

# Report on the 14th SMPTE Television Conference

## Toronto, 1-2 February 1980

The Toronto Section of the SMPTE found a hot topic to counter their city's chill when they selected "The Digital Decade" for the theme of the Society's 14th Television Conference. The weather was bright and bracing, and only the thermometer stood still — at about  $-18^{\circ}\text{C}$  or  $0^{\circ}\text{F}$ . The whole spirit of the Conference was one of intensity and enthusiasm, as if the idea was to compress a five-day conference into two days.

The Committees, Working Groups, and Study Groups had the spirit even before the official opening of the Conference. In fact, two days before the opening, the Working Group on Digital Video Standards stirred up tremendous interest when it called for the formation of a task force to investigate the possibility of developing one worldwide color television standard based on digital encoding of component color signals. The task force, under the chairmanship of Frank Davidoff (just retired after two decades with CBS), will examine whether NTSC, SECAM, and PAL must remain forever sacred, immutable, and incompatible. It has been said that nothing in the world can resist an idea whose time has come; on Friday and Saturday, numerous informal debates were heard about whether a worldwide digital color TV standard is such an idea. With the groundwork laid in the 1970s in digital electronics, it seemed that almost anything might be possible in the Digital Decade of the 1980s.

In keeping with the Conference theme, the Equipment Exhibit was limited to digital television equipment (including teletext systems) only. The papers that were presented (29 of them) fell into four categories: the all-digital TV plant, digital signal

processing, digital transmission and testing (including teletext), and digital recording. The outstanding success of this 14th Television Conference in attracting 1127 attendees, along with 17 exhibitors with 37 booths, and assembling such a high quality papers program can be credited to the enthusiasm, energy and know-how of the Committee members. General Arrangements Chairman, Maurice French, Canadian Broadcasting Corp., initiated plans for the Conference many months in advance. Other hard working Chairmen were Ray Brulé, 3M Canada Ltd., Papers Program Chairman; Robert A. McKinstry, OECA., Hotel and Luncheon Chairman; Peter Taylor, Canadian Broadcasting Corp., and Fung Lam, Sony of Canada Ltd., Audio Video Chairmen; Colin F. J. Davis, Kodak Canada Ltd., Publicity Chairman; and Howard Wilkinson, Canadian Broadcasting Corp., Exhibit Chairman. Edith Balantyne of Applied Electronics Ltd. was Assistant Auditor; Steve Cook of Arri/Nagra was CN Tower Reception Chairman; Walter Zessner of George Brown College was Registration Chairman; and Brigid French was Ladies Program Chairlady.

### The All Digital TV Plant (Friday Morning)

The session opened with a welcoming address by *Frederick M. Remley*, SMPTE Vice-President for Television Affairs. Session Chairman was *John Lowry* assisted by SMPTE Television Engineer Albert Conte.

The first paper, **Integrated Circuits for TV in the Digital Decade**, was presented by *William M. Webster* of RCA Laborato-

ries. He told the audience that the tremendous advances in large scale integrated (LSI) circuits during the 1970s brought about many changes in television and that he expected the coming of very large scale integrated (VLSI) circuits in the 1980s to foster even more changes. The same wide tolerance go-no-go properties that make digital circuits the preferred medium for LSI and VLSI argue for the choice of the digital domain for the storage and processing of TV signals. The need for critical adjustments and the noise and distortion build-up inherent in analog television circuitry disappear when digital techniques are adopted. Webster also noted that to realize the full potential of digital television we must continue to advance the state of the art of digital ICs. Projecting the past into the future suggests a single-chip frame memory for \$10 and a 70 $\mu$  A/D converter by 1990.

Webster predicted that whole computers, including RAM, ROM, and I/O all on the same chip will replace the separate LSI components of today's microprocessor systems. Late in the 1980s, he predicted, we can expect super-fast microprocessors that will permit programmable real time digital television signal processing. During the 1980s, he said, on-going development of computer-aided design tools will lower the design costs for custom circuits, making their use more economically viable in low unit volume applications such as broadcast equipment.

The second paper, **The All-Digital Television Studio**, was presented by *Frank Davidoff* of CBS, who predicted that the ultimate use of digital video would be in the all-digital studio which would be digital all the way from the camera to the master control output and possibly even up to the transmitter modulator. He noted that the introduction of digital video into television broadcasting has occurred in three phases: (1) the use of digital black boxes with analog inputs and outputs to perform functions not possible with analog circuits; (2) the use of digital black boxes with analog inputs and outputs to replace analog equipment having equivalent functions; and (3) the use of an all-digital studio. An additional phase has been proposed — the introduction of a digital editing suite between phases 2 and 3. In its simplest form the digital editing suite would be a digital island in an otherwise primarily analog program production or post production facility. Its input and output would be composite analog signals. Within the suite, however, video mixing, special effects, recording and editing would be on a completely digital basis to obtain the advantages of digital technology, especially where many generations of recording are involved.



Toronto, host of the 14th Television Conference, is a thriving cosmopolitan city. This view of the new City Hall from the Conference hotel shows how Toronto aptly mixes old and new.



SMPTE President Robert Smith addresses the Press in the Queen Elizabeth Suite the evening before the Conference opens.



The local committee has every reason to be proud, as the Conference was a rousing success.



SMPTE dignitaries lent their prestige to the Conference. Left to right: Messrs. Hedden, Becker, Smith, Coleman, and Sweeney.



A sumptuous buffet at the Thursday night International Reception was enjoyed by (left to right): Messrs. Reichard, Alden, Farmer, and Teitelbaum.

The choice of composite or component digital coding for the digital editing suite is now being discussed. Davidoff noted that although most people were leaning toward component editing, everyone is unanimous in the desire to have one common universal digital recording standard. An SMPTE Study Group and an EBU Committee, Davidoff observed, have been set up to discuss users' requirements for a digital videotape recorder.

The third presentation was by *Robert S. Hopkins* of RCA, entitled **Report of the Committee on New Technology**, a brief historical survey of the committee's with emphasis on digital video activities including digital television interface standards. The Committee on New Technology was formed in 1976 and has been very active in digital television from the beginning. Although this committee has several other interests in new and advanced technology, Hopkins' report was dedicated to digital television (the theme of the Conference). Four digital television groups report to the parent committee: the Study Group on Digital Television, the Working Group on Digital Video Standards, the Study Group on Digital Television Tape Recording, and the

newly formed Task Force on Universal Digital Television Coding. There has been a strong recent emphasis on component coding both within the SMPTE and in Europe. Recent meetings of the Study Group on Digital Television have concentrated on component coding. Although the Working Group on Digital Video Standards has worked primarily on composite coding, at a pre-Conference meeting the Working Group unanimously decided that a Task Force on Universal Digital Television Coding should be formed to investigate the possibilities for a worldwide component digital television format. The steering committee of the Committee on New Technology formed this task force only hours prior to the presentation of the paper, and Frank Davidoff accepted the Chairmanship role.

The next paper, presented by *J. R. Sanders* of the BBC Research Department, was entitled **When Are Digits Going to Meet the Action?** Digital methods have had relatively little use in picture origination equipment such as cameras and telecine, mainly because analog methods have been considered to be adequate and less costly. There are two areas of application, the first, control and correction, usually in-

volves microprocessor controlled slow speed operation and comparatively small amounts of storage; the second is in the real time processing of television signals. For telecine a digital control system can be used to regulate the entire operation. Electronic cameras already employ microprocessors to achieve automatic setting up and storage of information related to registration with digital links between the control position and the camera head. Cameras with solid state sensors are likely to need fairly complex correction systems. In principle the storage of element-to-element information is possible although this calls for many megabits of storage. The feasibility of such an approach should become more realizable as storage techniques develop.

An entirely digital processing channel has been in experimental use at the BBC Research Department for several years. It would be surprising if all-digital processing channels do not appear within the next two years. Much depends on the availability of high resolution (at least 11 bits), high speed monolithic analog-to-digital converters at a reasonable price. A solid state line array telecine is showing considerable promise. Reduction in film grain visibility by digital



Executive Committee business was also on the agenda. Shown are: William Connolly, Joseph Flaherty, Charles Anderson, Robert Smith, Donald Breidt, Harold Eady, William Hedden.

methods could become an integral part of telecine technology.

**Digital Audio Formats for Recording and Digital Communication** by *Toshi T. Doi* and *Heitaro Nakajima*, both of Sony Audio Technology Center, Tokyo, discussed various formats for digital audio recorders as well as digital audio transmission. Some specifications of rotary- and stationary-head digital recorders were shown. If strong error correction is adopted, the packing density can be increased, keeping the same (or better) reliability and the tape speed can be slower. Stronger error correcting schemes usually require more complex circuits. Thus a trade-off exists between the price of tapes and that of hardware. One example considered was that of an I/O format for digital communication for audio.

