation. The composite color image was then compressed, sectioned and rotated (like venetian blinds) and then rotated again on the Z axis. This



The SCANIMATE process allowed the simple form of artwork to be transformed into a complex, free flowing pattern. Pictured is an example of early SCANIMATE patterns.

The CAESAR system can animate multiple characters in full color with lip sync over art or live backgrounds. Pictured are animated characters from a public service announcement for the Department of Agriculture done on CAESAR.



Computer animation

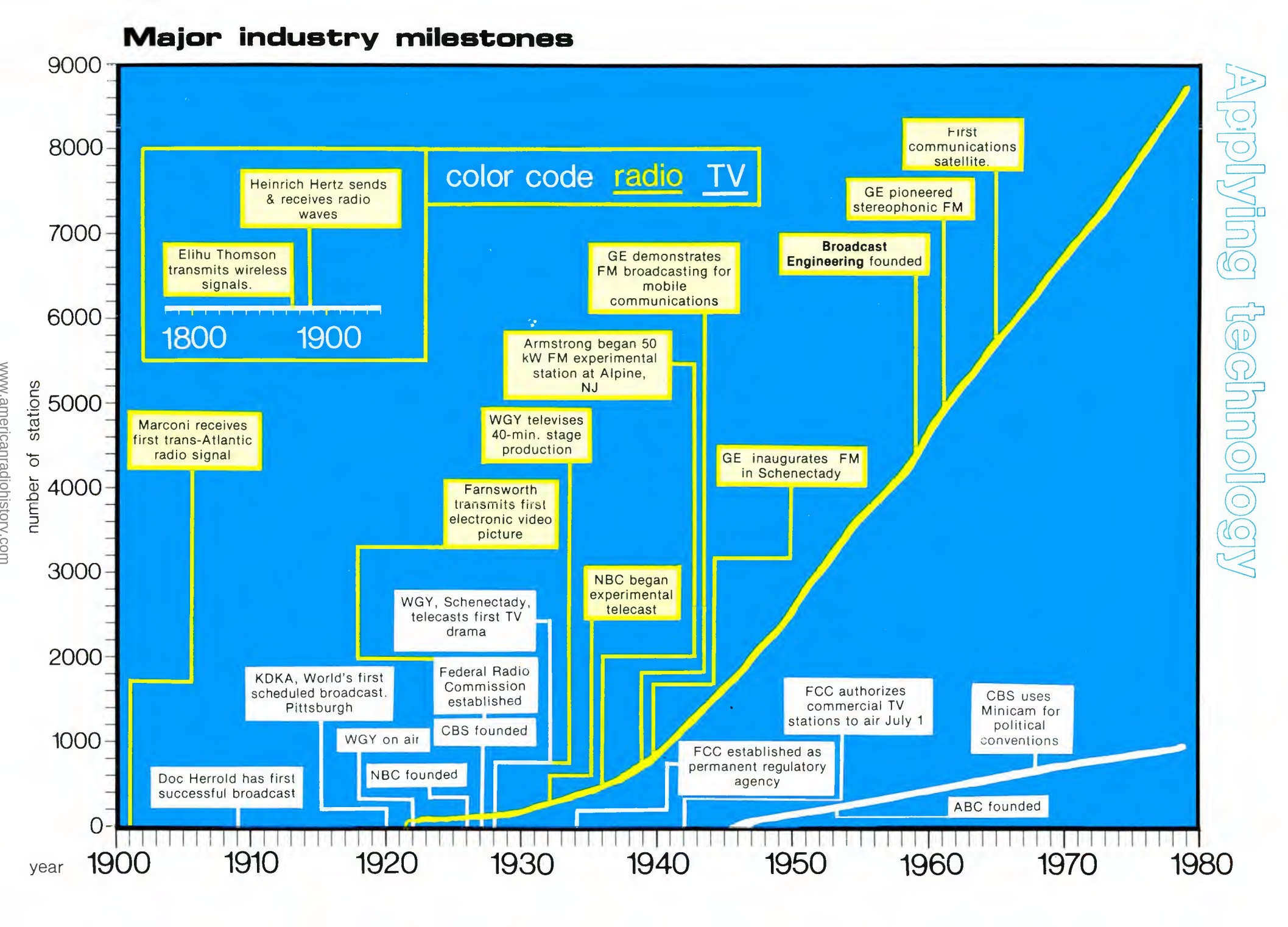
latest breakthrough is part of the development of the System IV computer animation system that will be operational in the summer of this year. With each new generation of computer animation systems developed at Computer Image Corporation, the operation gets easier, requiring less training and special skills for operating.

According to Harold Abbott, vice president of production, "Full-color animation is but one of the recent innovations. We have also developed realistic shaded metallic effects with absolute control of reflections in every surface and we can do it just as easily in a glass or crystal effect."

Experiments in new ways to use electronic video animation are always being explored at Computer Image: animating weather forecasts in a simple, accurate visual style that everyone can understand; editorial page type cartoons by leading political cartoonists have been animated quickly and successfully on the CAESAR system and reconstructing air crashes by adding visuals to the flight recorder data to aid in identifying causes of specific airplane crashes are but a few of the many continuing explorations for new uses of computer animation.

With the new "System IV" computer animation system starting off the decade of the 80s it is not unforeseeable that computerized electronic video animation could be quickly produced and the results or finished product could be delivered to the client or a commercial broadcaster via telephone lines in a matter of minutes. Dreams and ideas exist today that could make Computer Image Corporation the Polaroid of the computer animation industry, one step instant animation. □

The master switcher control room with the microprocessor in the foreground, syncs up signals from CAESAR and SCANIMATE and routes them to the VTR room.



Case study: K101, an FM pioneer

By Jim Gabbert

The saga begins in 1956 when my partner, Gary Gielow, and I decided that since we liked working in the Stanford radio station so much, it would be nice if we could build our own station when we graduated. Since Gary was a psych major with a good business mind, and I was in engineering, we figured that we had the basic necessities to do this, and all we needed to do was raise some money.

The first trip to the FCC's local office revealed that there were no AM frequencies available in California, but there were 12 vacant FM frequencies, and if we wanted one, we could have one. Earlier, FM had made a very small splash and then had gone away and died a quiet death. (Those 12 vacant FM frequencies had once been occupied). There was nobody manufacturing FM transmitters anymore and only Zenith and Granco still were making FM radios. I was supposed to be responsible for all the engineering on our radio station and I didn't even know what FM was. All in all, things didn't look too good, but we were young and we wanted a radio station and we didn't know it couldn't be done.

We figured that we could graduate from college and get high paying jobs and build the radio station in our spare time...just for fun. The jobs would support the station (by this time, we realized that we were not going to make a fortune with an FM station). FM just wasn't happening. Where would we get the money? We pooled our resources to come up with the $6000 we needed and were short by about $5300. And we still didn't have a place for the antenna. Since money was the more difficult of the two problems, we went off looking for an antenna site and found the perfect place on 2400-ft Kings Mountain behind the school campus. The owner of the land got so excited by our project that he volunteered to co-sign the necessary loans and we were on our way. He also owned a 120-year old adobe hut which we moved up to the mountain top to become the first studios.

We chose 101.3 out of the 12 available frequencies and called it KPEN, the city of license being Atherton on the San Francisco Peninsula. To show how times have changed, our original application was 20 pages long and the CP came through in 45 days. We rented a D-10 caterpillar and started clearing the land. We sold the trees for firewood and used the money to buy a new RCA console.

KPEN signed on at noon on October 27, 1957, with an effective radiated power of 1500 W. The emphasis was on superior sound and within a couple of months, the station started showing up in newspaper polls. Our advertisers were getting good results and there was so much hub-bub about the new hi-fidelity FM that national advertisers phoned in buys during the second month on the air. Within three months, we had increased power to 5 kW and business was almost too much to handle. In fact, things were going so well that another application was submitted for an increase in power. We considered this a mere formality, because the FCC had given us everything we had asked for. With visions of 50,000 W on the air 24 hours a day, we hired an announcer to help out while I was still in class at Stanford. And the commission did not grant the application.

Prior to action on this application by the FCC, we realized that it would be prudent to move the station to San Francisco as quickly as possible, as obviously it was better to have a radio station licensed in San Francisco than in the suburban town of Atherton. At the completion of this move, KPEN ended up with a maximum radiated power of 125,000 W and an antenna height above average terrain of 1420 ft.

At this time in the history of FM development, the maximum power of an FM transmitter was 10,000 W and, to achieve 125,000 W without utilizing a super high gain FM antenna which would not work well in the rugged terrain of San Francisco, we had to develop a directional FM antenna. The basic design for this antenna is still in use by the station and is the grandfather of all the high power FM panel antennas. Many companies have since duplicated the design of this antenna (back in those days it was all horizontally polarized).

The only 10,000 W transmitter available was a 1946 Western Electric 506B-2. These transmitters were notorious for poor tube life and, at $500 a final tube, was something we could not afford, so a research program was started by Eimac to develop a ceramic triode transmitter tube for FM. The people at Eimac felt that there would probably be a market for 10 kW (and higher power later) FM transmitters. The first 3CX 10,000 A3 ever put into FM service was used in our Western Electric transmitter, and was designated an X762B. At the same time that Eimac was researching this project, we were conducting experiments with zero bias triodes and grounded grid circuits. Today, these are standard in most FM transmitters.

The first three years that the station was on the air, we did a great deal of experimenting with stereo and, in 1961, we became the first station west of the Mississippi to broadcast in stereo, which opened up the proverbial can of worms for receiver manufacturers. Being the first to do something is always difficult, because there is no yardstick against which to measure performance. In this case, we were using a stereo generator that was a prototype and there were no receivers available to see if the system worked or not.

When receivers finally appeared, all but two distorted the signal on the high end, but since this was not happening in any of the Eastern markets which were broadcasting in stereo, the manufacturers said it was our fault. After much investigation, we found that it was indeed our fault because our fidelity was superior to any other station in the country. At that time, there were two basic design concepts. The GE circuit received a 19 kHz pilot tone, doubled and amplified it and reinserted it in the decoder. The Scott receiver, which did not distort, was a time division decoder. Since we were using STLs instead of phone lines, and really high fidelity cartridges, our high frequencies were getting in the 19 kHz doubler circuit and creating severe distortion.

Needless to say, all of these receivers were eventually recalled and the systems were changed, but in the first year of FM stereo, there were more stereo sets in San

Francisco than in any other market in the country. Because of our tenacity, we were honored by the Electronic Industries Association in Washington, DC, who attributed the success of FM stereo to what happened in San Francisco, as it had originally failed in both Chicago and Los Angeles, and we were the only FM stereo station in San Francisco.

The FCC decided to issue a Notice of Proposed Rulemaking, Docket 14185, which established the table of allocations for FM stations in the country. In this docket, they changed California, south of the 40th parallel Chicago, Detroit and other areas to Zone A, which permitted only Class B FM stations, with a maximum power at that time of 20,000 W at 500 ft.

Imagine the panic at KPEN—a station with 125,000 W and nearly three times that elevation! All efforts were concentrated on protecting rights for the super powered FM stations. We organized the broadcasters in Northern California, and ran a simultaneous program with all stations tied together, making a public appeal to write the FCC. All stations reduced power during the broadcast to show the public the negative impact such a reduction would have on service. This was copied in Los Angeles and other markets, and we were successful finally, in 1963, in establishing grandfather rights for those stations which had power in excess of a Class B station.

With this victory, we again turned our attentions to develop circular polarization to help FM car radio reception. We received an STA from the commission in the latter part of 1963 to start testing the effects of adding a vertical component to the existing horizontal signal. Another Western Electric 10 kW transmitter was purchased and modified with the Eimac tube to provide the additional required power. Separate vertical dipoles were manufactured and installed on the tower. With this setup we were able to vary the phase relationship and the amplitude so that we could go from a horizontally polarized signal to a circular pattern. Monitoring points were established in rugged areas of San Francisco.

