Argentina

In Argentina, more than 77% of the population has a television set. There are 38 stations, 94 "repeating stations," and 24 CCTV stations. Until recently they broadcast in black-and-white, in the 220-V, 50-Hz, 650-line system.

As a result of the Soccer Championship which took place in Argentina in 1978, and because of the need to transmit in color to many other countries, the Argentine government undertook the building of a studio in Buenos Aires which is equipped according to the most modern technology (Figs. AR-1, AR-2).

The building consists of three areas, one containing the offices, another the studios, and the third, production and maintenance workshops. The second area comprises six studios, one of 18 × 36 m, with 300 seats, and the others of 18 × 23 m. This area has two recording rooms, where 16 tracks can be recorded. Each studio has Auto Cue lighting panels that can be programmed and kept, thus ensuring continuity.

The image is produced by means of the PAL B system, and it is "transcodified" and broadcast in the PAL N system, which is the one used in Argentina. The station has all the equipment needed to transmit in a system compatible with black-and-white television.

The station has VTR Standard CPB equipment V-Matic, 3/4-in system and DK 76 cameras with Bosch BCN 2 recorders for ENG. For motion pictures, Cinema Products 16-mm cameras and Omac and Houston processors have been installed.

Broadcasting equipment includes a Harris, 25-kW and a SB, 5-kW transmitter. The station has four transmission vans, each one equipped with five cameras, two microwave systems, one VTR quad (Fig. AR-3), one VTR standard of 1 in (slow motion), one audio panel for 16 channels, and a mixer with special effects generator. Each transmission van has its own 60-W supply.

The station, which began transmitting in color in May 1980, provides programs to 30 stations in the interior of the country, covering distances from the city of Paso de Los Libres, located 560 km north of the capital, to the city of Usuahia, located in the South, 2,376 km from the TV station.

Figure AR-1. Central control room in new Television Center.

Figure AR-2. Camera Director in Television Center.

Figure AR-3. Broadcasting from VTR area in Argentine Television Center.

Australia

Television

Availability of more and better equipment and improvement in television techniques have resulted in improved reception for many viewers and better quality of pro-

Figure A-1. Editing suite at Videolab.

gram production. Production facilities were enhanced by the provision of digital effect devices in some of the major studio centers. The first charge-coupled telecine was installed in Melbourne.

A source identification and cueing system was developed and adopted. This system permits an originating station to encode its call sign and program or segment end-cues in one line of one field in each second. An inexpensive decoder installed at television stations taking the relay provides for a continuous display of the source of the signal together with a 30-s warning of the approach of the end of the program or segment and a countdown over the last 10 s. The system will be adopted by all commercial television stations, and it has also been adopted by Telecom Australia to provide identification of base band repeater stations where a fault has occurred.

In the field of videotape recording the problem of lateral image shift at edit points in 2-in (50-mm) PAL quadruplex recording has been the subject of much study both within Australia and with EBU Sub-Group G2. Progress has been achieved to the point where a solution to the problem appears to be close at hand.

Domestic Communications Satellite

The Australian Government decided in principle to introduce a domestic communications satellite system for Australia and has vested responsibility for the provision of the system in the Overseas Telecommunications Commission of Australia.

Tenders for the spacecraft and earth stations, which will be operated by Government instrumentalities, will be sought until closing on 4 May 1981. The system will provide transponders for television, data, and other commercial and national body services. One feature of the system will be the HACBSS (Homestead and Community Broadcast Satellite Service), enabling remote area reception of television services direct from major centers, such as Sydney or Perth, utilizing privately owned small earth stations employing a parabolic reflector having a diameter of one or two meters.

A remote area television satellite scheme, currently in operation, uses transponders of the Pacific Ocean Intelsat Satellite. They beam the national television service signals to existing terrestrial transmitters serving remote communities, such as mining centers, beyond the range of the Australian Broadcasting Commission's microwave broadband bearer network.

UHF Television Services

The Postal and Telecommunications Department, which is now known as the Department of Communications, announced plans for UHF television services in Australia involving both wide-coverage high-power stations and translator stations to improve reception in local communities. Adoption of UHF has been made necessary because of the unavailability of sufficient VHF channels, resulting partly from a previous decision to clear existing VHF television services from the recognized 88–108 MHz international FM band. It is proposed that Band IV will be used for wide coverage stations and Band V for translator services.

Several national and commercial UHF television translator services have already gone into operation to improve existing VHF service coverage in Adelaide, South Australia, and Northam, in Western Australia. Other services will shortly be provided in Sydney, Northern Tasmania, and the Gold Coast, Queensland.