*Jurgen K. R. Heitmann* in **The Future of the Digital Television Studio** gave a general survey of digitizing methods currently in use as well as suggestions for standardization and gave a look at possible future developments including the fully digital television studio. Such a studio would be mainly characterized by the fact that account need no longer be taken of the different color standards.

Composite coding methods are used in synchronizers and time base correctors for studio recorders while component coding is used in standards converters, film scanners with digital stores and special effect devices with electronic zoom. The complexity of the subcarrier is the reason for the well known editing problems. According to Heitmann it seems justifiable to demand the solution of these problems in the digital studio of the future. The only way to do this, he said, is to use component coding in the television studio. Heitmann examined (principally from the European point of view) the disadvantages of the current analog color standards for production purposes and suggested that a digital standard can overcome them.

*A. H. Lind* of RCA Corp. presented **An Overview of Progress Toward the Digital Television Plant**. He noted that there has recently been much progress toward the all-digital TV plant. Advances have been made in digital video, audio, and control. So far, however, digital equipment has taken the form of black boxes — devices sandwiched between A/D converters and D/A converters in order to interface the equipment into the analog system. Many of these digital products were developed to provide functions that could not be prac-

tically achieved by existing analog technology. As interface standards are developed there will be a growth of digital subsystems, marking a transition period. Eventually, various digital subsystems will be interconnected in an all-digital system — the ultimate all-digital plant exists for changes in the future television system and plant that will rival the advance from black-and-white to color television. It is therefore extremely important, he said, that all digital system standards be developed with great foresight and careful deliberation.

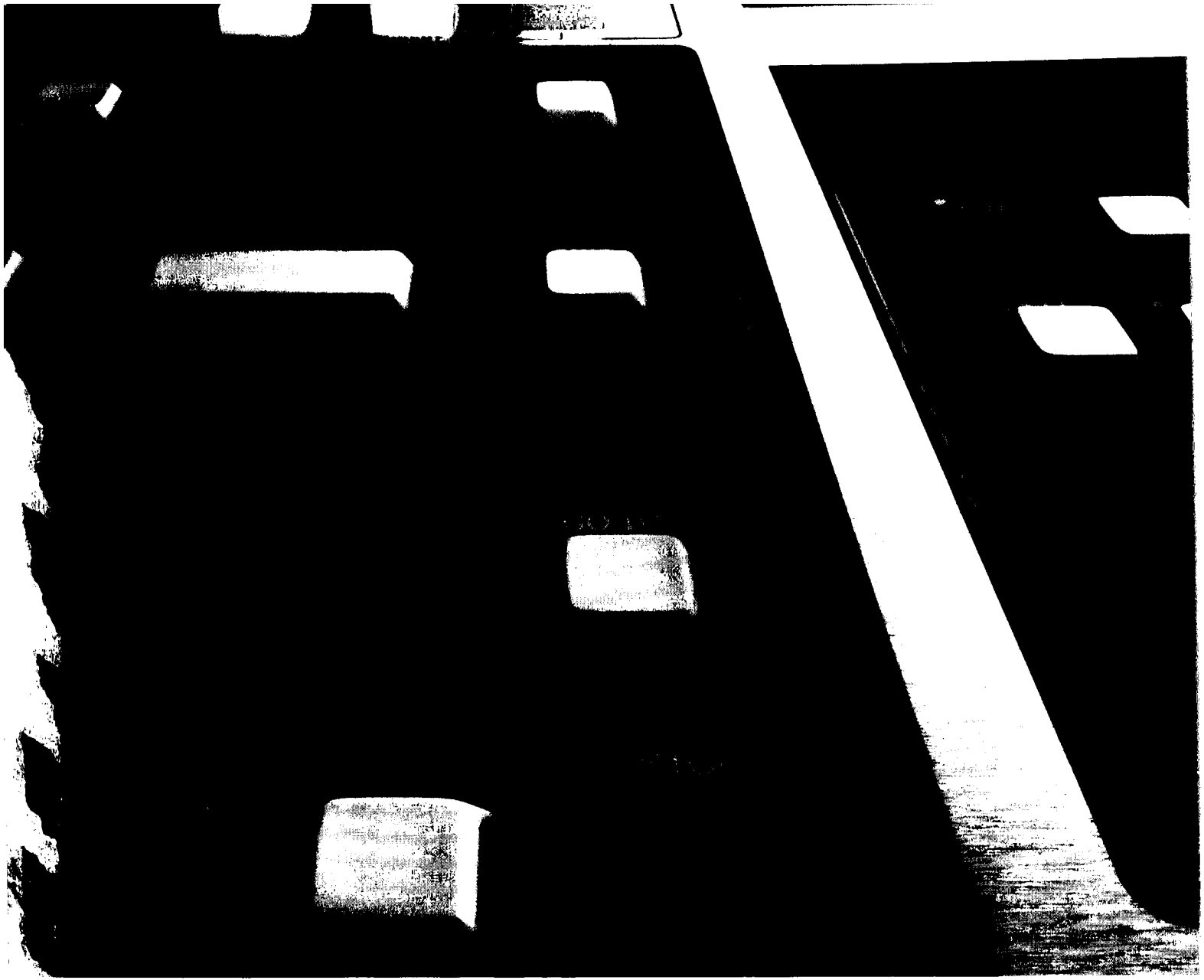
The keynote address at the Friday Luncheon of the Conference was delivered by Professor Robert B. Scott who is Coordinator of Media Studios in the Dept. of Film and Photography at Toronto's Ryerson Polytechnical Institute. Professor Scott's subject was Education in Media and Media in Education. In this entertaining and thought-provoking presentation, it was pointed out that humanity at this time is in the midst of an Information Revolution that may well have an impact equaling the Agricultural Revolution of 10,000 years ago and the Industrial Revolution of 200 years ago. The technology now exists or is being developed that can almost instantly put any item of information into the hands of the person who needs it anywhere in the world. Before this state can be attained, however, a number of issues will have to be squarely faced: the alienation from science felt by many people in society; the right to privacy of information vs. the right to free access to information; copyright protection; prevention of media monopolies; control of transnational data flow; jurisdiction over cable, microwave, broadcast, and satellite systems; international control over satellite transmission and receiving patterns; and the effects of new communication technologies on job markets, economies, and industries. Along with gold and oil, information will become an international medium of exchange. Just as teletext represents an interaction among educational, television, and computer disciplines, so too should there be interaction among human minds to ensure that our utopian dreams are not transmuted into Orwellian nightmares.

### Digital Signal Processing (Friday Afternoon)

Chairman of the Friday afternoon session on Digital Signal Processing was Kenneth Davies, assisted by Vice-Chairman John Murch, both of Canadian Broadcasting Corp. John D. Lowry in **Digital Video Processing — 1980** presented an overview of video processing, starting with the conversion of the analog television signal into digital data words, through a range of digital picture processing techniques to the conversion back to an analog television signal for display, transmission, etc. Lowry noted that as we enter the 1980s there is an ever increasing number of new



Keeping the Canadian funds separate from U.S. funds took some doing as about 1000 attendees registered in scarcely more than 24 hours.