In order to quantify multipath, the left stereo channel was modulated with 400 Hz, and by using a specially calibrated mobile FM stereo receiver with a chart recorder connected to the right channel, we could plot any loss of stereo separation which would be attributed to phase distortion. As the vertical component in the transmitted signal was increased, we found the condition to be substantially improved for optimum stereo reception.

At the same time, Lew Wetzel of WFIL-FM was proving to the FCC that the vertical component did not extend the station's 1 mV contour. With these two reports, the FCC decided that it would indeed be in the public interest for FM stations to transmit with circular polarization. This is the standard today.

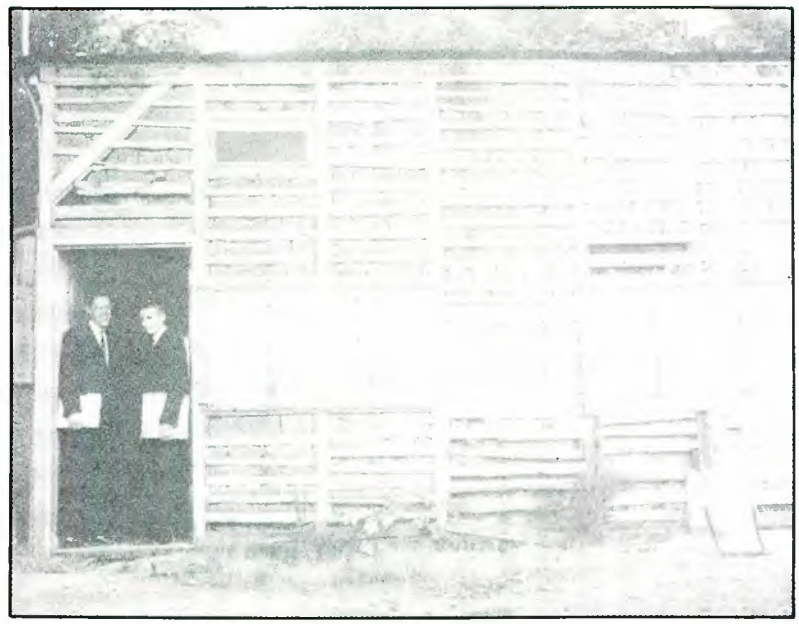
In 1968, the other two partners in KPEN decided to sell me their stock. Up until then, the station had been one of the most successful FM stations in the country. However, as competition increased, the ratings took a nose-dive. It was decided to change the call letters from KPEN to KIOI, and call the station K-101, which everyone said wouldn't work—look at all the Z93's, K102's, 97K's and W104's that have followed in the footsteps of K-101 which, by the way, is a registered trademark.

In our efforts to better cover the San Francisco market with an FM signal, we bought an AM radio station, as we found that AM miraculously was free of multipath and picket fencing in car radios. Immediately upon acquisition of the AM station, we started to work on improving the fidelity on AM, trying and testing everyone's black box, magic audio processors, transmitter modifications and broad-banding antenna systems. One of the positive results of these efforts was that other stations in the area had to keep up and spend a lot of money on new equipment to improve their audio. As a result of these competitive endeavours, radio technically improved in the Bay Area.

In 1967, our AM station received an STA to experiment with a Motorola AM stereo system. This was the third AM stereo transmission in the United States. The conversion of the transmitter was relatively simple and took approximately one hour to have the station transmitting a good AM stereo signal. Extensive measurements were conducted and submitted to the FCC at that time.

Recently, we broadcast a special 12-hour live simulcast with Channel 26, one of the local UHF television stations. It was *Tune In And Watch Your Radio* day. A complete video control room was constructed at the K-101 studios, using four color cameras, chroma-key, and many other special effects. Out of all events that we have done over the past 20 years, this one generated the most enthusiasm from the public. It was the most exciting day in the history of K-101.

Starting with two people, a *very* little bit of money and an old adobe hut, K-101 today is the flagship of a fleet of four and employs about 85 people. In dollars, it's worth quite a bit more than the $6000 it took to start with back in 1956. Its accomplishments over the years in the field of FM broadcasting are priceless. □



K101 began as KPEN-FM in a mud hut on the top of Kings Mountain in Atherton, CA, October 27, 1957.

Case study:
Past and future technical achievement at KTLA

By Edward H. Herlihy, vice president of engineering, Golden West Broadcasters

For over 32 years, the West's oldest television station has been innovating and pushing the bounds of television technology. Today, KTLA in Los Angeles ranks as one of the top independent television stations in America, both in ratings and technically.

After World War II, an experimental television station was constructed on Mt. Wilson, CA, W6XYZ, licensed to Paramount Pictures. That experimental license was turned into KTLA on January 22, 1947. The transmitter was a composite of various manufacturers. Some of it was home brew. In one form or another, it remained on the air until 1966. Perhaps the life span of the transmitter best exemplifies the ingenious engineering talents of KTLA's personnel, headed in the early years by Klaus Landsberg.

Over the years, KTLA has engineered its way to many successes. Long-time KTLA engineering department employees rightfully claim that electronic journalism (ENG) was pioneered at KTLA. Live remotes have been the forte of the station from its inception.

Various and sundry remote vehicles were designed through the years by the KTLA engineering staff, including several versions of the "telemobile" and two versions of the telecopter.

The first telemobile was built in a Ford station wagon, utilizing black and white equipment. The vehicle was totally self-contained, including a complete microwave transmission system enabling it to transmit while in motion. Subsequently, a more rugged vehicle was utilized with 4-wheel drive that is still in existence today, utilizing a portable color camera and a portable 1-inch videotape recorder.

KTLA is probably best known for the invention of the "telecopter." The initial attempt was a hand-held black and white vidicon camera out the side door of a Bell type-47 helicopter. A microwave antenna was suspended below the copter for transmission.

The ultimate telecopter was built in a Bell Jet Ranger utilizing a Philips portable color camera, remote-controlled from the ground and a servo-controlled microwave transmission system to ensure proper orientation to the receive site at all times.

Through the years, technical achievements have been the byword with KTLA engineering. The early years of black and white saw developments in kine recording, long distance microwave and full-fledged studio and remote productions.

The advent of color saw the station in the vanguard with the purchase of very early RCA TK-40 live color cameras. These were later traded for TK-41s, which performed long service until the advent of the Plumbicon camera in the mid-1960s. Today, KTLA operates 16 PC-70 cameras, as well as five TKP-45 portable color cameras.

Videotape entered the scene early in the game at KTLA. The four original Ampex VR-1000 Bs purchased in 1959 still are running today, 20 years later, in a highly-modified form.

In 1966, a decision was made to purchase a new transmitter. The station purchased the first low-band parallel transmitter built in the United States. It was placed in a new building with the latest innovations, including a 2-level microwave room shielded from the elements by fiberglass panels. This room houses a number of large remote-controlled microwave dishes used for KTLA's mini-remotes.

Subsequently, the transmitter was completely remote-controlled in 1975, with a sophisticated, computer-operated system that provides logging at the studio and the transmitter, complete parameter logging on a separate printer, automatic vertical interval test signal logging, and a 2-way teletype communications with the transmitter for maintenance messages. The system is all but ready to operate on "ATS" when it is approved.

Perhaps the biggest change at KTLA technically started in 1975. On-air switching, videotape, telecine and master control were in need of major revamping and updating. A capital investment program was developed to take KTLA operations from basically a 1950s vintage, from an equipment point-of-view, to a station of the future. Automation was the key word—not just in switching on-air, but in the entire system from traffic through videotape, telecine, master control to the final switching system.

A large, sophisticated Grass Valley automation computer system was tied to the BIAS traffic system, to the two ACR-25 videocassette machines and to other equipment in the station. Today, the entire day's log is delivered from the traffic system electronically to the engineering automation system. The technical director on duty has only to enter some of the machine assignments and a few minor embellishments prior to having this electronic log operate the automation for the entire day. The ACR-25s are totally operated by the automation computer. Basically, the ACR-25 operator loads upcoming cassettes in a random sequence in the bins. The cassette machine then identifies each cassette and sends a table of contents to the automation computer. The computer sorts out the cassette and sends back a play list to the ACR-25. Further, the system is sophisticated enough to allow a 3-hour "look ahead" of any cassettes that are inside the ACR-25. If the cassette is to be used in the next three hours, the cassette is allowed to stay in the machine. If it is not, a light flashes on the bin number and says "take me away."

KTLA is now looking forward to the 1980s and new developments in broadcasting and related services.

Already, the station is deeply involved in 1-inch videotape. Two Type C 1-inch studio machines have been in operation for more than eight months. They are being utilized for news recording and other in-house productions.

A newly-designed and constructed mobile unit has just recently had installed portable 1-inch Type C machines. The vehicle also houses two complete on-board power systems so the station can continue to perform "go anywhere" remotes, but still provide complete production facilities and comfort.

Application has been made to the FCC for a satellite earth station in

Gene Autry, second from left, shows off KTLA's vintage 1965 mobile units. The Telemobile directly behind Autry still is in operation.

Independent productions benefit from the $2.5 million renovation that equipped the six KTLA sound stages with such equipment as this Grass Valley switcher in the Stage 2 control room.

conjunction with CBN. The station is also seeking to install an RCA earth station to receive syndicated programming, as recently announced by RCA.

Perhaps the most exciting view of the future held by the KTLA Engineering department is the advent of the all-digital television station. Evaluations are already being made on digitally-controlled cameras and digital videotape recorders.

By 1987, it is estimated that KTLA will have in operation an entire digital video system from the studio to the input of the transmitter. At least the plans are being geared towards a target date in the late 1980s.

The past 32 years of KTLA's engineering history have been exciting and innovating. The future, even on a near-term basis, appears to be even more exciting and gives KTLA more ability to innovate in technical achievement. □

TV in the Bay Area as viewed from KPIX

By **Donald E. Lincoln,** transmitter supervisor, KPIX, San Francisco

Television began in San Francisco more than five decades ago. Does that statement seem strange? Modern, post-war television began in San Francisco on December 22, 1948, when KPIX started regular broadcasts. But, the experiments of Philo T. Farnsworth and a small group of co-workers formed the precursor of modern TV back in the 1920s.

It was Farnsworth, working in his San Francisco laboratory, who perfected scanning techniques which are the heart of the TV system we know today. Farnsworth was responsible for the Image Dissector pick-up tube which, up to the invention of the vidicon, was one of the finest flat field pickup devices known. The image dissector was only practical for film reproduction because of the extreme amount of light it required. It was used in early day pre-war motion picture reproduction, but was later replaced by the easier to use iconscope.

During the 1930s, television as an entertainment medium was largely ignored. Experimental stations in Los Angeles, New York and elsewhere broadcast on an off and on basis, sometimes only once or twice a week for a couple of hours. A guttapercha statue of Felix The Cat was placed on a slowly revolving platform and used as a "live model." Technical development was more important than aesthetics in those days. New pickup tubes were developed, circuitry was improved, but no real, large-scale push was made to develop TV into what it is today.

By the late 1930s, fairly acceptable images were being produced by RCA, Dumont and others. It was during the 1939 World's Fair in New York and the Golden Gate International Exposition in San Francisco the same year that exhibits of live and filmed television were demonstrated on a large scale for the first time. At the San Francisco Exposition the RCA company had a large exhibit which featured live television. The models could stand the hot lights for only a limited period; the studio areas were small, hot and suitable only for interviews and commentary.

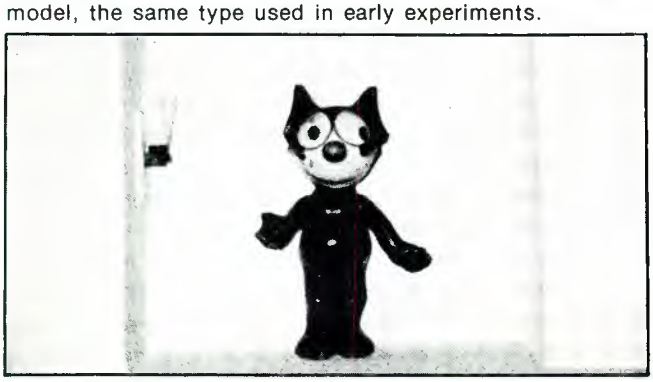
The public was allowed to walk through the TV studio and stand in front of the camera for a few seconds. Friends and family members were able to watch on monitors outside the booth. It was great fun, the lines were always long and the crowds enthusiastic. The interest caused by this first mass demonstration of television at the two fairs sparked an interest in television broadcasting. Both expositions ran for a second season in 1940, but war had started in Europe. This country was not yet affected and some proliferation of television broadcasting occurred. When the United States entered World War II, all TV operations came to a halt.

