A general statement about the status of television technology may be in order to properly begin a review of the year 1980. Without a doubt, television picture quality, throughout the world, is at a very high level. So far as the viewer in the home is concerned, little apparent need is evident for improvement of the basic quality of the pictures seen on present-day receivers. Larger viewing screens, stereophonic sound, and other refinements may make future television receivers somewhat more satisfying; in principle, however, the present television transmission systems are rather fully utilized both by the broadcaster and the receiver designer. Even so, dramatic new technological developments seem to lie ahead during the 1980s. It may well be that new television broadcast services will be implemented, perhaps involving satellites and higher-definition transmission standards. Since high definition television systems are likely to be incompatible with existing systems, such proposals may well be based on the use of synchronous-orbit satellites containing relatively high power microwave transmitters and the use of compact "earth station" antennas at the homes of viewers. This is one likely variant of the Direct Broadcast Satellite (DBS) services now being studied in many parts of the world. It is also reasonable to think that cable television distribution systems might choose to offer optional high-definition television service to viewers subscribing to cable service. In either case, special receivers will be required and picture quality should improve to a new level.

In early February 1980, the annual SMPTE Television Conference was held in Toronto. The theme chosen for this, the 14th such conference, was "The Digital Decade." A great variety of topics were discussed and most papers predicted that, by the end of the decade, digital video technology would be a commonplace attribute of broadcast and other high-quality television systems. Certainly, the efforts of the engineering committees of SMPTE during the year would seem to confirm this. Special attention was paid to digital video standards through the work of several ad hoc and existing SMPTE Engineering groups. Other areas of television technology showed remarkable progress, as well, but the matter of digital video seems to have captured the imagination of engineers working on equipment design and of those planning new television production facilities.

Detailed reports on the various SMPTE efforts in the field of digital video systems will appear in this and other *SMPTE JOURNALS*. In summary, however, 1980 saw a very concentrated effort mounted by SMPTE in this area of study. At the 1980 Television Conference it was decided to establish a Task Force on Component Digital Video Coding to spearhead the SMPTE efforts in this rapidly evolving aspect of television studio digital technology. The Task Force met, on a monthly schedule, in the U.S.A., Canada and several locations in Europe. In the latter part of 1980 two elaborate programs of component-coded digital video demonstrations were arranged. The first, sponsored by the European Broadcasting Union (EBU), was held in January, 1981, at the Engineering Headquarters of the Independent Broadcasting Authority at Crawley Court, near Winchester, England. The second series of demonstrations was conducted during the week, in early February, before the 1981 SMPTE Television Conference in San Francisco. The purpose of these demonstrations was to provide opportunities for engineers around the world to view a variety of possible digital coding schemes and then to make informed judgments as to the necessary parameters to be implemented in digital video systems. These are vital questions, since an important, once-in-a-lifetime opportunity is offered to eliminate the often frustrating major differences between the color television standards of the world. A properly chosen digital specification could eliminate many of the problems of international program exchange; a single, universal, digital interchange standard would replace present interchange specifications based on NTSC, PAL and SECAM coding systems. Only at the final stage of the process, the transmission of the signals into the homes of viewers, would present-day analog standards be used, in order to preserve compatibility with the hundreds of millions of television receivers now in the hands of the general public.

The early months of 1981 will see important decisions made, based to a significant extent on the results of these digital video demonstrations. The EBU proposes to make a decision on a European standard by April 1981; the CCIR meets in September 1981 to discuss these matters and others related to television broadcasting. The SMPTE is determined to participate fully in the selection of the best systems to meet the needs of the television industry for the future, a future wherein the chosen standards will be utilized well into the next century. Much of the groundwork for this decision-making process was accomplished through extraordinarily active SMPTE Engineering Committee work during 1980, and this year will be remembered as one in which digital video topics dominated most of the meetings devoted to television technology, no matter where in the world they were held.