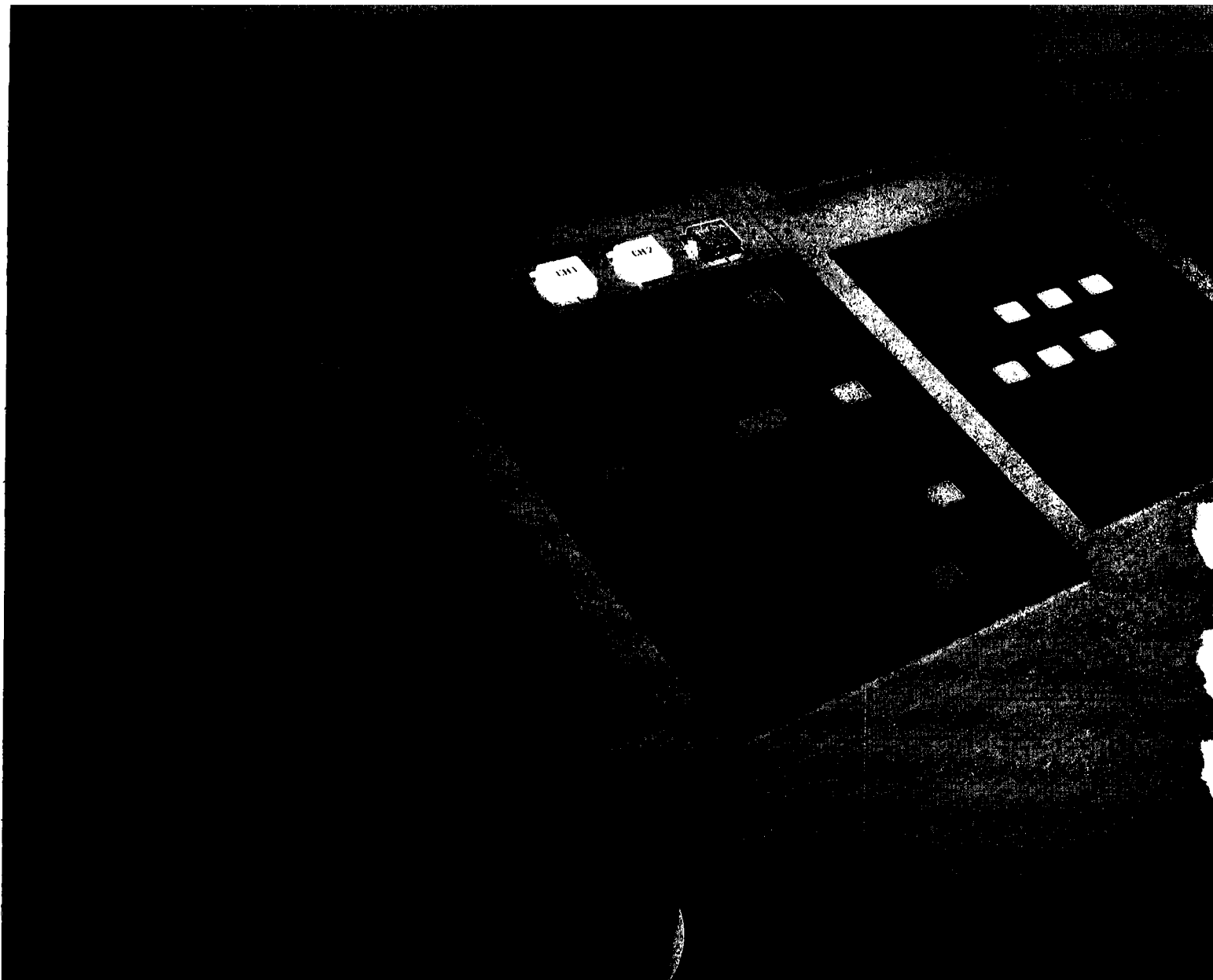
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Our competitor's 3/4" editing system sells for less.  
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If you were to perform the same edit on both the Panasonic 9000 G-2 Series and our competitor's system, you'd get a faster, more accurate edit with us. That's because our system is the only one with microprocessors. In all three components. They give you the most accurate control, the most precise timing of machine functions, now available. And that results in faster, more accurate edits for you.

Accuracy comes natural

to the G-2 Series. Take the NV-A960 controller with its address time indicators, which double as lap time indicators to measure the length of your inserts. The indicators are accurate to the frame, to 1/30th of a second. That's more accurate than our major competitor. And that can help make *you* more accurate. Also, both the NV-9600 editing deck and the NV-9240 source deck have electronic tape counters that read out in minutes

and seconds, even in fast forward and rewind. And that's far more accurate than the competitor's mechanical tape counters.

You can also get a faster edit than with any other 3/4" editing system in its class. Thanks to microprocessor technology. And many new and exclusive editing features. Like the NV-A960's ten microprocessor-based, dial-operated, lockable tape search speeds, plus pause. All with picture. So you can find what you're

looking for faster. Also the controller lets you edit faster with automated in/out insert and assembly editing, preview, review, fast return-to-in-point and fast go-to-out-point. A valuable combination of features that nobody else in its class has, to help you save valuable time.

Just when you're trying hardest to save time, that's when you're most likely to make a mistake. And that's where our automatic instruction error diagnos-



Shown left to right: NV-A960 Controller, NV-9240 Recorder and NV-9600 Editing Recorder.

tics comes in, another Panasonic exclusive made possible by microprocessor technology. It helps you find your errors fast by displaying a code that shows what you did wrong. Error diagnostics can also keep you from compounding your mistakes, to help bring edit time to a new low.

No matter how fast or accurate your edit is, it's all wasted if you don't get a great picture. To help you get it, only the G-2 Series gives you the precision of

full direct drive, including the video head cylinder and capstan motors. Plus the strength, stability-of-alignment and long-term durability of our aluminum die-cast chassis. Plus crystal-oriented HPF™ heads. Plus a lot of other high-performance "pluses" that add up to picture quality that's second to none.

But what good is a great picture and a great edit if your dub looks like a dub? Panasonic has three new features to make sure that it

doesn't: Our exclusive re-located video head switching—now entirely within the vertical blanking area, so it never shows up in the picture. Our exclusive head amp frequency adjustment, so you can compensate for tapes recorded on other ¾" decks. Plus separated luminance and chroma signals with direct transfer of chroma and a simplified circuit path for luminance.

All this, and extraordinary versatility, too. Both decks can detect time code on

audio channel 1. And the entire G-2 Series will not only interface with any other ¾" Panasonic editing equipment, but with our solenoid-operated VHS™ decks as well. So you can edit ½" tapes, too. What's more, it's the only system with built-in voltage selectors to give you a fast, accurate edit, anywhere.

The new microprocessor-based Panasonic 9000 G-2 Series. Compared to anything in its class, it's in a class by itself.

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Panasonic  
9000  
G-2 Series

Competitor  
System No.1: \_\_\_\_\_  
Competitor  
System No.2: \_\_\_\_\_

## System features:

1. Microprocessor-based system.
2. Automatic IN/OUT insert editing.
3. Automatic IN/OUT assembly editing.
4. Automatic STAND-BY (with picture) at out point.
5. Edit accuracy  $\pm 2$  frames.
6. 4.5 second pre-roll time.
7. Multiple AC voltage applications (100V/120V/220V/240V), at 60 or 50 Hz.

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## Controller features:

8. Dial search control with lockable speeds.
9. 10 tape search speeds (5X, 2X, 1X, 1/5X, 1/20X—forward and reverse) plus PAUSE, all with picture.
10. Automatic instruction error diagnostics.
11. Address time indicator for hr./min./sec./frames.
12. Lap time indicator.
13. PREVIEW function.
14. RETURN to in point function.
15. REVIEW function.
16. GO TO out point function.
17. Independent reset of entry and exit points.

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## Deck features:

18. Full direct drive, including video head cylinder and capstan motors.
19. Annealed aluminum die-cast chassis.
20. Frame servo and horizontal phase adjustment.
21. Servo lock and frame lock indicators.
22. Relocated head switching to vertical blanking interval.
23. Electronic tape counter.
24. Separated chroma (688 kHz) and luminance for dubbing.
25. Head amp frequency adjustment.
26. Chroma level adjustment.
27. Time code capability (audio channel 1).

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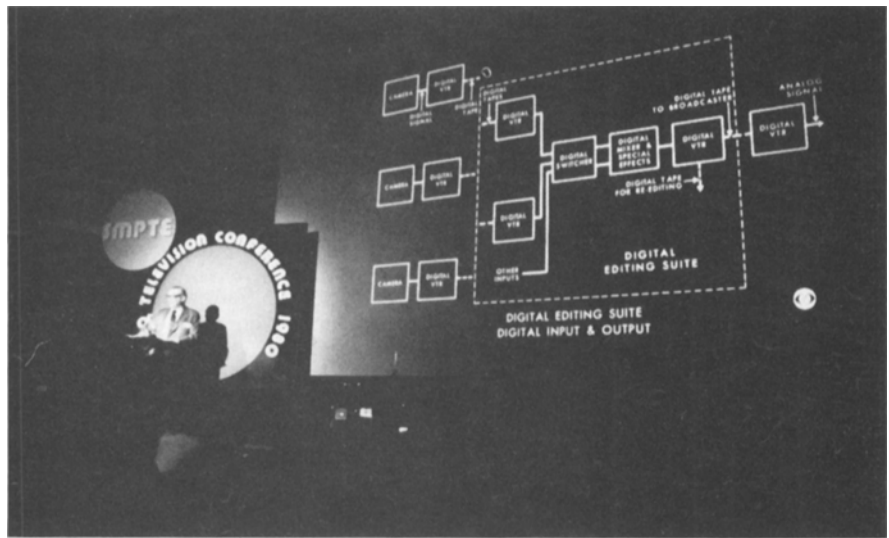
**Panasonic**  
VIDEO SYSTEMS DIVISION



Vice-President for Television Affairs Fred Remley welcomes everyone to the Conference. Attendance was so great that many people saw Mr. Remley and the other speakers on wide screen television in the adjoining theater.

integrated circuits becoming available that will make almost anything possible in digital video processing. He discussed parameters of the analog/digital and digital/analog interfaces, including such key items as input and output filters, clamping, correction of levels prior to conversion, sampling rates and axes, sine  $x/x$  rolloff, dynamic range and quantizing noise, analog to digital converters, and digital to analog converters. He compared the Nyquist sampling rates required for signal reconstruction with the sampling rates required for processing, particularly as related to interpolation and other types of filtering. He discussed analog vs. digital decoding of the composite signal as well as some of the relative merits of composite and component processing in various applications.