Multicultural Television

Multicultural Television went on the air in Sydney and Melbourne on 24 October 1980 on Channels 0 and 28 in both cities. The existing Special Broadcasting Service Administration will be responsible for the transmissions pending the recommendations of a Federal Government Standing Committee on Education and the Arts, which is considering the desirability of placing this service under a separate authority.

Motion Pictures

Colorfilm Laboratory – Sydney

Updating of equipment in the laboratory has been carried out during the past year.

New processing machines, built by Filmlab Engineering of Sydney have been installed for ECP2 35/16, black-and-white optical sound negatives 35/16, and specially designed H/Con machines exclusively for optical title work.

Figure A-2. Rank Cintel Mark III telecine at Videolab.

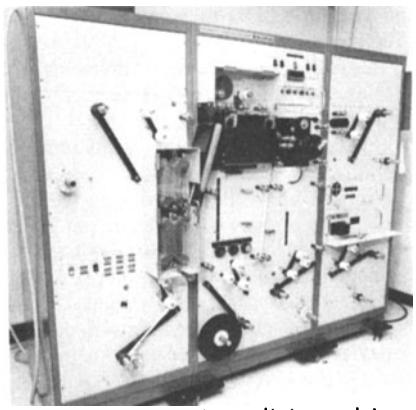

Figure A-3. ATLAB Australia's total immersion Bell and Howell panel printer.

An A & B Hazeltine analyzer has been added, together with two Bell & Howell wet gate modular printers and an Aquarium gate for the Bell & Howell Seiki step printing machine. The laboratory is moving over to frame count cueing as part of its updating of grading and printing facilities.

A new theater has commenced construction to tie in with a recently installed RCA sound optical transfer system for 35/16 formats.

Cinevex Laboratory – Melbourne

Over the past twelve months, Cinevex Film Laboratory has advanced rapidly in modern laboratory engineering technology. Installation of two Filmlab engineering processing machines, a 16/35-mm ECN2 and a 15/35-mm for ECP2, has been completed. In addition to the processors, Cinevex has installed a Hazeltine color analyzer, a 16/35-mm Oxberry printer with wet gate, and a wet gate printer.

Filmlab Engineering – Sydney

The laboratory equipment manufacturing division of Colorfilm has enjoyed a very successful year highlighted by the impact made by its first Photokina exhibit. The acceptance of the equipment as world class in design and craftsmanship by many leading film laboratories has resulted in more export markets being established throughout Asia. As a result of the increased demand, Filmlab Engineering has moved to a new, especially designed manufacturing plant.

Videolab – Sydney

The Video division of the Colorfilm group of companies has expanded its facilities during the 80s with the installation of a Grass Valley 300 Series Switcher with a dual-channel digital video effects system. This will make available for client productions a wider range of effects in minimal VTR time (Fig. A-1).

Videolab's unlimited re-entry GVG 300 will speed up the compilation of film-to-tape commercials, permitting various title super-impositions to occur in real time. The addition of software modifications to the current CMX 300 has provided a system comparable with the latest CMX 340. Software modification provides facilities of 127 events in a 60-s or 30-s TV spot, and will drive the 300 switcher to add and subtract artwork on coded cues.

With the increasing demand from producers requesting transfer of original negative film to videotape for completion, Videolab has recently refurbished the transfer room housing Rank Cintel's Mark III (Fig. A-2). To guard against negative scratches and dirt, the room has a pressurized laminar air flow with electrostatic cleaners fitted to the air supply ducts.

Negative ion generators have been installed at strategic points around the room, and further clean air flows have been introduced over the winding benches within the room. While the former trend in lush, carpeted telecine areas is glamorous, it is detrimental to the client's product and obviously generates and disperses dirt directly onto negative and positive film prior to transfer. The Mark III Cintel has been upgraded to accommodate super 8, 16, and 35-mm film. The addition of the TOPSY micrograde programmer has now proved to be the ultimate in grading and operation.

Introduction of the Convergence Corporation ECS-90 Offline Editing System has proved to be of immense value in editing. Film editors have adapted to offline editing with enthusiasm; the program is completely cut prior to assembly on 2-in (50-mm) quad tape. Audio is then completed in-house using a 16-track recorder locked to an offline videotape recorder and subsequently re-laid on the 2-in quad master.

Super 8 Services – Sydney

Super 8 Services has installed complete facilities for high volume multirank optical reduction printing of super 8 release prints. Included are facilities for high quality blowups to 16-mm and high speed sound transfers, lubrication, and cassette loading.