Following World War II, which produced so many scientific advancements, TV was to come of age. The Federal Communications Commission promulgated new rules, set new standards and allocated new frequencies. Channels 1 through 13 were allocated and applications accepted. Prior to the issuance of any license for Channel 1, the frequency was assigned to other services and there never was a Channel 1. As usual, the East Coast and Los Angeles were the first to have new stations; others followed soon. And as mentioned earlier, KPIX began broadcasting at the end of 1948.

The early days of television were about the same everywhere. There were no experts; all those involved, usually recruits from radio, learned together. The equipment manufacturers would send out some of their people to help get things started, but this provided little additional expertise. Improvements and changes came fast. Things that had been undreamed of became standard practice in a matter of weeks or months.

The newest status symbol became a TV antenna on the roof. Sets were

Felix the Cat was the first TV star. This is a guttapercha model, the same type used in early experiments.



The first sports remote took place at the East-West Shrine Game on January 1, 1949.

The living room in the Sutro Mansion was used as the studio by KGO-TV and later as the transmitter room by KPIX. Note the ornate ceiling and chandelier.

The first Pool pickup in San Francisco took place at the San Francisco City Hall where General Douglas MacArthur was speaking.

The present KPIX television tower extends beyond the fog and overlooks the San Francisco skyline.

The subject for the *Hobbies on Parade* show for this day was amateur radio and hamming.

expensive and not always reliable. Sometimes there was a waiting list to get one. Some people installed antennas on their homes when they didn't own a TV set. To the friend or relative who would come by to view the new communications miracle, it was explained that the receiver was in the shop for some sort of repair. Nobody cared, it was all very exciting—pictures through the air. People would stand in front of a department store window to watch a test pattern.

Those who did own a set had almost total strangers coming by asking to watch. Friends would bring over friends and soon there could be as many as 20 people trying to watch a 10-inch screen. In those days most sets had either a 10-inch or a 12-inch screen.

One day a lady called KPIX to inquire if it was broadcasting 10-inch pictures or 12-inch pictures. It seemed that she and her husband were contemplating the purchase of a receiver and didn't want to buy the wrong size. It was all very innocent. People would watch anything, even a test pattern which was broadcast several hours daily to allow installers to 'line up' new sets. If there was anything on the screen, somebody would be watching.

At this point it might be well to review some of the topographical features which make the San Francisco area a reception nightmare. San Francisco is an area of many hills and valleys. The coast range extends both north and south from the Golden Gate and to the east there is the secondary range of hills which separate the bay area from the central valleys of California. The foothills of these ranges form the primary service area for the San Francisco television stations.

Shadow studies conducted at the Army Engineer's bay model in Sausalito, CA, indicated that there were several possible locations which showed promise. Mount Diablo, to the east, offered a good overview of the entire area, but there were major shadow areas, too many in the primary service region. Mount Sutro, in the center of San Francisco, was very promising, but at the time the owners of the property were not interested. Mount San Bruno, to the south, was somewhat higher than Mount Sutro, however, it had severe shadows on the north side of San Francisco and elsewhere. Mount Tamalpais, to the north, had disadvantages similar to Mount Diablo. There seemed no truly ideal location.

The site finally selected was the Mark Hopkins Hotel on San Francisco's Nob Hill. One of the reasons for selecting the hotel was that KPIX's parent company, KSFO Radio, had studios located in the hotel and there was room for the TV studios as well. KSFO was to subsidize KPIX for a while until advertisers became convinced that TV could do a selling job for them.

The original transmitter plant was located at the top of the hotel, above the level of the world famous Top Of The Mark lounge. This made the transmitter sort of the Top of The Top Of The Mark. Within a short while it became apparent that the hotel location could not be a

long-term location, nor had there ever been plans to stay there permanently.

In the meanwhile KGO-TV, Channel 7, had concluded negotiations for purchase of the Sutro property. They moved into the old mansion and began telecasting in mid May of 1949. KRON-TV, Channel 4, chose the Mt. San Bruno location and went on the air November 15, 1949. In early 1952 KOVR assigned to Stockton in the Sacramento valley began telecasting from Mt. Diablo with studios in both San Francisco and Stockton. In addition, a pioneer in the UHF field, KSAN-TV, Channel 32, came on the air from Mt. Sutro. Early in 1952 KPIX began construction of a new transmitter plant at Mt. Sutro; their operations began from that location in May of 1952.

From the foregoing it appears that the viewer was in a quandary as to which way to point his antenna. Certain parts of the city would receive some stations better than others and the antenna rotor manufacturers did a good business.

Always competitive in the areas of programming and sales, there existed a good deal of cooperation among the different stations' engineering departments. No one ever stayed off the air for lack of a part or a tube which could be borrowed from one of the other stations. Breakdowns were common and hints and tips were shared unselfishly. The first Pool Operation was during the return of General Douglas MacArthur from Korea. This was an event of major importance and certain feeds from specific cameras were shared. San Francisco was feeding the rest of the nation and it was a big boost for local television.

Live sports coverage was a major item in the programming schedule of all of the local stations. Baseball, football, boxing and of course wrestling, were all covered for better or worse. There was no instant replay, no color, and sometimes only one or two cameras. All things considered, it was pretty good coverage.

At the very beginning, station employees would come in on their day off just to watch. Hours were long and the pay was low. The engineering staff worked together on all manner of problems; those who didn't cooperate didn't last long. It was hard work, long hours, but everybody loved it. It was the start of a new industry. By the mid 1950s television's adolescence was over. Owning a TV set was no longer a status symbol, but a necessity. The stream of technical improvements which would occur in the next two decades was beginning to emerge.

Color was being broadcast on a more or less regular basis, at least by NBC, which was pushing hard after winning the fight from CBS over which system would prevail. The studio had become the factory, Hollywood had made a marriage, if not of love, then of convenience with the emerging giant of the entertainment field. But sadly enough, that transmogrification process which led to Newton Minnow characterizing television as the "vast wasteland" had already begun. For those who had been in from the beginning, it wasn't quite as much fun anymore. □

Radio pioneers

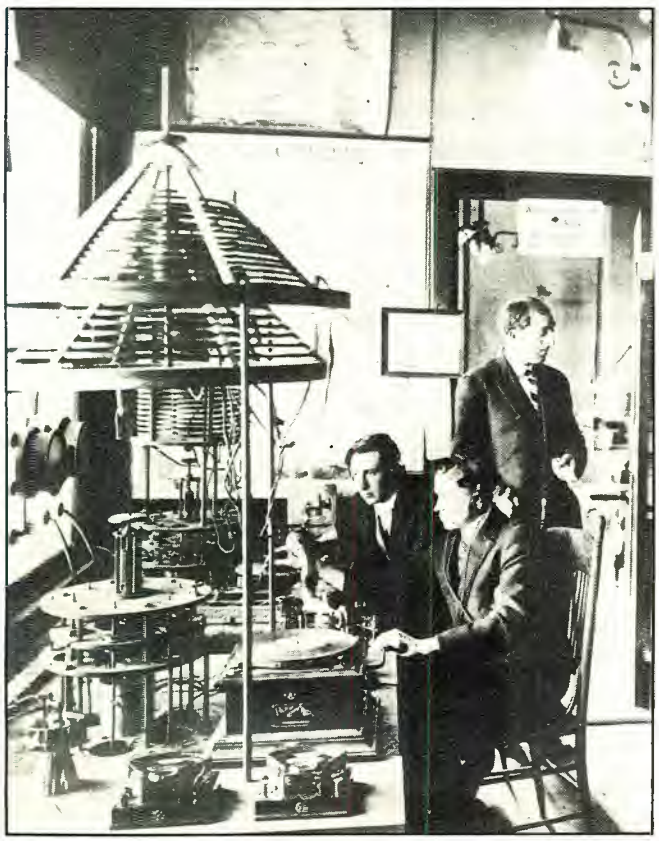
It is difficult to believe that just 60 years ago communication by electronic means was merely a dream in the minds of a few people. Today broadcasting plays such an important role in society that it is hard to imagine a way of life without it.

Who was first in broadcasting? That's a difficult question. Much depends on what is defined as broadcasting and whom one interviews. On the radio side there were five stations that exhibited a rich tradition in being first in broadcasting: KDKA of Pittsburgh, WWJ of Detroit, Doc Herrold's Station at San Jose, WHA of the University of Wisconsin and WGY of Syracuse. Each of these stations were first in their own way, and each played significant roles in establishing the foundations for radio broadcasting.

Because of limited transportation and primitive, handmade equipment, each station truly has claim to being the first in many ways. The stations were essentially isolated geographically and were the developments of inventive minds of the time. In this anniversary issue **Broadcast Engineering** applauds their pioneering accomplishments in broadcasting and wishes them good fortune in continued public service.

Over the years, **Broadcast Engineering** has covered all of the developments associated with radio broadcasting, including the efforts to improve sound quality and transmission. The latest in these continued efforts by the industry to produce better sound, and **BE**'s continued coverage of this technology, is in the area of digital audio techniques. Last year at the AES convention in New York City, a considerable amount of attention was given to the technology of digital techniques for audio processing, and in demonstrating the latest equipment associated with digital audio. There is no question that digital (at least in the audio field) is firmly entrenched in audio processing and broadcasting. However, the lack of standardization is a serious handicap to the industry and must be resolved before digital broadcasting can become a mature industry. As this occurs, and it surely will, **Broadcast Engineering** will continue its service in covering the technology for its extensive readership.

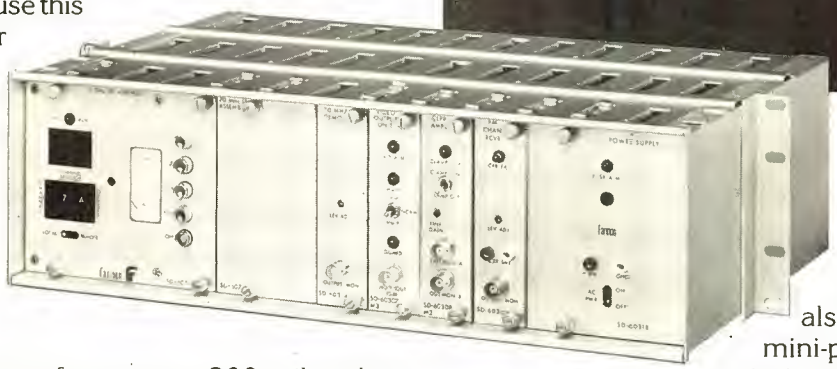
Early station operation at KCBS. Note phonograph for broadcasting music and early instruments for power measurement.



The plaque dedicated to station KCBS, San Jose, in 1959 by the San Jose State chapter of Sigma Delta Chi.

Our new receiver couldn't care less where your ENG crew goes.

With Farinon's new FV2CR Central Receiver, you can now send your ENG crew to wherever the action is. And minimize the problems of weak signals and distortion. That's because this outstanding receiver has an unsurpassed 82-dB dynamic range. When signal strengths vary due to different transmission distances, the FV2CR compensates automatically to assure optimum performance.



For transmissions as far away as 300 miles, the FV2CR can operate with a minimum system fade margin of 20 dB. And with the ENG crew as close as 1/8 of a mile, the receiver's front end won't overload and cause distortion like other receivers.

The FV2CR provides 21 synthesized channels in the 2-GHz band. By instantaneous phase-lock loop, the channel you select (manually or remotely) is the channel you get. And the receiver's unique, extremely sharp IF SAW filter provides excellent selectivity of at least −45 dB with maximum half-channel rejection. Also its noise figure of only 3 dB is tops in the industry.