A paper on **Component Versus Composite Coding for Television Signal Processing** was presented by *J. L. E. Baldwin* of the IBA, UK. He explained that analog processing of 625-line color pictures in PAL countries is normally performed by operating on the encoded composite PAL signal in the same way that composite NTSC coding is processed in most 525-line countries. This similarity of approach results from the use of the same type of modulation for the chrominance information in NTSC and PAL coding. In distinct contrast, SECAM signals, which use frequency modulation to carry the chrominance information, are not convenient for signal processing and such signals have to be decoded to component form prior to such operations as mixing. In order to overcome this problem it is likely that all television studios in SECAM countries will, in due course, adopt digital coding of the component luminance and color difference signals.



Frank Davidoff, retiring from CBS, presented what may be his final paper before an SMPTE audience.

Baldwin then noted that it was about the beginning of 1979 when the first signs of a general swing away from composite coding for PAL studios became apparent, and at Montreux in May 1979 it had become obvious that most knowledgeable people considered component coding the optimum choice for television studios in PAL countries. He listed three main reasons for this. First, it permits a single color coding standard for international exchange of programs between countries using 625 lines but different color systems. (Although this is important it should not be overrated, since transcoding from one color system to another has been used for analog signals for many years.) Second, it frees studio operations from the 8-field sequence of PAL — which is particularly relevant to videotape editing but also of some importance in synchronizers. Third, it permits better performance with special effects such as zoom. For some of these effects the use of components is absolutely essential and in other cases such as slow motion, it is very advantageous.

In the past, the difference of total word rate of at least two to one was sufficient to deter people from component sampling when such an effective composite sampling standard was available for PAL. Most people considered that realizing practical videotape recorders at this much higher bit rate was doubtful. However, at Montreux three different prototype digital videotape recorders were demonstrated using packing densities of up to 20 Mbit/in<sup>2</sup> showing that normal analog tape consumption can be matched with digital recording even when component coding is used. In the future it may be possible to achieve a single digital component standard for the sampling of luminance and chrominance components on each line of the television signal, this standard being compatible not only with NTSC but also with PAL composite digital coding.

**Three Dimensional Spectrum and Processing of Digital NTSC Color Signals** was presented by *E. Dubois* and *J.-Y. Ouellet* of INRS Telecommunications and *M. S. Sabri* of Bell-Northern Research, Quebec. The NTSC color signal is a three-dimensional signal the spectrum of which has support in various disjoint regions of three-dimensional frequency space. Effective sampling and processing of such signals requires an understanding of their multidimensional character. For example, the goal of efficient sampling is to choose a three-dimensional sampling grid which minimizes the number of samples per unit volume without introducing aliasing (overlapping of spectra). In this paper the form of the three-dimensional spectrum of the composite NTSC signal was derived. The effect of sampling to obtain a digital video signal was discussed. The utility of a sampling scheme may depend not only on its efficiency in packing the spectral components as closely as possible but also on the complexity of the filters required to reconstruct the original signal. Trade-offs between filter complexity and performance were outlined.

**Current and Future Developments in Digital Switching and Effects** were described by *Dennis Fraser*, NEC America, Inc. He discussed methods of production switching, production effects (both live and post production), routing of television signals, and signal processing in the digital domain in both the U.S. and Japan. He emphasized advanced techniques in which digital-based techniques outweigh the analog handling within a switching complex and analyzed those factors which limit, at present, future digitization of mixing and monitoring functions. He also discussed new concepts in applications of frame storage memories with the utilization of asynchronous inputs to production switchers, synchronization functions replacing



Davidoff was applauded frequently at the Conference, in recognition of his years of service to CBS, to the industry, and to the Society — and possibly for assuming at the Conference the Chairmanship of a new task force seeking one international standard for digital color television.

conventional processing amplifier installations, and digital compression techniques applied to carrier-based video transmission from remote locations. Fraser evaluated the introduction of a digital switcher for production use, including manipulative functions, in the light of proposed SMPTE digital interface standards and practicality with various manufacturers facing the marriage of diversely designed equipment.

A paper on **Software-Based Digital Signal Processing** was presented by *Richard Kupnicki* of Digital Video Systems, Inc., in which he pointed out that with the use of microprocessors and PROMs it is possible to implement a sophisticated control system on the basis of software, with a small component count to maintain a reliable and practical system. Interfacing a computer to a frame store memory through software allows the user to manipulate images and display them in segmented real time.

**Digital Picture Creation**, a paper presented by *Richard G. Shoup* of Belmont, Calif., discussed imagery created directly in the digital video medium for use in broadcast and closed-circuit television pro-

duction, touching briefly on the larger and exciting possibilities of combining artificially generated and real world "natural" imagery. The aim is to amplify the ability of the graphic artist or other user — not to replace him.

**Multifunction Digital Video Processor** by *Stephen Kreinik* and *Renville H. McMann* of Thomson-CSF Broadcast, Inc., noted that the application of digital techniques has made possible several classes of devices that process the video signal in the digital domain, the first such device the digital time base corrector. Now one can obtain on a single chassis: time base correction, frame synchronization with freeze field and freeze frame, digital noise reduction, crosspoints switcher, and processing amplifier.

**Digital Transmission and Testing**  
(Saturday Morning)

The Session Chairman was Stanley Quinn, CBC, and he was assisted by Vice-Chairman Gordon Ballantyne, Applied Electronics, Ltd. **Optical Fiber Transmission Technology and Its Impact** by *R.*



The exhibit area had only 17 exhibitors represented, but they were the cream.



The exhibits were limited to digital television, teletext, and fiber optics.



Exhibit specialization gave everyone a sense of what is to come during the Digital Decade.



Television is not now considered a print medium but, with teletext coming, it soon might be. Joe Roizen (center) and French Antlope representatives discuss what the crystal ball shows.

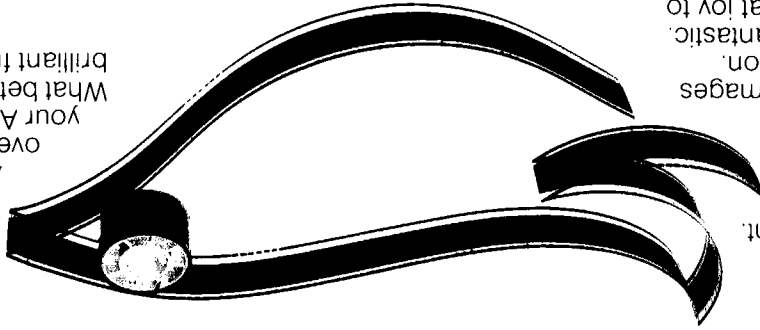
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The Authors Lounge is where authors check out their slides before they "go on." Afterwards they leave their manuscripts here to be considered for possible publication in the *Journal*.



The Friday noon Get-Together Luncheon was an elegant affair in the Dominion Ballroom. Shown at the Head Table are: Ray Brule, Robert McKinstry, Donald Breidt, Robert Smith, Fred Remley, Charles Anderson, Roland Zavada, and William Hedden. (Hidden by the podium were Maurice French and Luncheon speaker Professor Robert Scott.)

*R. Fergusson*, Bell Northern Research, was the session's first paper. Fergusson outlined optical fiber transmission principles and predicted that light conduction in highly transparent glass fiber cables will displace electrical conduction in copper cables for signaling in many future telecommunication facilities. He also noted that investigations of the new technology point to displacement of copper by glass for transmission of digitally multiplexed signals between urban telecommunication switching centers.

**Network Distribution of Digital Television Signals** by Denis J. Connor of MacDonald, Dettwiler & Associates Ltd. discussed the possibility of the future distribution of network television signals in a digital format. Connor pointed out three alternative strategies for network distribution of the high quality signals capable of being produced by an all-digital production center — the use of existing analog distribution facilities; the use of bit rate reduction to yield rates compatible with the common carrier digital hierarchy; and the use of bit rates compatible with those used in a digital production center. Questions relating to relative system cost, spectrum utilization, quality standards, and ancillary services were discussed.