ATLAB – Sydney

ATLAB has continued its forward planning with the installation of one of the first Bell & Howell interchangeable 35/16 total immersion printers (Fig. A-3). This expansion, coupled with the installation of two high speed ECP2 processing machines, has been undertaken in anticipation of increased local production likely to result from the new taxation incentives recently announced by the Federal Government and the real possibility of more release prints of overseas features being produced in Australia.

Belgium

In 1980 the emphasis was on videotape recording. The Dutch speaking broadcasting organization, BRT (Belgische Radio en Televisie), decided to adopt EBU standard C option III. The third program audiotrack will be useful in a bilingual country. Based upon this decision an order has been placed for six portable and 13 studio VTRs, together with an editing suite. Delivery is expected in 1981. As far as the French speaking station RTBF (Radiodiffusion — Television Belge Francaise) is concerned, a new video recording standard will be decided upon this year.

Also for BRT the renewal of the audio equipment for the four major television studios has been completed. One 48-input console, one 44-input and two 32-input consoles together with a 12-input auxiliary mixing desk have been put into service (Fig. B-1). According to established BRT policy these consoles and their ancillary equipment fully anticipate the future stereophonic television transmissions.

For the video facilities to keep pace

Figure B-1. Audio mixing desk with 44 inputs.

with the audio a new digital production effects unit has been installed in one of the studios. A major part of the news operation has been converted to ENG, with four independent crews and two editing rooms at BRT.

At RTBF, 1980 saw an explosive growth of ENG. Nine cameras are in daily use, together with six editing suites scattered over five cities in Southern Belgium.

Experimental teletext transmissions offering up to 100 pages, according to the British standard, began at BRT on 8 May 1980. By the end of 1980 the total number of teletext receivers sold exceeded 5000.

In November 1980 a small scale experiment called Perceval was begun at RTBF. Based upon the French Antiope system it involves a limited number (30) of Antiope receivers in strategic places.

In conclusion we report that construction of the new telecommunication tower has been completed. The dishlike structure (weighing almost 5000 tons) at the top of the tower (*SMPTE Journal*, p. 332, May 1980), which will contain the transmitting and receiving equipment, has been constructed on the ground and subsequently hoisted to its final position by hydraulically operated cables. It is the first time that this time- and money-saving procedure has been applied to a telecommunications tower in Europe.

Canada

New technology played a large part in many of the projects undertaken by CBC Engineering during 1980, while at the same time engineers have been active towards the determination of a North American position on broadcast digital technology standards which will later be presented to the CCIR.

ACP

Progress has continued on the implementation of the Accelerated Coverage Plan under which CBC radio and television service is being extended to all unserved areas having a population of 500 or more. Of the 622 projects in the plan, 387 had been completed by the end of 1980 which, coincidentally, represents 62.2% of the total. During the year, 51 new transmitters were brought into service — 34 television and 17 radio. Only one of the radio transmitters operates in the AM Broadcast band.

Due to a change in regulations, CBC is now installing its own satellite receiving earth terminals in conjunction with new remote transmitters. Both television and radio program services are available from Canada's ANIK satellite.

New Facilities

Additions and replacements to production facilities occupy a large percentage of engineering time and, with some 600 active projects on the books ranging from reconstruction to console replacement, there is hardly a CBC location that has not been updated in some way. Some examples over the past year are:

A complete super-8-mm film unit, with editing, was installed at Yellowknife, Northwest Territory.

Two VPR 2 and one VPR 20 one-inch videotape machines were installed at Montreal and nine VPR 2's at Toronto.

A Television Standards Conversion suite which uses a Quantel DSC 4000 as the heart of the system was added to CBC facilities in Montreal (Fig. C-1). A 35-mm to quad tape transfer suite using a Cintel Flying Spot Scanner was also added to the Montreal plant.

The Toronto network center received closed-captioning equipment to add subtitles for the hard of hearing. At the present time the service is officially experimental, pending the establishment of a Canadian captioning center which will cover the requirements of both French and English networks.

Two stereo mobile units have been delivered for radio production in Vancouver and Toronto, and a third one is under construction for Winnipeg.

Revisions were made to the television lighting facilities in the House of Commons, Ottawa.

Structural modifications were made to the buildings in Halifax and Corner Brook to improve fire safety measures.

The seventeen Vista 80 character generators in broadcast operations have been updated to include light pen control of font editing. This was a joint undertaking of CBC and Canadian industry. Another example is a 44-message alarm enunciator developed by AVL Digital for particular use in announcer-operated radio stations. Alarm messages are silently displayed on a standard TV monitor for the announcer's benefit while on-the-air.