Meanwhile, as these high-technology discussions continued, 1980 saw continued maturation of the television industry at large. Later in this report will be found summaries of the progress achieved in the several disciplines making up the areas of television technology in which SMPTE involvement is found. These include studio practices, video recording, camera systems and transmission systems such as cable and satellite distribution. No summary of an industry as complex as the television industry can be complete in every detail; it is hoped that a general overview can be given which, together with other reports and papers in the *SMPTE JOURNAL*, and elsewhere, will provide the reader with a good picture of the situation in 1980.

Studio Video Systems

This section of the report will describe several categories of television equipment available in the North American television equipment market. Other sections will focus more specifically on equipment manufactured in and/or designed for other areas of the world.

A survey of 450 U.S. television engineers conducted by the Institute for the Future of Menlo Park, CA, revealed many interesting opinions expressed in the responses received.* The replies indicated a number of preferences for future studio equipment designs, such as studio cameras with automatic setup features and better low-light-level performance; ENG cameras with less bulk, reduced weight and improved sensitivity; EFP cameras slightly larger than ENG models but with better sensitivity; improved studio film chains and film projectors; flexible and easy-to-operate video switching and video processing equipment; ease of maintenance for all forms of studio equipment, given that qualified maintenance technicians are more and more difficult to find.

The report also makes important points by recording the opinions of station engineers with regard to equipment design: new equipment should be designed to require less-skilled operators and maintenance technicians; support services, such as spare parts and field service, are highly valued; promises concerning delivery and operational features of equipment must be kept; some engineers feel that equipment designers are too remote from the changing needs of their customers; new products should be designed to avoid "built-in" obsolescence.

**Technological Trends in the U.S. Television Industry:* The Next Five Years. Institute for the Future, 2740 Sand Hill Road, Menlo Park, CA 94025. (415) 854-6322.

Figure T-1. Camraprompter.

Cameras

The manufacturers of television cameras seem well aware of most of these concerns. Many new ENG and EFP cameras were introduced during 1980 claiming the desired attributes of smaller size and weight. Ampex introduced the BCC-20, RCA the TK-86, Thomson-CSF the TTV 1525, Ikegami the EC-35, Panasonic the AK-760, Sharp the XC-700 and Cinema Products the MNC-81A. In addition, Hitachi showed the SK-91 and Sony the DXC-6000 and CEI the 340. Each of these cameras attempts to meet the needs of ENG and/or EFP in improved performance specifications.

Some of the cameras noted above can be equipped with studio lenses and viewfinders, thus converting them from portable to studio production use; however, cameras of more conventional appearance but having greatly improved performance as studio cameras were also evident. RCA announced the new version of its computer-controlled TK-47 studio camera, the TK-47EP extended performance model using special pickup tubes and providing significantly improved signal-to-noise ratio specifications. Harris announced the TC-80A camera, with full automatic computer-controlled setup features. Hitachi introduced the FP-60S model which stresses high signal to noise ratio and relatively low cost. Other suppliers of studio cameras retained models which were newly introduced in 1979, including Bosch-Fernseh, Marconi and Philips, all of whose designs are well proven and popular in the U.S. market. It seemed evident, as well, that more and more broadcasters are finding the triax camera cable feature offered by a number of manufacturers to be useful to them, both for field use and for studio use. ABC has installed a number of Ikegami HK-312 studio cameras with triax cable and automatic set-up adjustments in studios in New York, Hollywood and Washington.

Lenses for television cameras continued to evolve during 1980. Most activity was found in offerings for ENG/EFP cameras. Light weight, higher optical speed and greater zoom ranges were stressed by several manufacturers. Canon, Fuji, Schneider and Angenieux all introduced several new lens designs during the year. Some designs now feature built-in diascope systems for ENG/EFP use, as well as built-in range extenders and close-focus mechanisms. In order to meet the needs of the latest high-performance studio television cameras, some lens makers have introduced higher resolution zoom lenses. For example, Fujinon offers three lenses claiming 1300-line resolution.

A variety of new camera mounting equipment was also introduced. An interesting portable image stabilizer was introduced by Arriflex; the unit makes use of mirrors and a small gyroscope unit to optically stabilize handheld camera images. Very low power consumption and compact size are featured.