**Overview of Broadcast Teletext Systems for NTSC Television Standards** by *J. R. Storey, H. G. Bown, C. D. O'Brien,* and *W. Sawchuck* provided an overview of the British, French and Canadian broadcast teletext systems and their adaptation, where necessary, to the North American NTSC television standard.

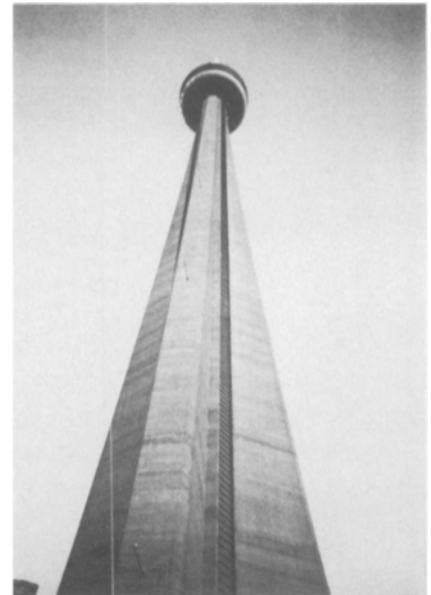
Teletext as a proper noun refers to the British Ceefax and Oracle systems which broadcast information in digital form over existing television networks. The French Antiope Videotex system is designed as either an interactive or one-way broadcast information service depending on the type of network over which it is transmitted. The broadcast service is transmitted over the Didon data broadcasting network which



Professor Scott noted that our Society is at the leading edge of an Information Revolution that could affect mankind as strongly as the Agricultural Revolution of 100 centuries ago and the Industrial Revolution of 2 centuries ago.

can carry many different services. The Canadian Dept. of Communications has developed an alpha-geometric Videotex system called Telidon. In this system the graphic images in the data base are described in terms of geometric descriptors such as line, arc, polygon, etc.

A Report of the Subcommittee on Teletext of the EIA Broadcast Television Systems Committee was presented by *Robert A. O'Connor*, who said that the work of the subcommittee has been concerned with two major areas: (1) the basic technical parameters of a teletext system, such as an appropriate data bit rate, data



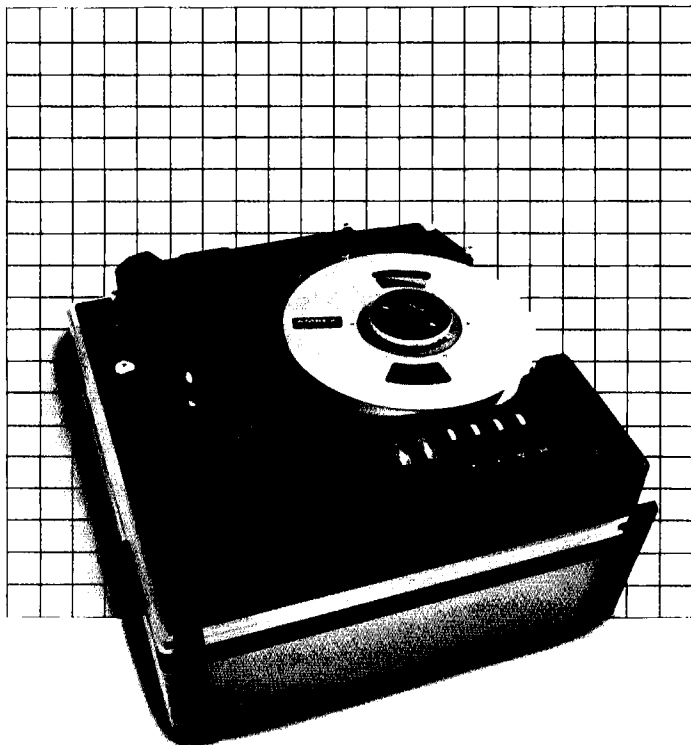
Friday night many attendees and their spouses visited the CN Tower for a reception. This is the tallest free-standing structure in the world, and reactions ranged from excitement and wonder to terror. The restaurant and viewing area is 1450 feet up, and some people did not get there because the elevators automatically run slowly or shut down if the winds are too strong.

pulse amplitude, and shape and the specific lines in the vertical blanking area to be used; and (2) the complete specifications for a teletext system, including the method of coding, alphabets and graphics, special features, and error protection methods.

French progress in the field of teletext was covered in **Architecture of the French LSI Set for Antiope Teletext Decoders** by *Bernard Mati, Yves Noirel* and *Alain Poignet*, Antiope Videotex Systems, Inc. Decoder cost is regarded as the factor

**PORTABLE VIDEOTAPE RECORDING WITH THE AMPEX VPR-20:**

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Finally, you can videotape remotely without compromising the considerations that apply to studio work. Because Ampex engineers went far beyond the usual definitions of portable acquisition when they designed the VPR-20 one-inch helical.

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On location, you have to know that you're capturing good material. So Ampex built a confidence feature into the VPR-20 that actually plays back the picture from the tape into the camera viewfinder during recording. When you see it in the viewfinder, you know it's on the tape. And you can have color playback in the field, thanks to the color stabilizer option, which mounts inside the VPR-20.

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Tapes recorded on a VPR-20 are fully compatible with every trick in the VPR-2 special effects book. Once you bring your material back to the studio, you can slow it down, speed it up or stop it on a selected frame with a VPR-2. And if you haven't seen the quality of VPR-2 special effects yet, you're in for a surprise.

## **If You Can Take It, Your VPR-20 Can, Too.**

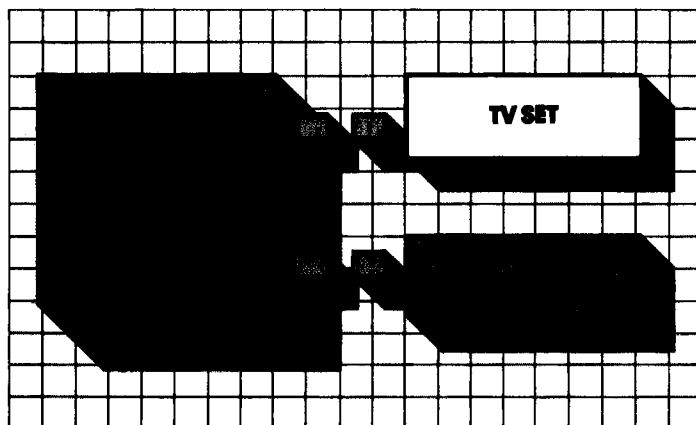
Environmentally, your VPR-20 can take nearly anything that your operator can. It shrugs off dust and sand in the air, tolerates a cloudburst, and stands up to heat and cold. Oblivious to the way it's held or positioned, the VPR-20 has an amazing resistance to the kind of gyroscopic conditions that go along with field recording. So you can take the VPR-20 for granted.

## **Enough Power to Finish What You Start.**

The VPR-20 battery pack has more than enough capacity to record and rewind a full hour of tape. Then, when you're ready for more shooting, the quick-change battery pack gives you quick-change power. There's even a battery/charger system that brings you up to full power again in less than an hour. You'll really value the VPR-20's power-down memory. It keeps the tape timer operational during battery or power changes for up to two days if need be. This is portability with a punch.

## **If The Specs Don't Convince You, A Demo Will.**

Somewhere within reach of your station, the tough, "smart" VPR-20 is turning the impossible into an everyday affair. Call us for the technical information, and then get your hands on a VPR-20. You won't want to let go.



# **AMPEX MAKES IT EXCITING**

Ampex Corporation, Audio-Video Systems Division, 401 Broadway, Redwood City, CA 94063 (415) 367-2011



The fairyland of downtown Toronto, as seen from the CN Tower, dazzles even the most experienced traveler.



The ground and Lake Ontario seemed scarcely closer than the full moon.

most likely to influence the commercial success or failure of a teletext system. A great deal of effort has been devoted to developing a design that, utilizing LSI circuit technology, reduces the cost of teletext decoders. The paper dealt mainly with the different approaches taken by three French manufacturers in developing a set of integrated circuits for broadcast and interactive Antiope.

The next paper was **The Technical Parameters of the Television Closed Captioning System** by *David Sillman*, Public Broadcasting Service. Captioning of television programming is essential to the millions excluded from full enjoyment of the programs by reason of hearing impairments. Closed captioning (transmission of captions which are encoded and thus invisible on screens of conventional television receivers unless made visible by a special decoder) permits the captioning of substantial amounts of television programming without the disadvantages of the open

transmission method. Development and testing of the PBS captioning system was described. The establishment of a new programming service called Closed Captioning for the Deaf, beginning in 1980, required a comprehensive coordinated development program which included the encoding and transmission system, programming methods and equipment, and low cost home receivers.