Now you'll have a new degree of freedom in news coverage. So you can send your ENG crew wherever the action is. And Farinon's new FV2CR Central Receiver couldn't care less where they go.

Farinon Video also offers portable and mini-portable video transmission systems, STL microwave radios, FM transmission channel systems, as well as video baseband treatment units and ancillary equipment.

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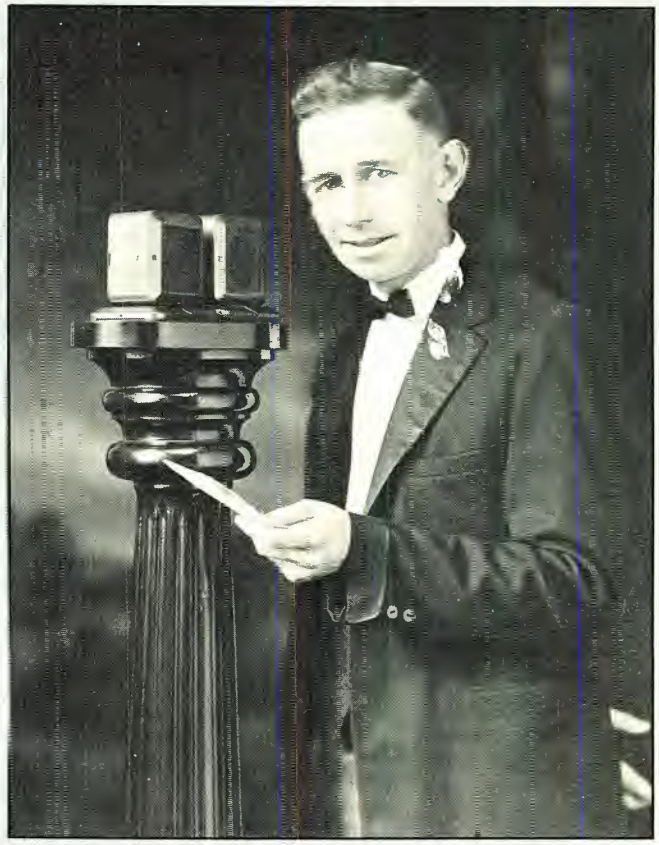
Circle (73) on Reply Card

Dr. Frank Conrad conducted the experimental work that led to the establishment of KDKA, Pittsburgh, which made its formal debut on November 2, 1920. Conrad was the first to use the term "broadcast" to describe a radio service.



Harold W. Arlin, the first full-time radio announcer in the world, did the first play-by-play of baseball and football and introduced many noted persons in their radio debuts on KDKA.

The Birthplace of Broadcasting at WWJ, *The Detroit News,* August 20, 1920. WWJ was the first station to be operated by a newspaper and the first commercial station to broadcast regularly scheduled daily programs. Early technicians included (left to right) Howard J. Trumbo, Elton Plant and Keith Benand. (Photograph by *The Detroit News*)

"The TDF-1 makes all our signals studio quality."

"The TDF-1 Digital Noise Filter has made a major difference in how our news feed looks..."

"As a member of ITNA, we receive co-op news feeds from all over the world, and sometimes they are 6th or 7th generation converted from PAL by the time we receive them. The TDF-1 absolutely dramatically cleans up even the worst feeds. It makes us look live . . .

"Commercials shot with ENG/EFP equipment look better. It cleans up shots under existing light to the point where the client is happy with them . . .

"Overall, our day-to-day operations look significantly better."

— Hal Protter
Vice President and General Manager
KPLR-TV, St. Louis, Missouri

"The TDF-1 has given us a consistent air look and higher overall quality - better than network ..."

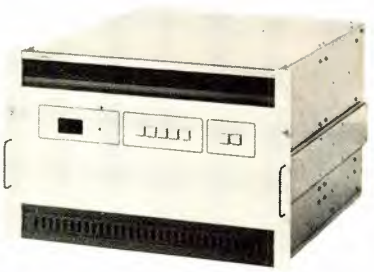
"It really makes life easier — it improves the signals that need improving and leaves the rest alone . . .

"We did a side-by-side test with a competitive unit, which we thought was pretty good, but when we brought the TDF-1 in — well, somebody had sure done their homework on it! It especially handles film grain better . . .

"It's fabulous on cartoons! By the time you run the TDF-1 up to its top correction, you end up with a signal that has no grain . . .

"I haven't seen anything it doesn't handle well."

— Jim Gonsey
Chief Engineer
KPLR-TV, St. Louis, Missouri



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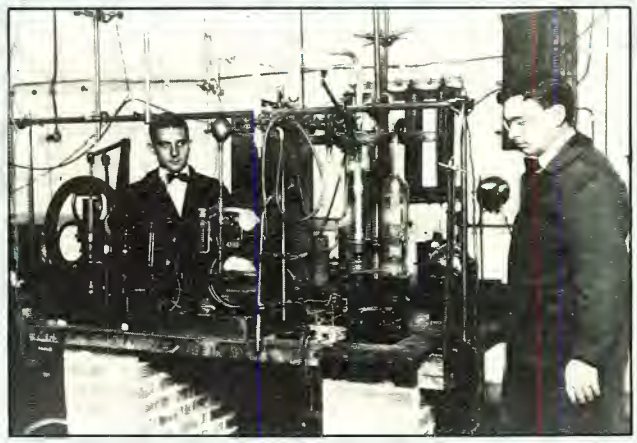
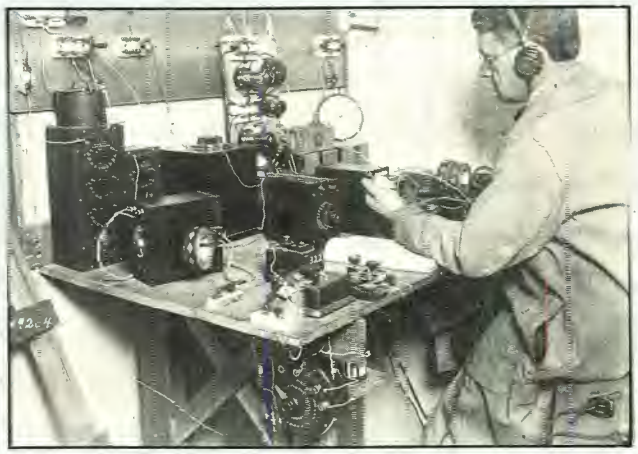
Radio pioneers



9XM-WHA on the University of Wisconsin campus, achieved its first successful transmission of voice and music in 1917. Pioneers in the establishment of the station, Malcolm Hansen (left) and Professor Earle M. Terry, are shown with early equipment. (*Photograph by the University of Wisconsin*)



Professor Terry is shown at work on WHA equipment in 1923. (*Photograph by the University of Wisconsin*)

The WHA master control room as equipped in November 1973. (*Photograph by the University of Wisconsin*)

"This Auditronics 501 was one of TM Productions' first

boards six years ago and it still runs a tightly packed schedule of original vocal session recording and mix-downs", says Ken Justiss, Operations Manager of TM Productions in Dallas. "Since we do more commercials and station ID's than anybody else in the world, we produce literally thousands each year, and at some point they've all gone through this Son-Of-36-Grand (serial number 011)."

"There's not a faster board to work with than the Auditronics 501 whether we use it for building demos or complex production tasks. It's compact; all its controls are so very accessible even trainees become proficient on it quickly."

"Its reliability is outstanding. We've literally worn out the faders once, and we've changed a switch or two, but the things I've seen go wrong with this board in six years are so minor, it's a waste of time to even talk about. It's an excellent creative tool and I'd find it hard to fault our Auditronics 501 in any area. In fact, our success with this board was largely responsible for our buying three more Auditronics consoles."

If you'd like to know more about what Ken Justiss at TM Productions and over 300 other satisfied users think about Auditronics consoles, circle reader service number or contact:

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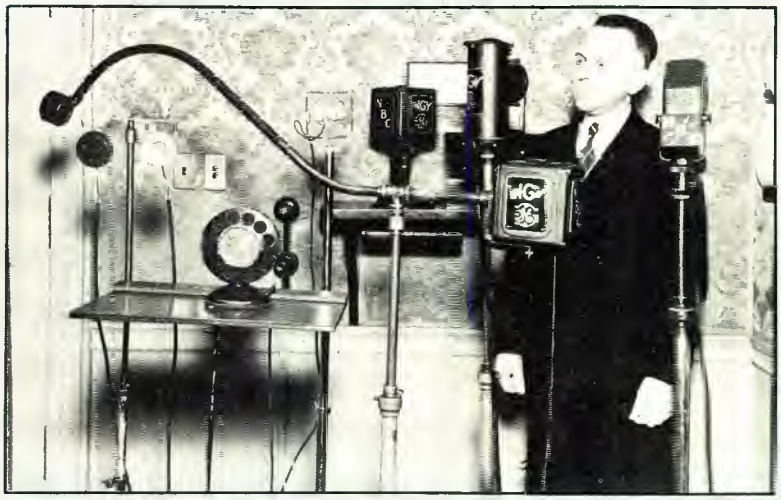
auditronics inc.

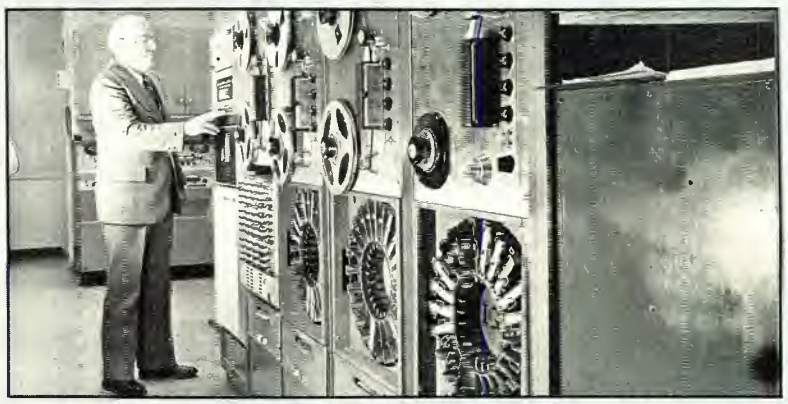
Circle (74) on Reply Card

Radio pioneers

Franklin D. Roosevelt as governor of New York broadcast at WGY in a similar manner that he would use a few years later in his presidential *Fireside Chats*.

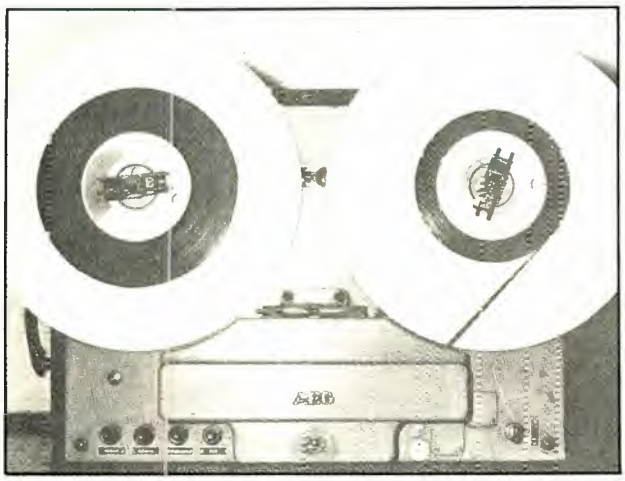


Kolin Hager, the first voice of WGY, is shown with a collection of some early mics.



Charles King, WGY operations manager for the past 40 years, operates the minicomputer that controls the station's cartridge machines.

John Herbert Orr is shown receiving the Audio Pioneer gold trophy at the 1975 conference of the International Tape Association. Orr was instrumental in the development of the first magnetic recording tape for the armed services and the Ferro-Sheen tape coating process. Orr established Orrox Industries to provide material for the production of magnetic tape. The John Herbert Orr Collection of phonographs, radios, wire and tape recorders includes over 600 individual items valued at $1 million.