Outside Canada, the technical facilities at the CBC offices in Paris, Washington, New York, and at the United Nations have each been updated.

A Major Overhaul

One of the more challenging projects of the year has been a major update of the English Television Network facilities at Toronto. The existing five-story building, which has been in operation since television broadcasts began in 1952, has been extended to house videotape and telecine facilities and the whole of Master Control.

All equipment moves are being made without interruption to normal service, and, in general, the same equipment is being re-used, except that the new Master Control includes new distribution and jackfields, a 120 × 144 Image Video routing switcher, a 96 × 96 Ward Beck Systems intercom system, and a Mitel touchtone order wire telephone system. To ease the problems of system timing during the changeover, all machines and studios have been given individul Leitch sync generators.

By means of a number of Digital Video frame synchronizers, all incoming lines are now synchronous, as is the whole Toronto complex, thus removing all the need for gen-locking, which in turn relieves such problems as character generator assignments.

As fast as the telecines and quad machines are moved out, the old building is being refurbished to allow installation of the nine new Ampex VPR 2 one-inch machines in four suites, two of which are equipped with Epic editors. These suites are to cover major programming requirements. At the same time in the old building the control room and service areas of the main TV studio are being completely rebuilt. To permit operations in the studio to continue, a temporary wall was built to isolate the reconstruction, and two trailers outside act as control and dressing rooms. Changes to the studio lighting system are being done at night.

The organizational difficulties have been considerably eased by the use of a critical path bar chart program written for a

Figure C-1. Overall view of the Montreal Television Standards Conversion Center.

TRS 80 minicomputer, and such units are available on site and in the planning office.

Although smaller in scope, the radio network center, also in Toronto, had its hourly English news service studio rebuilt without interruption to programming requirements.

Future Projects

Engineering planning during the previous year included a new CBC production center for Regina, scheduled for completion in 1984. Under study are the requirements for two proposed additional television networks, CBC-2 and Télé II, and a system to provide surveillance of the parameters of unattended transmitters called Monitoring Alarm and Remote Control (MARC). Three different systems are undergoing field trials as a part of this study.

Figure D-1. Electronic subtitling equipment in Denmark's Radio/TV.

Denmark

The Danish Filminstitutes Information Department, which registers all the important events in the motion picture industry, reported that the number of cinema tickets sold has been surprisingly constant each year for the last few years; however, there has been noticed recently a significant change in that the profit goes to the big city centers with their much greater choices concerning the number of pictures shown with a suitable time of the day to choose between. In consequence of this it has been a very hard time for the suburban and small town cinemas and those in the countryside. The trend toward more than one cinema under one roof has continued with the subdivision of the existing houses to two, three, or even more theaters; in one special case up to 17.

The number of Dolby stereo installations is now well above 10% of the total number of theaters. The Danish Filmstudio continues further with its plans of modifying the Sound Department to cope with Dolby SVA recordings, strongly supported by a group of young sound engineers, headed by Jan Juhler, who has already planned to produce a short documentary film of the Danish Radios Boys Choir.

The companies with studio facilities (Fig. D-1), including Nordisk Film Co., the Danish Filmstudio, and Risby Studios, all report full time engagement with little or no idling. Half of the time has been occupied with feature film production for cinema release and the other half of the time with features for television release. The Troels Orland Engineering Co. has custom designed several mixing facilities for both Nordisk Film Co. and the Risby Studios and also for Minerva Film, a company which together with Laterna Film takes care of most of the commercials produced both in the 35-mm and the 16-mm fields. The industry's amalgamation of distributors, producers, and cinema owners, supported by the Filminstitute, has now had its office working for more than one year, with its service unit busy aiding the industry to obtain the best possible presentation of picture and sound. Brüel and Kjaer and Ivie equipment is used to register the quality of the technical performance.

The BICO Company, importers of Arriflex, Sondor, Nagra, and Steenbeck Editing Tables, pointed out that their customers have been mostly interested in Sondor Multitrack Machines, Nagra Stereo Recorders, and especially the Steenbeck ST 921 Editing Table, which has gained widespread use with its interfacing facilities to manage the special film/TV problems in the production stage. The Johan Ankerstjerne Laboratories has after a very prosperous and busy year used the quiet time after Christmas to convert their processing system to the Kodak ECP2.

Federal Republic of Germany

Videotape Recording

In 1980, Bosch-Fernseh introduced the BCN 51 (Fig. G-1), a further development of the BCN 50 1-in B format VTR. The BCN 51 with optional digital techniques offers improved slow motion performance, visible search at many times normal play speed, and more convenient audio features, while retaining all the format and performance specifications of its predecessor.