**The User's View of Teletext Systems**, a paper by *Walter S. Ciciora* of Zenith Radio Corp., attempted to analyze the North American consumer's reaction to teletext, noting that a forecast was required since a consumer teletext system has not yet been implemented in North America. Teletext has many potential categories of users, the author noted, and can be implemented in many different ways, but he emphasized that the paper concentrated on ancillary service for consumers, basing his analysis on considerations of technical feasibility and the constraints imposed by consumer

behavior. That the consumer can and will run a cost/benefits analysis cannot be ignored by marketers of teletext services.

#### Digital Recording (Saturday Afternoon)

The concluding session of the Conference, on Digital Recording, was presided over by Session Chairman Raymond Carnovale and Vice-Chairman Martin Greenwood. The first paper by *Dominique Nasse* of CCETT, France, **Digital Recording: What is to be Done?**, reported that digital recording has such great advantages that it is extensively used in most technical areas including instrumentation. The author noted that digital recording was particularly difficult to apply to motion pictures but that it is now definitely feasible. He noted the possibility of using the same digital production facilities for both conventional (e.g. broadcast) and unconventional (e.g. filmmaking) purposes. Nasse said that the most important requirement for both broadcasters and manufacturers was that of an accepted standard. He indicated that this was close to being realized in Europe where an agreement is imminent on a digital video format.

The next presentation was **Digital Audio Recording for Television: Some Choices** by *E. S. Busby, Jr.*, of Ampex, who defined and explained the technology available to the designers of television recorders and outlined the constraints and tradeoffs dictated by television studio practice. The relation between sampling rate and bandwidth was established, and the reasoning behind the proposals for the various sampling rates was explained with special emphasis on those derived from television scanning frequencies. The requirements for input and output bandwidth limiting filters were discussed.

In **Digital Video Recording — Further Options**, *Charles E. Anderson* of Ampex Corp. reported on a survey of

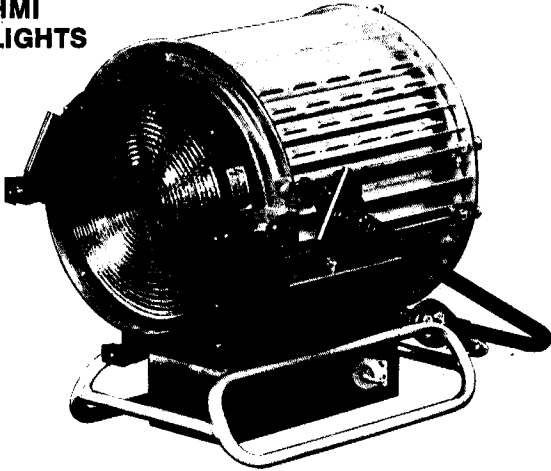


Saturday morning the attendees were back again in the theaters for the first-class papers presentations.

# New Arriflex products at the SMPTE Conference Exhibit last October:

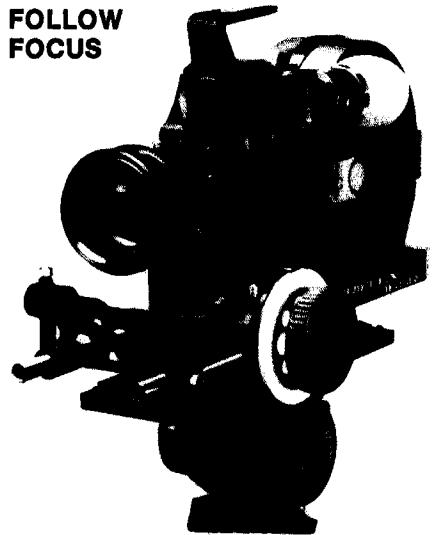
Seven items: three of them for both cinematography and video.

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Follow-focus system: full production capability, interchangeable for all ARRI cameras. □ HMI day-light-balance lights from 200 watts to 4000 watts, with new, economical distribution system.

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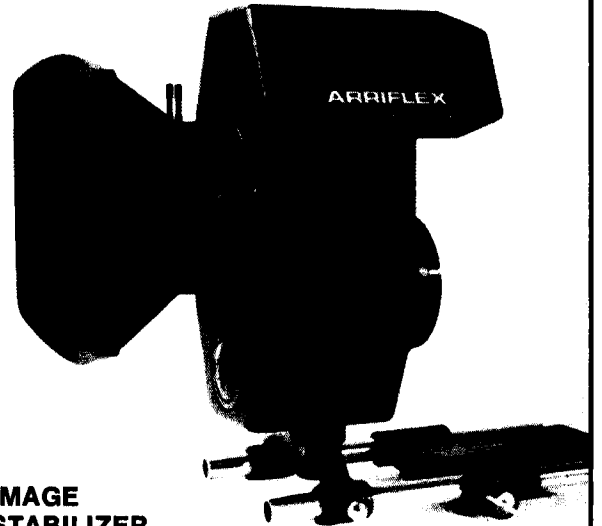


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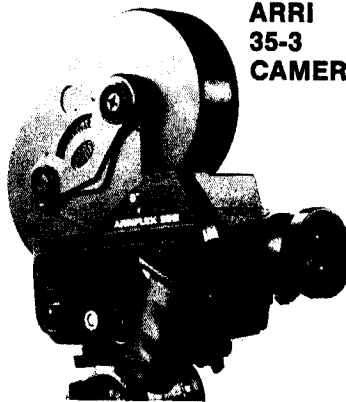
**IMAGE STABILIZER**



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16SR High-Speed gives you 10 to 150 fps, continuously variable. □ 35-3 camera: 2nd unit camera, complements the 35BL. Uses same lenses.

**16SR HIGH SPEED CAMERA**

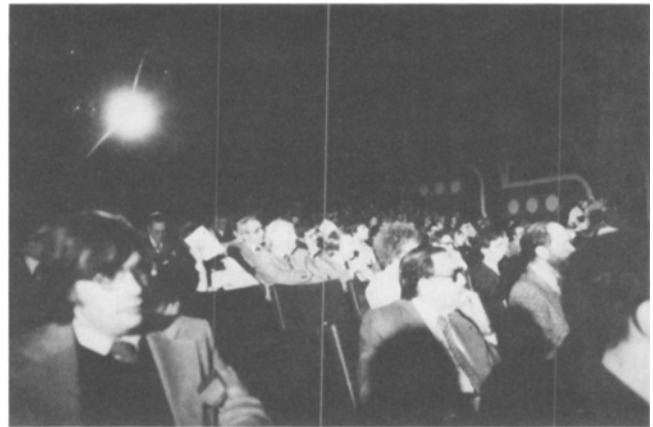


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Stanley Busby of Ampex covered a hot topic on Saturday afternoon: digital audio for television.



From first paper to last, attendance was practically SRO. Papers presenters and audience alike came away from the 14th Television Conference knowing that they were going to deal with — if not create — The Digital Decade.

broadcasters and production houses which showed that while all of them looked forward to such advantages of digital recorders as the ability to maintain good quality more consistently and to obtain improved multigeneration capability, they are also very concerned that other capabilities now available in 1-in helical recorders not only be maintained but that they be improved and new ones added. The survey also revealed that users feel that when a step as serious as a complete change of a tape format is made, advantage should be taken of the opportunity to have a no-compromise approach. It was the consensus that a portable version utilizing a cassette should be added. The use of a cassette places many restraints on the choice of a format; and, conversely, some features of the system place severe requirements on the cassette and thus influence its design. A general engineering specification for the cassette was suggested.

**Digital Video Recording in the 625-Line System** by *Hubert Förster* and *Joseph Sochor* of Robert Bosch GmbH described a recording system developed by Bosch-Fernseh which uses sub-Nyquist sampling at a  $2f_{sc}$  sampling rate noting that with this method the possibility of error-concealment is fully maintained and the picture quality is not significantly affected when certain conditions are fulfilled. Transmitted signal bit rate is 80 Mbit/s and channel bandwidth is 50 MHz.

**Experimental Digital VTR with Tri-Level Recording and Fire Code Error Correction** by *Yoshizumi Eto*, *Seiichi Mita*, and *Yasuhiro Hirano* of Hitachi Ltd. and *Toshiaki Kawamura* of Hitachi Denshi Ltd. reported on a newly introduced digital VTR, describing in particular its magnetic recording and error correcting technique.