One of the German Magnetophons captured at radio Luxembourg after D-day served as the basis for US manufacture of the Ampex and Rangertone audio recorders. (*From the John Herbert Orr Collection*)

Radio pioneers

The Rangertone audiotape recorder was one of the first American-made tape recorders that matched the performance of the German Magnetophon. The system served to start the switchover from electrical transcription discs to magnetic tape at studios in the late 1940s. (*From the John Herbert Orr Collection*)

George Craig, chief engineer at KSAN (left), and Bob Peterson of Dolby Laboratories discuss the features of the Dolby FM noise reduction system. Dolby Labs, established by Ray Dolby in 1965, was instrumental in the development of the FM noise reduction industry.

Television pioneering

Two pioneers of electronic methods for scanning, reproducing, and transmitting video images deserve special mention: Philo T. Farnsworth and Vladimir Zworykin. Farnsworth became enamored with electricity at a tender age and, while still in high school, staggered his science teacher by asking advice concerning his plans for developing electronic television systems. Even at that time (1922), he recognized that the mechanical systems were doomed to failure and felt that electronic means was the way of the future. By 1927 he had achieved his first successful transmission, and had applied for his first patent for television. In August, 1930, 34-year-old Farnsworth received his patent and in the following year entertained Vladimir Zworykin of RCA in his California laboratories.

Farnsworth's original broadcast included transmissions of graphic images, continued film clips of a Dempsey-Tunney fight, and scenes of Mary Pickford combing her hair from her role in the "Taming of the Shrew." This pioneering broadcast set in motion the progression of technology which would lead to commercial television 20 years later.

In his early systems, Farnsworth could transmit motion pictures of 100 to 150 definition with a repetition rate of 30 pictures per second. By 1939 Farnsworth held many patents for television. Indeed, his thoughts seemed to be directed toward cornering patents for the field and protecting his ideas, and this obsession with patents appears to be the source of his separation from the research laboratories of the Philco Corporation. Throughout the mid-1930s Farnsworth remained RCA's fiercest competitor in the development of television. In many ways Farnsworth's image dissector was unable to meet the quality of RCA's Iconoscope, but in other ways it exhibited superior performance.

In the late 1930s fierce patent conflicts between RCA and Farnsworth flourished. These were ended in September 1939 when RCA capitulated and agreed to pay continuing royalities to Farnsworth for the use of patents. This ended a long period of litigation, but by that time Farnsworth held an impressive list of key patents for electronic video.

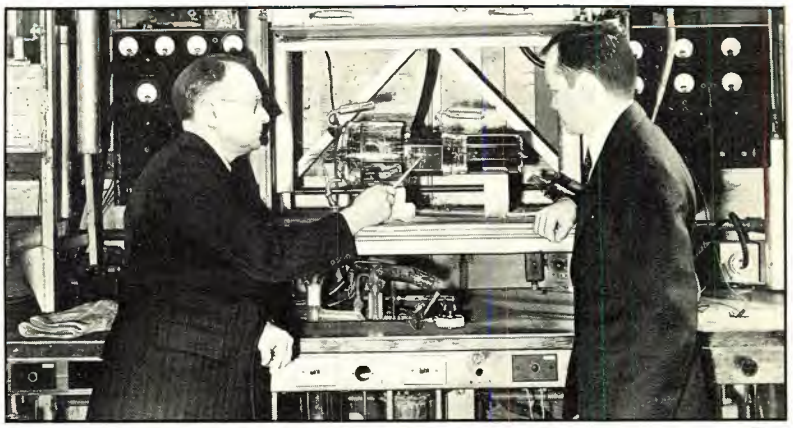
Philo T. Farnsworth died in 1971, only slightly credited for the giant industry which he helped create. But many San Franciscians point out that the "T" in his name stands for television. Presently, the San Francisco Motion Picture and Television Council is spearheading a movement to commemorate a 1981 stamp honoring Farnsworth's pioneering effort in the development of television. Anyone wishing to support this movement may communicate with **Broadcast Engineering** to have their interests passed along.

In marked contrast to Farnsworth history, Dr. Vladimir K. Zworykin received his interest in television through his physics professor, Dr. Boris Rosing, at the St. Petersburg Institute of Technology. Upon coming to the United States in 1919, he joined Westinghouse Electric in Pittsburgh and began concentrating on the development of an electron imagery tube. As early as 1923 he was able to demonstrate to Westinghouse executives the first tube that permitted all electronic television. His first tube was a very thin aluminum oxide film supported by a thin aluminum film and coated with a photosensitive layer of potassium hydride. With this crude camera tube and a CRT as the picture reproducer, Zworykin had the essential elements for electronic television.

Continuing his pioneering work, Zworykin developed the Iconcoscope 8 years later, a tube which employed a relative thick, one-sided target area. In the meantime he had continued work on improving the quality of CRTs and presented a paper on November 18, 1929, at the Eastern Great Lakes District Convention of the IRE. This attracted the attention of David Sarnoff, then VP and General Manager of RCA, and led to his joining RCA Victor Company in Camden, NJ, where he was made director of RCA's electronic research laboratory. By 1931, with the Iconoscope and CRTs well developed, electronic television was ready to be launched—and David Sarnoff and RCA were ready for the new industry of television. □

In 1933, station W9XK and radio station WSUI, broadcasting from the campus of the State University of Iowa, thrilled midwestern audiences with a regular evening program of television. WSUI broadcast the audio portion on its assigned 860 kHz frequency, W9XK transmitted video at 2050 kHz with a power of 100 W. This twice-per-week program, initiating educational television, included performances by students and faculty with brief skits, lectures, and musical selections. During the early 1930s, station W9XK was the only television station in the world located at a university transmitting simultaneous video and audio programs.

As noted elsewhere in this issue, the General Electric Company played an early role in developing television. In 1926, a young Swedish engineer at the company, Ernst F. W. Alexanderson, developed a mechanical scanning disc for video transmission and gave a public demonstration in January, 1928. Coupled with the GE station, WGY, Alexanderson's system again made history on September 11, 1928 by broadcasting the first dramatic program on television—a 40-minute play titled *The Queen's Messenger*. This program involved 2 characters performing before 3 simple cameras. □



Two of RCA Victor's famous staff of television research engineers, Dr. V. K. Zworykin (left) and E. W. Engstrom, examine a new piece of equipment at the Camden laboratories. (RCA Victor photo)

Early network role

Both the National Broadcasting Company and the Columbia Broadcasting System took early leads in paving the way for television. NBC, through the envisionary eyes of David Sarnoff and the RCA resources, stood ready at all times to undertake pioneering television efforts. From its transmitter on the Empire State Building, RCA began field testing television transmission in 1936.

By 1935, Sarnoff felt that TV could establish an industry-wide dominance only if television set manufacturers and broadcasters were using the same system and had adopted the same standards. This would only occur if the FCC would adopt suitable standards and allocate the needed frequency spectrum. Toward this end, in April 1935, Sarnoff made a dramatic announcement that RCA would put millions of dollars into television development.

In a parallel move, the CBS organization (after several years of deliberation) was ready to make its views public. In 1931, CBS put a New York station on the air with television and air programs for about a year and a half before becoming disillusioned with the commercial aspects of TV. However, in 1937, CBS again committed itself by announcing an expenditure of about 2 million dollars for experimental field testing of TV systems.

In other areas, the Allen B. DuMont Laboratories made significant contributions to early television. While DuMont made significant advances in CRT development and in synchronization techniques, its major historical contribution appears to have been the production of early electronic TV sets for the public in 1939.

Television was formally launched in July of 1941 when the FCC authorized the first two commercial television stations to be constructed in the United States. However, the quick growth of early television was ended by the freeze as the nation entered World War II. By the end of 1945 there were nine commercial TV stations authorized with six of them being on the air. In June of 1946 there were 21 construction permits authorized and in June of 1947 there were 66. The first post-war full commercial license to be issued was in January, 1948, to NBC's Washington station, WNBW. On September 20, 1948,

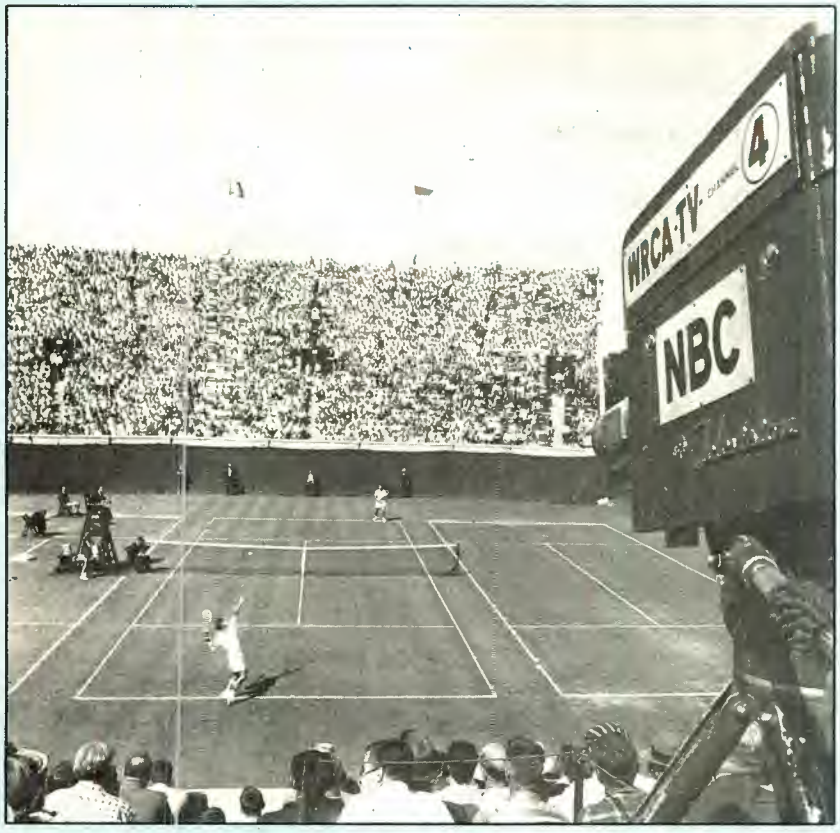
In another area Edward J. Nobel bought the NBC Blue Network for 7 million dollars in 1943 and renamed it the American Broadcasting Company. As previously noted, this was merged in 1953 with Paramount, and ABC was born.

Thus it is that radio and television have been brought to fruition by many fertile minds, much dedication, much litigation, and stands today as the most awesome force on earth in communication and in shaping public opinion. The industry stands ready to launch itself into the 1980s with great anticipation for digital technology and its resulting advantages. □

Sports coverage

The first baseball game ever televised was the Princeton-Columbia contest covered by NBC at Baker Field, NY, on May 17, 1939.

NCAA basketball was covered at the Checkerdome, St. Louis, 1978.



National Singles Tennis Championship was held at Forest Hills, 1956.

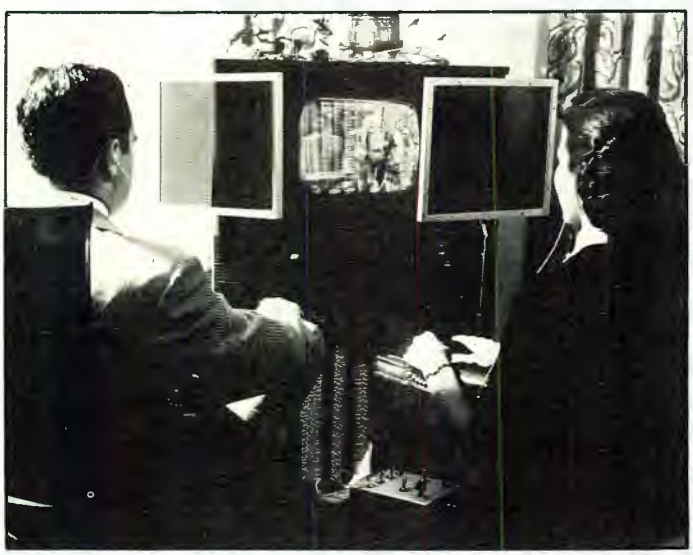
1978 World Series was covered at Yankee Stadium, New York.