Many improved power supply units for portable television cameras were introduced. Frezzolini Electronics Inc. introduced a new line of "On-Board" battery packs that mount directly onto the backs of most portable video cameras. Matching "quick" and trickle chargers were made available, as well. Christie Electric, Cine 60, and Comprehensive Video Supply also introduced new battery units and new charging equipment. Most of these new units were nickel-cadmium battery designs; the increased cost of silver has somewhat slowed the introduction of silver-zinc battery systems.

Cinema Products announced an interesting new, small camera prompting system, known as the Camraprompter (Fig. T-1). This compact unit mounts on the front of many ENG/EFP sized cameras and provides a usefully large display of prompting text to the talent in front of the camera.

Telecine

Telecine chains continued to show new advanced design features during the year. RCA announced the TK-29 and Bosch-Fernseh introduced the FLD60 CCD-sensor telecine to the U.S. market at the 1980 NAB show in Las Vegas.

The Fernseh FLD60 has a continuous motion film transport which scans the moving film with three line-array charge-coupled devices. The resulting video signal is stored digitally and then processed to provide slow motion, jogging, still-frame and forward and reverse projection facilities.

The RCA TK-29 is, in fact, a family of telecine systems. Models are available to serve the needs of broadcasting, production and post-production houses and film-to-tape transfer operations. A large variety of options are available as well as comprehensive remote control facilities.

L-W International introduced its newest 16-mm television projector, the Athena 6000. It allows slow motion, freeze frame, instant start/stop and unlimited still frame time, and can hold up to 5000 ft of 16-mm film.

Studio Production Equipment

New video switching and control equipment was introduced and put into service in a number of important applications. So far as design is concerned, the largest television control room switching systems now emphasize the availability of memory features which make the most complex sequences of special effects essentially automatic. Given the proliferation of digital special effects equipments, frame synchronizers, and slow motion and still frame devices, it is apparent that many if not most human operators of large switching systems will benefit from these digital memory systems. Examples of the systems include the Grass Valley E-MEM II, the Vital PSAS and the Central Dynamics CAP system. The Grass Valley unit was used, with a Model 300 GVG switcher, at the 1980 Lake Placid Winter Olympics by ABC, in conjunction with an NEC Digital Video Effects system. New large switching systems were also demonstrated by American Data, Industrial Sciences and Ampex. Many of the switching systems are especially designed to interface easily with videotape editing systems. During editing sessions, the editing controller makes use of a digital interface to the switching system and takes control of program transitions as necessary. Many small and medium-sized switching systems were introduced during 1980, as well, and some were designed for use in ENG/EFP type of productions, resulting in an emphasis on small size and weight. Examples of these compact systems include the Crosspoint Latch 6104 and the Asaca ASW-100.

Routing and distribution switching equipment of advanced design was also evident. NBC prepared to install a very large routing switcher in its Burbank studios. This system, the NEC TKA-105, makes use of LSI circuitry in both the mainframe and in the control panels. Most large routing switchers are now designed around microprocessor control of the switching functions. Units built by Grass Valley (Model 440), Hedco, Fernseh-Telemation (TVS/TAS-1000) are all microprocessor controlled and use single coaxial cables, carrying data, to connect control panels to main switching racks. In general, control panels for large routing switchers are now furnished with alpha-numeric displays to make identification of sources and loads a relatively simple matter. Many large systems also distribute audio; more and more of them are using digital audio systems containing, usually, four audio channels multiplexed on a single video quality circuit. This technique was also used at the Winter Olympics by ABC, using GVG equipment.

Many other suppliers of routing equipment introduced new configurations during

1980 — Utah Scientific, Telemet, Dynair, 3M, Di-Tech, Datatek, and others. Some units featured cathode-ray tube computer terminals as supervisory consoles for large systems.