The code series of a PCM video signal is equipped with error correcting codes. Shuffling produces a new code series. This series composes error detecting codes which are scrambled before recording. Additional time necessary for redundant error correcting codes is designed within the

horizontal blanking period so as not to increase the recording bit rate. Shuffling is designed to be completed in one horizontal scanning. A combination of fire codes and cyclic redundancy check codes are adopted for error correction and detection. Fire codes correct most of the burst and random errors whereas the cyclic codes expand the correctable burst error length of fire codes and detect the remaining errors. The detected errors can be concealed by the signal which precedes one horizontal line.

The experimental VTR records 10.7-MHz-sampled 8-bit PCM-NTSC signals in two magnetic channels at the same tape consumption rate as an analog VTR. The optimum tape format is under investigation. Picture recording experiments are being carried out using modified analog VTRs with both transversal and helical scanning.

**Digital Video Recording: Some Experiments and Future Considerations** by *M. Morizono*, *H. Yoshida*, and *Y. Hasimoto* of Sony Corp., Tokyo, outlined the technical details of another experimental NTSC recorder. A C-type 1-in VTR was chosen to be the basic transport. The only changes made were to the heads and record/replay processing electronics. Three multiple heads were used with one-third of the normal analog track width for each head. Two of them were used for digital video and the other was prepared for the multichannel digital audio. The paper revealed that some advantages of a digital video recorder have been confirmed but that much more work remains to be done before designing a marketable machine.

**Recent Advances in Digital Video Recording** by *C. Robert Thompson* of RCA described RCA's digital recording developments in relation to the user's probable requirements. The author discussed digital bit packing density (along the track and cross track), transport technology, digital integrated circuitry, and the transducer-to-medium interface. Thompson also dis-

cussed items of concern to the user such as media consumption, picture and sound quality, search rates, and interchange ability.

#### Equipment Exhibit

One of the special features of the SMPTE Television Conferences was the Equipment Exhibit, planned to complement the Papers Program. Only equipment bearing some relation to the topics on the program was permitted. This policy was adopted so that persons attending the Television Conferences could focus on exhibits of special interest to their concerns without the distractions of unrelated types of equipment. The exhibit also provided the opportunity of observing and handling equipment described in the Papers Program.

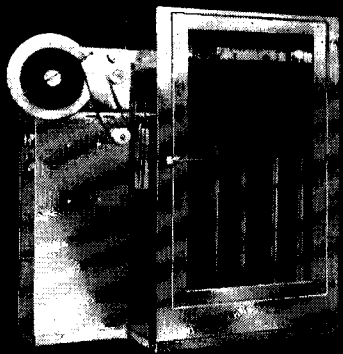
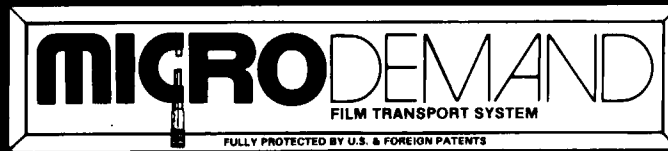
Companies that participated in the Equipment Exhibit are listed below:

- The Adda Corp.
- Ampex Corp.
- Antiope Videotex Systems, Inc.
- Colorado Video, Inc.
- Digital Video Systems, Inc.
- Fernseh, Inc.
- Micro Consultants, Inc.
- Microtime, Inc.
- NEC America, Inc.
- New York Institute of Technology —  
Computer Graphics Lab
- Ontario Educational Communications  
Authority
- RCA
- Recortec, Inc.
- Skotel Corp.
- Sony Corp.
- Vital Industries
- Laser Fiber Optics, Canada Ltd.

#### Committees and Working Groups

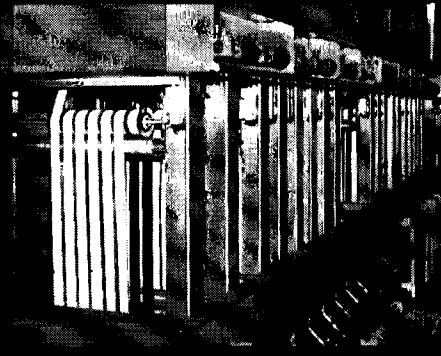
Study Groups and Working Groups reporting to various SMPTE Committees met during the Toronto Conference. These included the Working Group on Digital Video Standards (Chairman, R. S. Hopkins), Study Group on Digital Television Tape Recording (Chairman, William Connolly), Working Group on Digital Con-

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Typical medium size  
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One of 8 Filmline hoist-type  
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400 F.P.M. (Hoist shown partially raised.)



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Micro-Demand is a dynamically tension-controlled friction film transport system that operates effectively at minimum tension and with complete reliability. When used with Filmline Feather-Touch film spool "tires" it transports 35mm, 16mm and single strand 8mm film interchangeably and without adjustments even when these films are spliced back-to-back.

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| <b>Versatility</b>   | Any speed, any process.  | <input type="checkbox"/> Push-Button operation, and reliability allows operator to perform other functions while the machine is running! |
| <b>Reliability</b>   | Rugged construction, quality materials and sound engineering. Always ready when you are!   | <input type="checkbox"/> Automatic compensation for elongation and contraction of film during processing cycle.                          |
| <b>Flexibility</b>   | Any format 35mm, 35/32mm (1-3), 35/32mm (1-4), 35mm 5R S8, 16mm — 70MM-105MM etc.  | <input type="checkbox"/> Virtually eliminates all film breakage, scratches and static marks.   |
| <b>Dependability</b> | Can stand the gaff of long, continuous, top speed runs with "Zero-down-time."  | <input type="checkbox"/> All film spools use standard bearings or bushings.  |
| <b>Credibility</b>   | Ask the labs who own them. Most of them own not one but several.   | <input type="checkbox"/> Entire upper film shaft/roller assemblies easily removed. No tools needed.                                      |
| <b>Maintenance</b>   | Exclusive Maintenance Monitor tells when and where the machine needs attention. Significant savings assured.   | <input type="checkbox"/> Stainless steel construction used throughout.   |
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trol of Television Equipment (Chairman, Robert McAll); Study Group on Digital Television (Chairman, Charles Ginsburg); and the Committee on Television Video Technology (Chairman, Michael Fisher). (Reports will be published as they become available, in the *SMPTE Journal* and in the next Digital Video book.)

#### Acknowledgments

The Society thanks the following companies for their generosity: Digital Video Systems for their sponsorship of the CN Tower Reception; Leitch Video Ltd. for

transportation; Ampex of Canada Ltd., Sony of Canada Ltd., RCA Ltd., and Robert Bosch Canada Ltd. for the Ladies Program, Coffee Club and International Reception. Kodak Canada Inc. provided Audiovisual equipment. Sony of Canada Ltd. supplied electronic AV facilities including a large screen video monitor, three cameras, and mixer for microphones. Ontario Educational Communications Authority, Jack A. Frost, and the Society of Television Lighting Directors of Canada offered lighting equipment; and Canadian Broadcasting Corp. supplied design and staging.

## "On-Board"™ Frezzi Battery Packs for all portable video cameras



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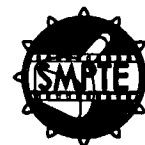
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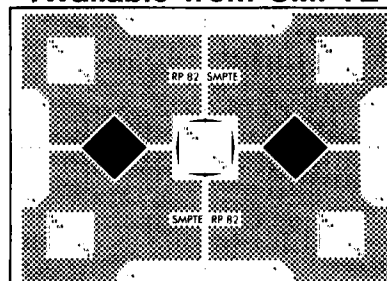
If you are not now regularly receiving the *SMPTE Journal*, participating in the Society's local Section meetings, attending SMPTE's technical conferences and equipment exhibits, and not keeping up on the technology and developments of our industry, now is the time to join this world-renowned Society.