Video museum highlights

Photographs courtesy of E. Grayson Mattingly, president, Smith-Mattingly Productions

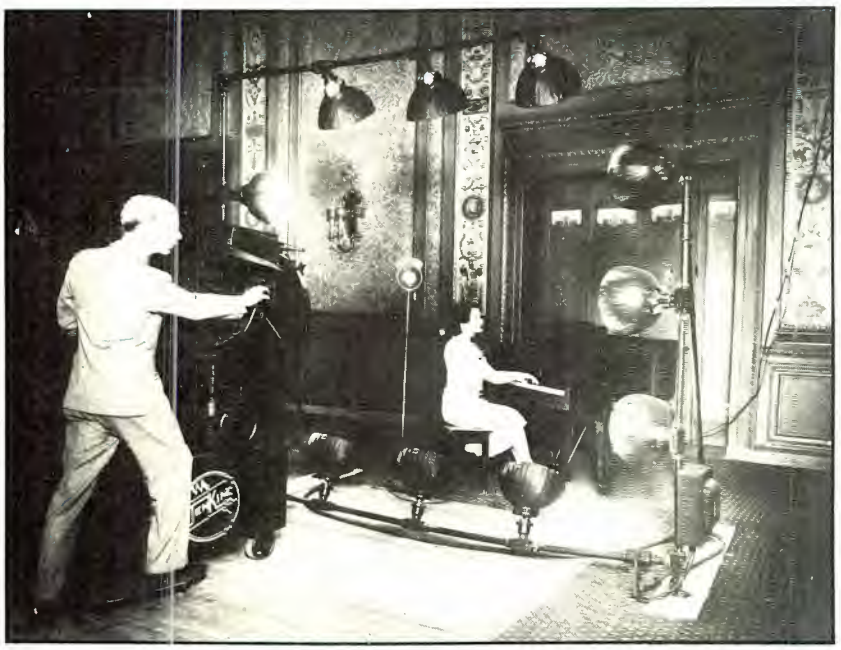
Early television set

Early production in first Dumont studio



In early TV, this system allowed two programs to be broadcast simultaneously on one channel.

A Jenkins flying spot scanner receiver

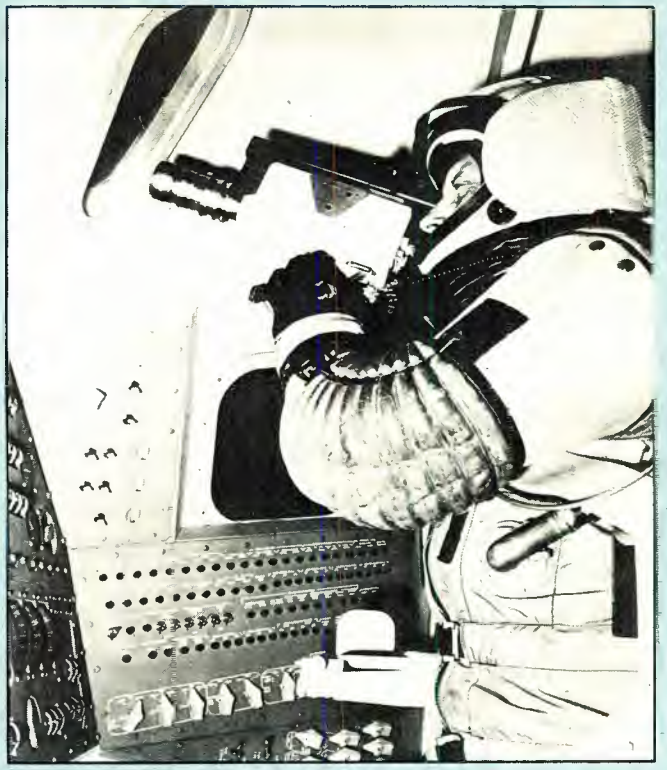


Flying spot scanner in use

"On location" incorporating other media

Television from space

Bob Graham, McDonnell Aircraft spacecraft engineer, assists Gordon L. Cooper, astronaut on the MA-9 mission, with the placement of the Lear Seigler camera.



Television history was made when the Apollo 7 and 8 astronauts used an RCA portable TV camera to transmit the first "live" programs ever sent to US homes from an Apollo spacecraft.

A TV transmission from Apollo 8 (1968) shows Astronaut Borman waving. The craft was 120,653 nautical miles from earth and traveling 3207 mph when this TV picture was transmitted.

This photograph of the moon's surface was taken from inside the lunar module by the Apollo 11 lunar mission crew. The US flag on the lunar surface dominates the photograph. Far in the background is the monochrome lunar surface television camera which televised the event.

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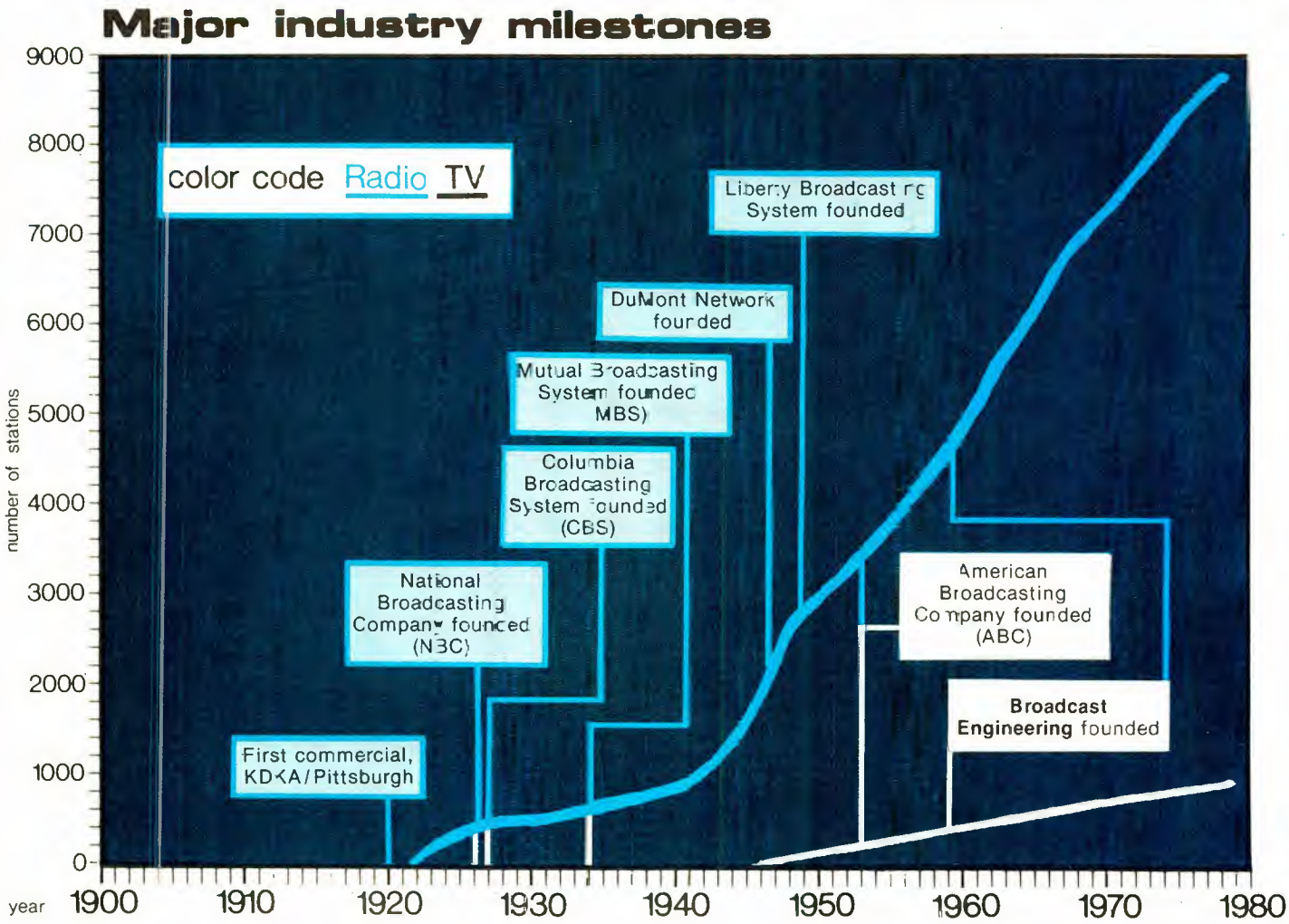
Managing technology



Birth of the networks

The formation of networks and their growth through advertising revenue form an exciting chapter in the history of broadcasting. The giant RCA organization was the first to recognize that the development of broadcasting technology and the management of broadcasting services could be served better with independent companies. As a result they set the trend in network formation by creating the National Broadcasting Corporation in 1926. NBC handles all the broadcasting function of the network, fully utilizing resources in the industry, but having the giant RCA R&D organization at its disposal for developing technology that makes continued growth in broadcasting services possible.

Similarly, CBS was founded in 1927 and maintains its R&D facilities at the CBS technology laboratories in Stamford, CT. When Mutual (MBS) was created in 1934 it was founded on a radically different principal—that of programming without the supporting R&D. Much later, with the launching of communications satellites, Mutual was destined to become a significant factor in broadcasting upon its basis of programming expertise.

Two other broadcasting organizations—the DuMont Network and the Liberty Broadcasting System—founded in the mid-to-late 40s played important roles of broadcasting of their time but later bowed to the giant networks in terms of dominance in the marketplace.

It is easy to praise the networks for their growth and development, but the small independent operator should not be overlooked; nor should the smaller localized networks. Both the independent operators and the smaller networks form important portions of the broadcast marketplace. Their service within their respective areas are vital to communications in those areas and to the economics of their territory.