Machine control systems were also evident in greater abundance. These systems use digital data streams to control the functions of videotape recorders, video and audio cartridge and cassette machines and telecine systems. They are an extension of and an augmentation to various types of automation systems, and are commonly located in master control rooms. Manufacturers active in this field include American Data, 3M, Fernseh, Ross, ISI, Di-Tech, and NEC. Seen for the first time, and already installed at ABC, New York, is the VIMAC system. Developed in Great Britain by Dynamic Technology, this system uses the television vertical interval to transmit encoded data consisting of two 40-bit words, transmitted on alternate fields. This approach has the virtue of requiring no additional control wiring; up to 4096 individual machines and control points can be utilized.

Digital video effects (DVE) systems continued their rise to high levels of performance. Units sold by NEC, Quantel, ADDA, and Vital, among others, were used in the majority of post-production houses. Quantel was awarded a technical Emmy award for its DPE 5000 system; the system was used, suitably enough, in the telecast of the Emmy awards themselves. Still stores of several types also increased in popularity. Units built by Ampex, ADDA, Harris, Quantel, Arvin/Echo, and EIGEN were displayed and placed into service. Most of these items are disk-based and provide storage for very large numbers of still television frames ("slides"), available on a virtually instantaneous random-access basis.

Analog processing amplifiers, distribution amplifiers, audio amplifiers and similar apparatus continued the long series of evolutionary improvements that characterize these rather undramatic but absolutely necessary components of the television studio system.

All-digital test waveform signal generators made their appearance during 1980 and exhibit the consistent and nearly ideal characteristics which are now expected of digital equipment. Tektronix and other companies are active in this field.

"Television technology showed remarkable progress in 1980. Digital video has captured the imagination of engineers in equipment design and in the planning of new production facilities."

Video Recording–Broadcast

Videotape recording applications and equipment types continued to proliferate during 1980. In the professional and broadcast fields, the sales of 1-in recorders continued at a very high rate. In 525-line television countries, the Type C recorder is most popular and is now available from six different manufacturers located in three countries. In 625-line countries, the Type B format is very popular, although many services make use of Type C machines, as well. It is estimated that the world population of 1-in professional video recorders now exceeds 10,000.

For news gathering and field production both 1-in and U-format recorders are used. The 1-in Type B and Type C machines are increasingly popular as more models become available, since their direct color picture quality is inherently superior to that provided by U-format equipment; however, the small, light-weight cassette-loaded U-format recorders are widely used in all parts of the world for production purposes. Additionally, the European Broadcasting Union (EBU) has decided on U-format machines for the international exchange of program preview material; the international exchange of recorded television programs for broadcast is, however, restricted by EBU and CCIR to the larger professional formats.

In North America, the broadcasting networks increasingly depend on the Type C recorders for network production and program origination purposes. For example, the American Broadcasting Company now operates 155 Type C systems and, by the end of 1980, had converted 95% of its video recording facilities to the 1-in Type C format. This is a significant conversion of the network facilities from the previous quadruplex recording systems, since the first Type C machine was installed by ABC in November 1978.

At least one "second generation" Type C machine, the TR-800, was announced during 1980 by RCA Corporation. This advanced microprocessor-controlled machine will begin service late in 1980 or early 1981 and is certain to be followed by improved models from other manufacturers in the very near future.

In the cast of the Type B format, the several models of the BCN machines manufactured by Bosch-Fernseh saw increased use, particularly in their portable versions. The BCN-5, a cassette loaded design, is particularly popular in Europe for electronic field production purposes, and produces recordings which may be reproduced, edited, and re-recorded on the larger BCN-50 studio equipments.

International standardization of both the Type B and Type C formats is the responsibility of the International Electrotechnical Commission (IEC), and the documentation of both types of equipment is now essentially complete. It is expected that final approval to the relevant IEC Standards will be obtained at the next meeting of IEC Technical Committee 60-Recording, to be held in Prague, Czechoslovakia, in February 1981.

Videotape Editing

Very extensive selections of editing equipment were displayed during 1980. It seems to be possible to categorize these systems into three levels of design: large, full scale editors whose progenitor was the original CMX design of several years ago; middle-sized systems, whose capabilities are based on microprocessor control; and small systems controlled by essentially manual means. All three types usually utilize the SMPTE time-and-control code for editing decision functions. The proliferation of this kind of equipment is a clear demonstration of the increased use of post-production in the present television industry.