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**Society of Motion Picture and Television Engineers**

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## New 16mm Test Film Available from SMPTE



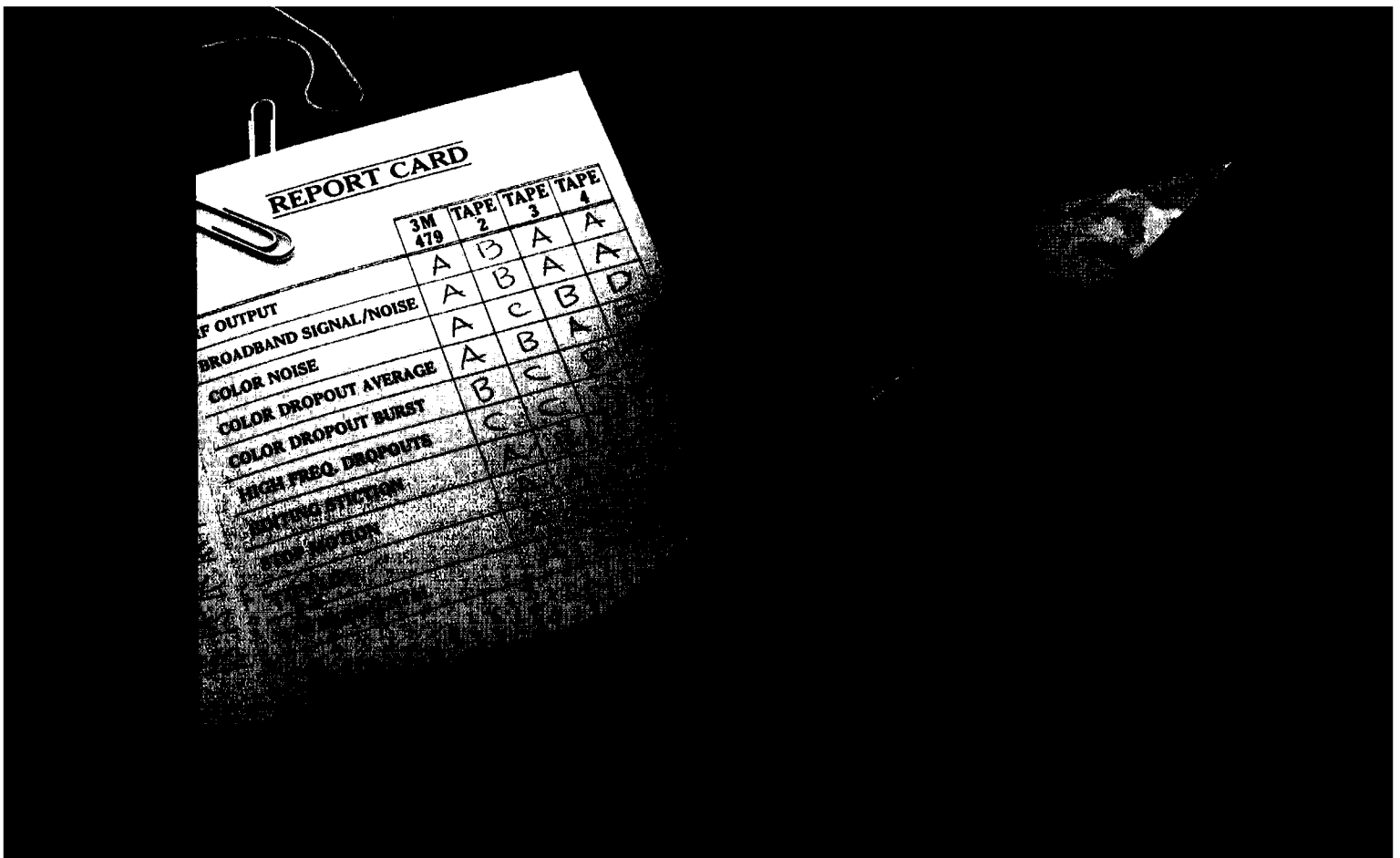
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SMPTE's new 16-PA test film helps you evaluate the performance of your 16mm projector for alignment and screen image quality. It is designed to provide the same degree of performance evaluation for professional 16mm projectors that has been available for 35mm projectors through SMPTE's well known 35-PA and 35-IQ films. The film, supplied in 100 ft. rolls in black and white, is produced as a camera original. This is an excellent tool for permitting the quantitative measurements of projector adjustments that affect a projector's visual image. This film is made in accordance with SMPTE Recommended Practice RP82-1978.

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

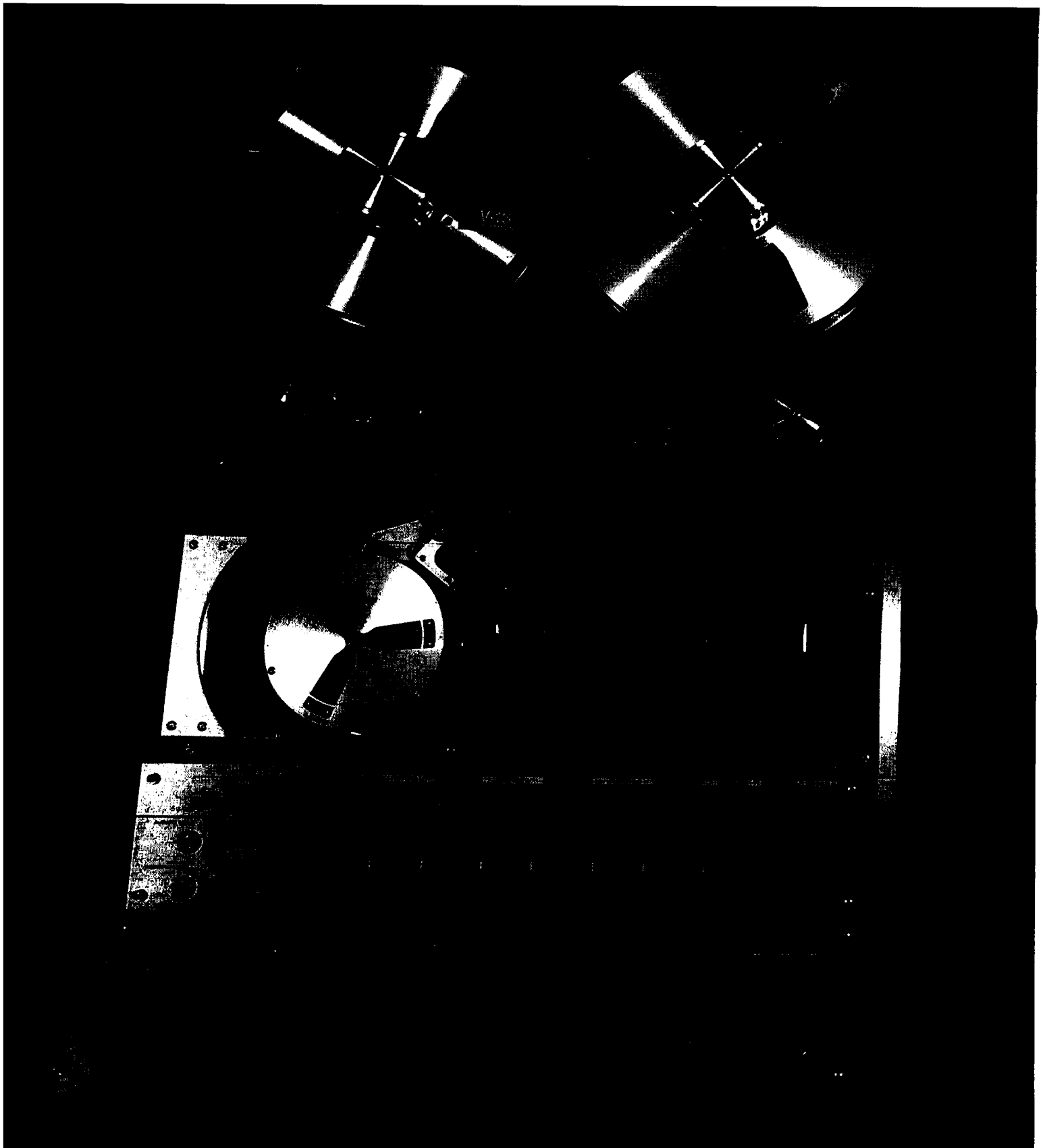
When we tested the top four brands under strict lab conditions, the overwhelming performance leader was Scotch 479 Master Broadcast Video Tape. In fact, we came out on top in all ten performance categories.

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"Not one of these machines has ever broken down," McAndrew adds. "What makes that even more impressive is that they're constantly being used by different people with different ideas about how carefully to handle equipment.

"Seventy per cent of the time, our equipment is

used by ABC and NBC, but we also rent it to local television stations and production companies."

Continental Colour, the country's largest video equipment rental company, has specially built trucks and trailer trucks that are virtually television stations on wheels. Two of these trucks are equipped with one-inch equipment, including a total of two BVH-1100 and four BVH-1000 one-inch high-band video recorders. Continental has also purchased additional Sony recorders for its brand-new post-production facility.

"Sony picture quality is excellent," says McAndrew,

# “375,000 MILES WITHOUT A BREAKDOWN.”

*Martin McAndrew, Continental Colour Recording*

“much better than its main competitor. And the slow-motion capability of the BVH-1100's means that each can do the work of two separate machines, in less space, at less expense. No one else's equipment can match these 1100's.

“No wonder our Sonys are almost always on the road. They've covered the World Series, the Winter Olympics, the daytime Emmy Awards, the Tony Awards, operas and symphonies for PBS, and the Pope's visit to the U.S. And we've had zero problems; working with Sony has been delightful.”

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