Growth of broadcast advertising

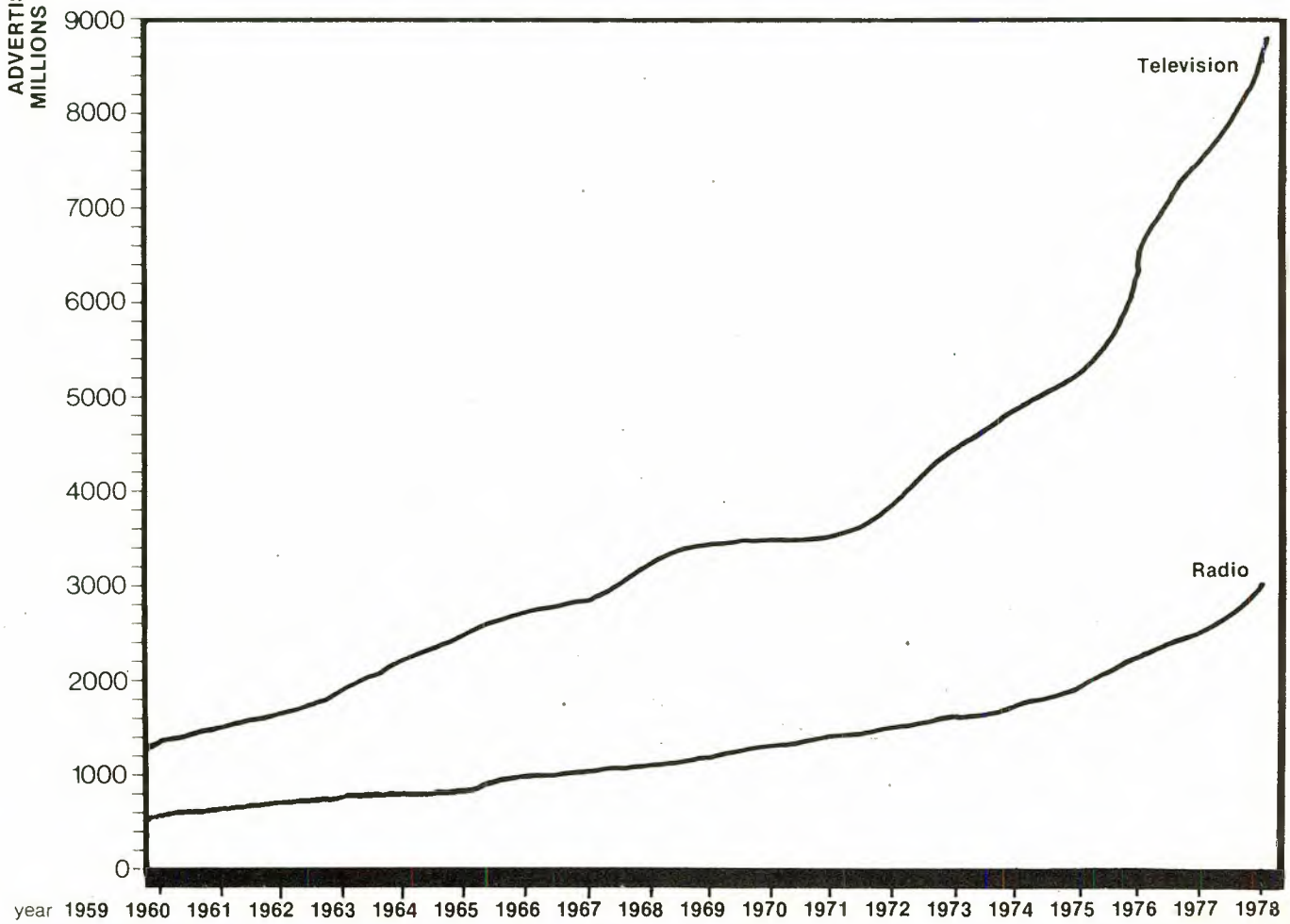
As noted elsewhere in this anniversary issue, advertising became an early part of the operation of both Doc Herrold's station in California and KDKA in Pittsburgh. Thus, the groundwork was set for obtaining financial support to operate stations almost from the beginning of regular broadcast scheduling. When **Broadcast Engineering** was founded in 1959, the advertising level for broadcasting was just over 2 billion dollars annually as shown in the accompanying chart and graph. At that time there were 4,153 radio stations on the air and 609 television stations. Last year the combined radio and television advertising closed out at slightly in excess of 11 billion dollars while the number of stations had risen to 8,621 radio and 988 television stations.

Thus, over the period in which **Broadcast Engineering** has continued its service to the industry, the number of stations on the air have increased by 20.2% while advertising revenue has mounted 540%. The accompanying graph shows that the marked increase for television revenue began in 1971 and has increased dramatically to date. For radio, over the years, advertising revenue has grown steadily and took a noticeable rise in 1979, but at a rate less than its counterpart in television advertising.

The data show a healthy, dynamic industry. The results of the March NAB convention in Dallas show an all-time record of interest in broadcast instrumentation and sales. That interest at NAB is directly coupled to the growth in broadcast revenues. Broadcasters have more money to spend, even though they are selective in that spending. They are intensely interested in new equipment because that new technology is what they'll be using in their stations tomorrow. With this in mind on our 20th anniversary, **Broadcast Engineering** congratulates the industry on its health and vitality and wishes it continued growth and prosperity.

	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968
Television	1,529	1,627	1,691	1,897	2,032	2,289	2,515	2,823	2,909	3,231
Radio	656	693	683	736	789	846	917	1,010	1,048	1,190

	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978
Television	3,585	3,596	3,534	4,091	4,460	4,851	5,263	6,721	7,612	8,850
Radio	1,264	1,308	1,445	1,612	1,723	1,837	1,980	2,330	2,634	2,955



The growth of videotape editing

By Arthur Schneider, A.C.E.

When the first videotape recorders appeared in 1956, the question immediately arose "Can we edit videotape?" Early attempts were crude by today's standards. The first splicer was an aluminum block, a steel straight edge and a razor blade. At first, the television frame line was not clearly defined and making a successful edit was a hit or miss proposition. We used to call it "Kamakazie" editing.

In the 10 years I spent splicing videotape, I made more than 20,000 edits. It is interesting to note that two years after videotape was introduced, NBC in Burbank developed a method of editing tape by first using a kinescope film as a workprint and later, conforming the tape master to the edited film workprint. One of the first television shows to utilize this technique was the *Fred Astaire Special*, edited in 1958. This technique was an immediate success and a flood of television shows were edited that first year.

As a matter of fact, this technique of using a film workprint to edit videotape spread around the industry rapidly and although the other networks did not develop systems of their own, NBC supplied editing facilities to many producers that aired their shows on other networks. I remember seeing my screen credit on all three networks on the same evening! Some of the television shows edited by this method at NBC were *Laugh-In*, The *Bob Hope Comedy Specials* and many other award winning programs.

This was really the first attempt at what is now called *offline editing*. Actually far ahead of its time, it was in use for more than 12 years at NBC.

The history of videotape editing may be broken up into three groups that provided definite jumps in technology. The first was physical tape splicing that started in 1957. In 1967, time code editing appeared and continued in its present form. Overlapping time code editing was automatic computer control developed in 1971. There are no defined lines that separate the various groups since all three exist today in many parts of the world. As a matter of fact, there is quite a bit of tape splicing still being done in Europe today.

Videotape editing increased steadily as small television stations along with the networks purchased equipment to edit in-house productions. In spite of the fact that splicing videotape provided a rapid means of editing for producers and directors, this physical handling of the tape sometimes caused tape damage, scratches and other defects that many times could not be repaired. Since high band color recording did not come into use until around 1965, copying videotape from low band color originals did not provide good quality "dupes" for distribution.

So, in 1963, Ampex developed an electronic method of editing videotape. This first electronic tape editor allowed the operator to play back material from one VTR and record this image on another VTR loaded with a blank edit master tape. The obvious advantages of this were that the original material was not cut or altered in any way and could be used over and over again without harming its quality. This is essentially the method of editing used today, called *transfer editing*.

The first splicing was an aluminum block, a steel straight edge and a razor blade.

Soon, another improvement was added. A small computer was interfaced with this electronic editor to control the in and out edit points on the master tape. This was accomplished by recording audible "beeps" on the secondary or cue channel of the tape. These "beeps" either turned the editor on or off as determined by the operator. This computer-controlled device is known as Editec. Even though not very sophisticated, it gave production people more flexibility than they previously had.

So far, this has referred to editing 2-inch videotape. The equipment required just to play the tape is very costly and adding an editor to a VTR increased its cost even more. The hourly rate charged by most facilities can run the cost of post-production into the thousands of dollars. When editing on 2-inch tape, the term used is *on-line* editing. It literally means "at the terminal." What is being created is a finished product in many cases ready to be broadcast. True, there is no conforming or matching to other copies edit by edit, but the dollar cost is pretty high. The producer or director may be under pressure to finish quickly to reduce costs.

A low-cost solution developed with the advent of offline computer editing. This equipment uses inexpensive videocassette VTRs interfaced with pre-programmed computer software. A workprint picture is created with all the dissolves, wipes, and fades so that the production staff can see an exact work copy of what the finished master will look like. Offline editing provides a number of advantages. First, low cost. The average offline rate is about one third that of the on-line rate. Second, using videocassettes, the editor has the ability to see a still frame as well as to move the picture forwards and backwards slowly, giving greater flexibility and control over the edits. Third, a paper-punched tape and a hard copy printout of all the edits in the program (some systems even include pertinent notes between the edit lines). Finally, the noticeable relaxed atmosphere of a comfortable offline editing facility enables the production staff to concentrate more easily with fewer distractions of a lot of noisy equipment usually surrounding them.

Even less expensive are the joystick editing systems using the same type of videocassette machines as are used on the more sophisticated computer controlled systems. Many tape producers and directors have joystick editing available to them for rough assemblies of daily material or simply just to provide a means of doing their homework prior to going into the editing room.

Without the ability to still frame the cassette VTR as well as to move it forwards and backwards, users would find it very difficult to use it for making accurate notes for editing.

A rule of thumb that may be used to estimate costs is to figure that for joystick editing systems, facilities charge about $35 per hour plus the editor. About $100 per hour is charged for computer editing includ-

ing the editor, and about $300 per hour for 1-inch or 2-inch computer editing including the editor. All rates are for three VTRs except the joystick type, which uses two VTRs.

Computer offline editing is about one third the cost of 1-inch or 2-inch, and joystick editing is about one third that of offline computer editing. Remember, this is an average figure since rates will vary from facility to facility. It is also true that post-production houses may offer package rates below their list prices if editing is booked in for several days at a time.

A few years ago, microprocessors and minicomputers appeared on the market. They brought the cost of computer-assisted editing systems down, which made them less complex and easier to maintain as well as more user-oriented. Since 1971, the television industry has been editing with sophisticated computer systems which have the ability to store hundreds of edits as well as to recall them in an instant.

There are now more than 40 manufacturers of editing systems in the United States and Canada. Eight years ago, there were but a handful. It is interesting to note that in Los Angeles today there are close to 90 computer-assisted editing systems compared to 80 at the end of July last year. And this does not include the "joystick" non-time code editing systems that are used in schools, businesses, hospitals and even in the homes of television producers and directors.

It is my concern that there may not be enough trained editors to meet the demand of the future. Eventually, the major film studios will go into videotape on a much larger scale than at present. Closed Circuit Pay Television will demand more quality product than the industry may be able to supply. We must provide the creative people as well as the technicians to meet this demand. The Editors Guild in Los Angeles is one of the first to train its members in videotape editing, being aware that videotape is here to stay and cannot be ignored.

With digital recording just around the corner, and a host of other technical goodies available to the producers and directors, the future of videotape looks bright and promising. Videotape allows people to see special effects as they happen, not wait for days or weeks for the laboratory to create the effect.

Don't laugh, but the technology is available today to build an editing system that allows the editor to talk to the system, telling it to perform edits or any one of a hundred editorial functions. Wisely enough, it will only recognize its masters voice, anyone else attempting to over ride the editor's commands will be politely ignored! This is certainly bound to make editing easier and more creative, even less technical.

I look forward to this and other challenging concepts as a way of helping to do a better job. Believe it or not, more people are employed now as a result of computer editing than ever were in the past, using conventional tape editing techniques. So look forward to the challenge of computer-assisted editing. It can be very creative and satisfying. □

Looking back on 35 years of radio and TV

By **Bob Zweck**, president, ASTVC

The spring and summer of 1943 found me very much involved with all aspects of the operations picture at WNLC, located then near the Thames River in New London, CT. To be exact, the transmitter site was so located. As I recall, the studios were in the old hotel Mohican. However, inasmuch as a good portion of the program origination was at the transmitter site, I still think of that as home. We switched from the Yankee network to Mutual and back to the studios and then back to the turntables at the transmitter.

Every so often, I'd cease my sweeping and run to the cut-in mic for a station ID or some other copy. While I never thought I would be another Jimmy Wallington, I secretly felt that I had some of the nasal tones of an Andre Baruch until I heard the off-the-air recordings. Then I felt Archie Andrews or Homer might be more like it.

At any rate, I decided to concentrate more on the technical side of broadcasting and colluded with destiny to assure my future as an engineer. I would have been at WNLC yet, had not lightning struck the transmitter. After being forced back into the transmitter building by some unreasonable representative of the management, I realized that I had to make a choice: either remain here in the "country" with the easy life, or seek employment with one of the big city nets where the living might not be so easy, but where there might be more of it (since the large buildings did offer more protection from the elements).

Well, I did take my leave from WNLC and joined forces with the National Broadcasting Company in September, 1943. In those days, NBC had an apprentice-training program. I could not have afforded to pay for a course such as that if I wanted to. But, it would have been worth whatever the cost. NBC, of course, did not charge for the training, but paid a salary to all those hired as apprentice engineers.

Some of my classmates were guys like the late Johnny Norton who went over to the Blue network which later became ABC. John transferred to the TV side at ABC and became a technical director for the net. Another apprentice was Larry Lawrence, who would be becoming one of NBC's best audio engineers, doing shows like the Lucky Strike *Hit Parade*. Larry's rapid rise as an audio great found him rivalling old-timers like Gil Markle, the super-mixer on shows like *Mr. District Attorney*, and even catching up on pros like Ed "Buddah" Whittaker, who for years did the audio chores on General Electric's *All-Girl Symphony Orchestra* program.