The largest editing systems, produced by CMX, CDL, Sony, Harris (EPIC), Bosch-Fernseh (Mach One), and Datatron include comprehensive computer control and, in general, also can control associated video switching systems using digital input ports provided on the latest switching system designs. Mid-sized editors, including models from CMX (EDGE), Convergence Corporation, Datatron (Tempo '76), United Media, Videomedia, and others depend on more direct user interaction with their computer keyboard panels and all use SMPTE code in the main operating mode. The smaller systems, which frequently use SMPTE code to assist the editor choose in and out cues, are represented by JVC, Panasonic, Sony, Dynasciences, and the smaller Convergence Corp. units. They are the workhorses of off-line editing procedures in many facilities and exhibit many unique control features to ease the task of the editor.

CBS completed installation of several off-line editing suites making use of special Sony Beta-format videocassette recorders in the decision-making process; finished decision lists are then stored on floppy disks for direct input into CMX on-line editors which make the final program edits.

Video Recorders–Videocassette Equipment

As noted earlier, the U-format is popular for broadcast field production purposes. In addition, this IEC standardized format also remains very popular for professional non-broadcast use in schools, universities and industrial studios. Especially important

advances in editing systems for this format have become available in the recent past, and during 1980 several editing systems using the SMPTE/EBU Time and Control Code for editing control purposes became available for U-format equipment.

In the United States in 1980, the heavy sales of home videocassette recorder/players continued. The equipment offered to the public in both the Beta-format and VHS-format showed more and more special features, such as timers and tuners permitting recordings of off-air programs to be made while the owner watches another program on the household television receiver. Strong competition drove prices downward and more and more recorded cassettes appeard in the marketplace. Small, relatively inexpensive television cameras appeared, including some color units, and the home television studio came closer to reality.

Technicolor Corporation introduced a new, very small videocassette unit which makes use of ¼-in tape and results in an extremely compact portable machine. An helical recording format is used.

Industrial/educational use of the ½-in videocassette units became more frequent during 1980. Manufacturers introduced new lines of equipment built to more professional levels of operation for these applications. Improved packaging, more flexible control systems and editing options appeared in the "industrial" versions of both VHS-format and Beta-format equipment. In general, professional non-broadcast producers of video recordings retain a preference to make the original recordings and to perform editing on larger tape formats. The ½-in machines are most frequently used for reproducing distribution copies of such professionally produced material. This situation will undoubtedly change as the smaller format equipment becomes even more suited to production uses.

Videodisks

While videocassette equipment became more commonplace, the videodisk is still rather a novelty. The main supplier of such units in the U. S. market is Magnavox, a subsidiary of N. V. Philips, and the disks for these players are recorded according to the Philips/MCA specification; they are optically read by the player. Competition in this field has not yet fully developed, although both RCA and JVC have announced that they will introduce units in the U.S.A. during 1981. The industrial use of videodisks is expected to expand since the joining of forces of IBM and MCA in a joint venture. Use of the Philips/MCA disk and Pioneer players continues as a sales tool in many automobile dealerships in the U.S.A. Introduction of new types and new models of videodisk units in 1981 may well bring additional activity to this area of television technology. Some interest in videodisk standards activities can be noted in the work of IEC Technical Committee 60 and some recent expressions of manufacturer interest in having the SMPTE work on specifications have been heard. SMPTE formed a Study Group on Video Disc Recording more than five years ago, but no manufacturer or user has proposed specific standards up to this time.

Satellite Systems

The 1979 loss, during sub-orbital maneuvers, of the RCA Satcom III communications satellite resulted in a shortage of television satellite transponder availability in the U.S.A. during 1980. This slowed the growth in the use of satellite distribution channels for both broadcast users and for cable television and data transmission users. A replacement RCA satellite will be launched during 1981. In the interim, two other RCA Satcom satellites and two Western Union Westar satellites provide most of the service to the United States, while the long-established ANIK satellites continue to serve the needs of Canada.