And there were many others, like big Ed Peddy, who earned himself a place in the Hall of Errors. It happened this way. There was a company-union agreement that while an apprentice could "take the controls" while assigned for instruction to a Group-2 (or regular) engineer, he could not operate in place of an assigned engineer or on his own. The incident in question saw Eddy and his mentor assigned to a NEMO (remote) at the old Roseland Ballroom in New York City.

And on this evening there was another broadcast in process when Teddy Hahn, NY master-control supervisor, began receiving complaints from long lines and various other points of periodic distortion and erratic fluctuations in the program level. Hahn got on the PL to Roseland and asked what was wrong (among other things). It did not help his mood or digestion to learn that "the pilot (Group-2) had bailed out and the steward (apprentice) was at the controls."

This might not have ever been discovered if the engineer in question had told the apprentice in question that you can't ride gain on the filament rheostat! It just won't substitute for the master gain. Shortly, thereafter, the engineer was launched into a somewhat successful storm and screen door business.

Upon being accepted for the program, an apprentice would be assigned to the field group under Max Jacobson. He would spend approximately two months in that area going out for instruction with a regular field engineer. He would

then be rotated to the maintenance group under the supervision of old-timers like "Chris" Christopher. Here, he would enter into the activities from polishing patchcords to rewiring mic connectors. The over-the-shoulder and on-the-job training was intensive and rewarding. This was one area where you could get your hands on the equipment, tear it apart and put it back together under the direction of some of the best professionals in the business. I will never forget Gordon Windham patiently correcting my mistakes until I could service a 44-A mic almost as well as he.

Those who learned faster (according to the ratings given them by their mentors and section chiefs) left sooner to become full-fledged Group 2 Studio/Field Engineers. The evaluations of regular engineers plus the amount of training and experience one had before coming to NBC usually determined just how long the period of apprenticeship would last.

I am asked from time to time about some of the celebrities I surely must have met while here at NBC. One of my favorites was the wife of the late President Franklin D. Roosevelt. This delightful lady had a talk and interview show each afternoon which was visited by some of the world's better-known personalities from the world of politics, theater, the arts, etc. And although she had rubbed elbows with many, if not most, of the world's leaders while in the White House, she never was anything but unaffected, cordial and even solicitous towards the personnel with whom she worked.

I also enjoyed working with the late Fiorello LaGuardia, then broadcasting in the Italian language for the overseas section of the Office of War Information. In addition to the Red and Blue networks that were a part of NBC, we had a third net that serviced the government's overseas broadcasts. This was affectionately known as the White network. Mayor LaGuardia would arrive routinely to lend his effort to the big propaganda barrage we had mounted; in this case against Italy, part of the Rome-Berlin axis at the time. We had a battery of antennas located at Bound-Brook, NJ, which was capable of beaming transmissions across the oceans to most of the occupied countries.

Also, how can I forget meeting Frank Sinatra when he was the idol of the Bobbysoxers at the peak of his war-time career in 1943? He was then surrounded by staff, PR men and the rest of his entourage fighting off autograph seekers while trying to make his way into studio 6A for one of his appearances. I contrast this with the picture of a lonely, depressed and rather forlorn fellow who had suffered many reverses and in the spring of 1951 was doing a relatively unrewarding radio drama in studio 3B called *Rocky Diamond, Private Eye*. Frank was not surrounded by staff or autograph seekers then.

You may have noticed that the foregoing has concerned itself mainly with my early days in radio to the exclusion of TV. The great impact made upon me by this business (industry, if you prefer) was in the radio era. I was introduced to a "family" that I had grown up with and had come to know by listening to in my home for most of my formative years.

I transferred to the TV side back in January of 1960. It was a big and dynamic industry then. But a sad thing happened not too long after I came upon the scene. It started to go the way of radio. Live programming disappeared with the advent of tape. In-house production was abandoned to the movie industry. I won't end this piece with predictions of where the industry is heading or what the future holds in store for the incoming class of 1983 or beyond; but it will never be the way broadcasting (both radio and TV) was in the past. □

In 1945, NBC broadcasted from the Circus Lounge in the Hotel Piccadilly, New York City.

Bob Zweck cues record at International Broadcast Studio in 1947.

In the 1964 New York Senate race, Bob Zweck worked the remote at Senator Keating's headquarters.

Bob Zweck is shown handling the NBC *Nightly News* camera, broadcasting from studio 3K.

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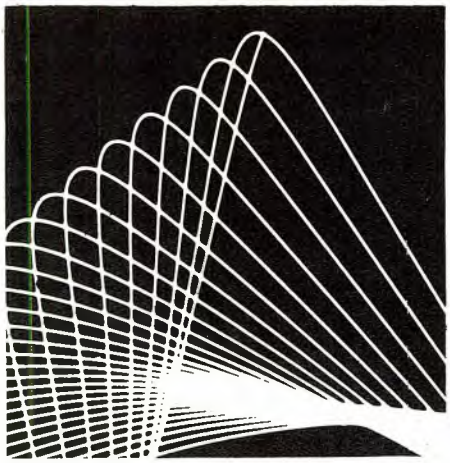

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VIDEO PROJECTION TECHNICIAN. A young, rapidly growing industrial video company seeks a motivated, experienced technician to service Advent, Panasonic, IMI and GE "Light Value" video projectors. Minimum requirements include 2 years repair experience with color TV and/or Advent projectors. Knowledge of digital, computer terminals and VTR's would be a plus. Salary negotiable. Applicants should send resume only (no later than May 25, 1979) to Andy Curtin, 1832 18th Street, N.W., Washington, D.C. 20009. 5-79-1t

CHIEF ENGINEER for new Denver area public TV station. Participate in original construction. First phone, maintenance experience with older RCA VHF transmitters, ENG equipment, STL, required. Send resume, salary history, and references to: John Schwartz, KBDI, Box 4262, Boulder, CO 80306. Equal Opportunity Employer. 4-79-2t

TELEVISION BROADCAST TECHNICIAN: Baltimore television station has an opening for a technician. Must have FCC 1st class license and technical school education. Send resume to: Chief Engineer, WMAR-TV, 6400 York Road, Baltimore, Maryland 21212. E.O.E. M/F. 5-79-2t

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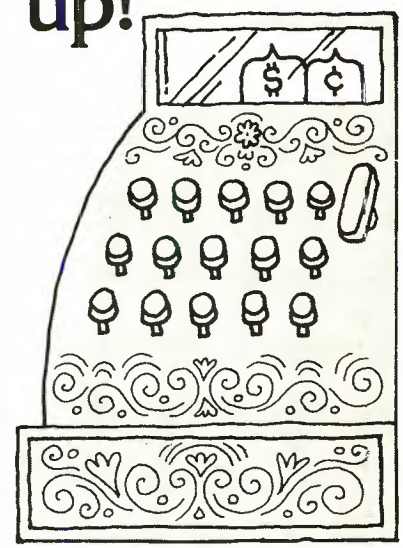

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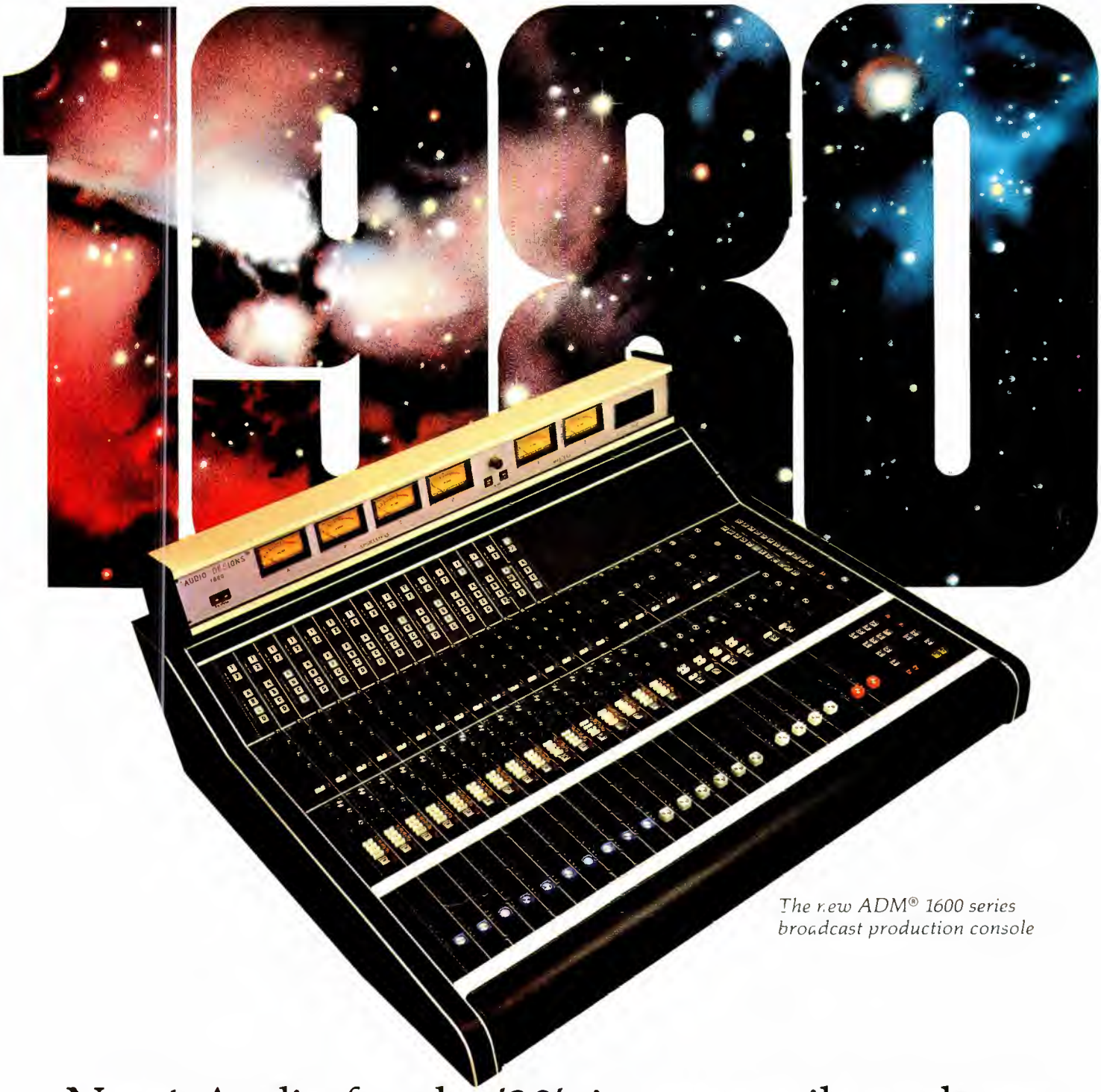

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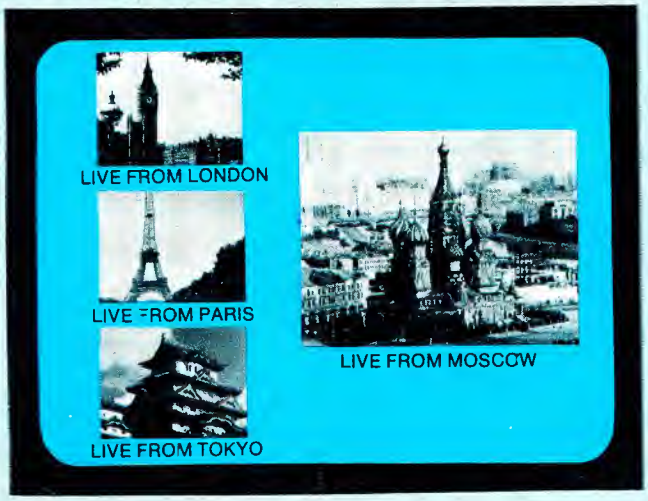

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