Satellite service to broadcasters in many other parts of the world continues to increase. Indonesia has announced plans for expansion of its existing national telecommunications satellite system. In Europe, France, Germany, and the Scandinavian countries are actively engineering the systems necessary for implementation of new broadcast service satellite systems. In the U.S.A., Comsat General announced plans and applied to the F.C.C., through its subsidiary Satellite Television Corp., for permission to operate a Direct Broadcast Satellite (DBS) satellite system, initially to use one satellite for three-channel coverage of the eastern U.S.A. A second satellite would subsequently provide service to the western part of the nation. In Japan, the experimental satellite used by NHK to study DBS systems reached the end of its useful life; much data had already been gathered and published and further experiments are planned in the future. In Canada, DBS plans and experiments continue, with generally good results. It is anticipated that DBS service the world over will be conducted on K-band microwave frequencies, lying between 12 and 14 GHz. In the Americas, the next Region II Regional Administrative Radio Conference, conducted under the aegis of the International Telecommunications Union (ITU), will be held in June, 1983, and the Converence will set frequency allocations and orbital positions for DBS satellites serving North and South America at that time.

Cable Television

Cable television became more and more diversified in the services supplied and the year saw the agressive pursuit of new franchises by both large and small operators. Franchises are being sought in the larger cities of the United States in a very competitive manner. Franchises in the suburbs are nearly as attractive and dozens of applications are now being considered by the relevant local authorities.

New cable television services provided to system operators by means of satellite distribution channels became important program sources for persons subscribing to cable systems; 24 hours/day news and sports services proved to be very popular among cable-TV viewers and, in fact, the Cable News Network, which began operation in 1980, achieved national attention during the Presidential election by furnishing another outlet for nationwide political discussions. In addition, the C-SPAN service initiated distribution of gavel-to-gavel coverage of the meetings of the U. S. Congress by satellite distribution to cable television systems. These services, not available through normal broadcast television channels, represent the efforts of cable television operators and syndicators to provide expanded services to their clients.

More and more cable television systems are offering their subscribers "pay cable" options. In these cases, one or more cable channels are encoded ("scrambled") and an extra-cost decoder is necessary to view the program. Usually this decoder is rented to the subscriber as an addition to his normal monthly cable television subscription charge. Programming of the "pay channels" usually consists of relatively recent motion pictures although other special interest material may be shown. Some "pay cable" programming is distributed by satellite and the remainder by means of video recordings supplied to the local cable television operators by several suppliers.

Teletext Systems

In the United States, studies of Teletext systems continued and one set of field tests in St. Louis was concluded and another more ambitious test sequence was announced for Los Angeles. One television network (CBS) indicated a strong preference for a specific Teletext system and petitioned the FCC to approve its use, but the EIA committee studying the matter stated that it was not yet prepared to endorse a single system. In other countries, some announcements of the beginnings of Teletext service were made, while the service already offered in the United Kingdom continued to expand. In Canada, the Telidon system is under study and produces high-quality color graphic material. The EIA committee is considering Telidon as well as the U.K.-developed Ceefax/Oracle and the French-developed Antiope system.

Stereophonic Sound for Television

Stereophonic sound for television broadcasting is now a regular service in Japan. A subcarrier is transmitted in the audio transmission channel and decoded by an adaptor or by television receivers espe-

cially designed for stereo sound. In the United States and Europe, "simulcasting" has been used more and more frequently to provide stereo sound to television viewers. In this system, the stereophonic sound is transmitted by an FM station located in the same locale as the television station providing the video signal. Most frequently this system is used for musical broadcasts, although drama has been broadcast as well.

In 1980, in the U.S.A., the Electronic Industries Association (EIA) established a Steering Committee and several working groups to investigate suitable transmission specifications for compatible stereophonic sound for television broadcasts. The EIA-Japan is cooperating in these studies, as well, and field tests were begun in late 1980 in Chicago, making use both of closed-circuit and over-the-air broadcast testing procedures. It appears likely that any system adopted in the U.S.A. will make use of a noise-reduction system to improve the signal-to-noise ratio of the stereophonic sound channels; this scheme must provide monophonic compatibility as well, and the specifications for suitable noise-reduction techniques came under active study in mid-1980.

Subscription Television

At the end of 1980 approximately ten subscription televison (STV) stations were in operation in as many U.S. cities. These stations encode (scramble) their transmissions, for a certain fraction of their broadcast day, and rent or lease decoding units to viewers who subscribe to the service. Subscription programming consists largely of motion pictures and sporting events. In these two examples, it is said that the relatively expensive ($20/month, average) subscription fee is more than offset by savings in admission fees to first-run motion pictures in theaters and sporting events in stadiums. In addition to the ten stations now operating, about 15 more are authorized to start subscription service and the FCC has more than 80 applicants awaiting approval.

Captioning for the Hearing Impaired

The quantity of U.S. network and local television programming providing encoded captioning signals to viewers with impaired hearing increased greatly during 1980. The captions are encoded into the first active television line (line 21 in 525-line NTSC systems) and must be decoded with either an attachment to the television receiver or by use of a television receiver with the necessary circuitry built-in. Receivers of the latter type were made available during 1980 by a large retail chain (Sears, Roebuck & Co.) and separate decoders were available from the same source. The National Captioning Institute (NCI) began full-scale operation in 1980 near Washington, D.C., and by the end of the year was providing the PBS, ABC, and NBC networks with as many as 100 hours per week of captioning data for inclusion in network programming. The CBS network declined to use the services of the NCI but has announced plans for the experimental transmission of captions during the TELETEXT tests in Los Angeles during 1981.

Low-Power Television Stations

During 1980, the Federal Communications Commission (FCC) announced its intention to license a new class of local television station, the Low-Power Television (LPTV) station. This type of station would consist of a transmitter similar to present-day translator/repeater units, with powers ranging from 100 W to 1 kW, but with the added capability of local program origination. Presently licensed translator/repeater systems may only relay the programming of a distant station licensed under traditional rules. The purpose of the new service is to diversify the types of programming available to all viewers and, especially, to enable ownership of television stations by the many minority groups in the nation who now have only limited ownership of broadcast television facilities.

Other Developments

Television transmitter design continued to stress energy efficiency. Many UHF television transmitters now utilize klystron modulating-anode pulsing during the horizontal sync interval and significant efficiency improvement is well documented. VHF transmitters of advanced design and lowered power consumption were delivered by Harris Corp. and RCA during the year. A number of stations, both VHF and UHF, now make use of circularly polarized transmitting antennas. Reduction of the effects of ghosting, due to multipath reflections, and relative independence of receiving antenna characteristics is evident.

In another area of video technology, Colorado Video, Inc., announced the availability of a slow-scan color television system, capable of transmitting full-color still images over audio-bandwidth circuits. The system has been placed into service by Satellite Syndicated Systems to provide information and entertainment programming to decoding apparatus located at cable system head-ends. The slow-scan video is accompanied by a multiplexed audio signal and transmitted on a subcarrier located near the upper band-edge of a Satcom II transponder. Good results have been obtained; the first use has been to transmit a "video magazine" program to cable subscribers.

CFI (Consolidated Film Industries) Video Division announced construction of a fifth editing room in addition to CFI's four editing rooms updated by extensive software improvements during 1980 (Fig. T-2). Completion of the new editing room is expected early in 1981.

There have been improvements in telecine, including the addition of a second Rank scanner with color correction developed independently of Rank. It has 12-bit computer capacity and fill color, gamma and matrix selectivity. Modifications being made to the Rank machines reduce the ambient dirt attracted during color correction, reducing the need for sonic cleaning (Fig. T-3). — *Frederick M. Remley, Jr.*, Vice-President for Television Affairs.

Figure T-2. CFI's edit room no. 3 with custom software.

Figure T-3. CFI's Rank/Cintel Mark III flying spot scanner.