Video Editing System

Albrecht-Elektronik in Schwabach introduced the ESP-M editing system. It is designed as a modular system, which can consist of a number of keyboards and a pool of video and audio machines (maximum 32) (Fig. G-2). Each of the enclosed machines requires a microprocessor controlled interface. All interfaces and keyboards are connected by only one bidirectional bus-line, using a 75-Ω coaxial cable. Five machines, selected out of the pool and assigned to the keyboard at the beginning of post-production, can be controlled with one keyboard. The assignment can be set up and cleared using the keyboard. Assigned machines can not be selected or disturbed by other keyboards which are working on the same bus-line. This construction offers variable configurations of editing facilities according to changing requirements. Beside this flexibility, provision for ultimate growth is one of the main advantages of this system. The keyboard contains all the editing facilities needed for modern post production. Illuminated buttons together with a clear arrangement and a simple well-defined identification of the machine status makes operation easy and fast. This editing system is used by broadcasters throughout Europe.

Albrecht-Elektronik also developed a time-code pocket calculator with stop watch (Fig. G-3). The battery-powered time-code calculator, TCC-1, can be used for the addition or subtraction of any two time-code values. A decimal keyboard is provided for the input of these two values, shown as two fluorescent displays. After pushing (+) or (−) the result is shown on display A. The built-in stopwatch (time-code generator, selectable 50 or 60 c/s version) can be started from zero or any other presentable time-code value. The running time code can be stored and is shown on the second display. By pushing the (−) button during this operation mode, the difference between running and stored time code can be calculated and shown on display A. In this way, accurate timing of different production events is possible. Applications include preparation of productions, actual production, post-production, news, sports, and editing calculations.

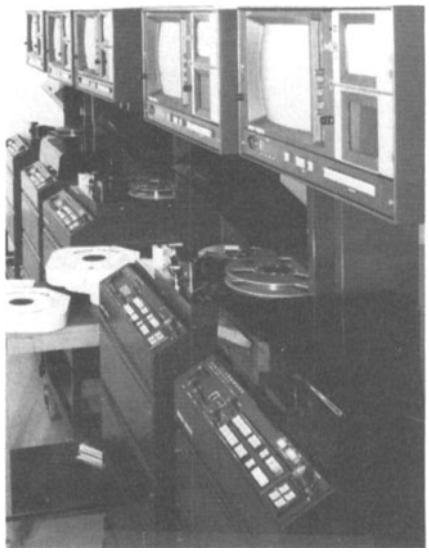

Figure G-1. The Bosch-Fernseh BCN 51 1-in B format VTR with slow motion and visible search.

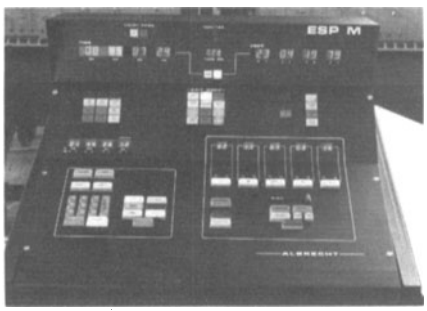

Figure G-2. Albrecht ESP-M editing system.

HMI Lighting

The Arri Report 200 HMI, manufactured by Arnold and Richter, München, is a universally applicable 6000 K daylight handlamp which was developed for mobile use in motion picture and television applications (Fig. G-4). Formerly unknown in modern lighting technology, this handlamp with its unusual package flexibility, offers a choice of power supply: either independent of the ac power supply by means of the accompanying 24-V battery, or in buffer operation using network power. This offers motion picture and television teams, especially those engaged in fast news reporting work, freedom of movement. As the battery is automatically charged when the ac power supply is being used, it is possible, when necessary, to switch immediately from network supply to battery. A special circuit in the power unit of the Arri Report 200 HMI assures freedom from flicker, regardless of the camera shutter opening. The flicker-free functioning is not affected by the transistor-controlled or, as the case may be, quartz-controlled camera speed, whether it be constant or variable. The portable electronic ballast set is functionally designed. It is composed of plug-in units including a power unit, charger and buffer unit, and battery (Fig. G-5, top to bottom).

When no ac power supply is used it is not necessary to use the charger and buffer unit. Charging via the buffer unit is effected automatically when the ac supply is connected. Additional batteries can be separately charged on an external charger.

The rotatable four-leaf barn door can be loaded with two filters. Dichroic 3200 filters, as well as filter frames with diffusing glass, are available.

Fiber-optic Signal Transmission

Last year Bosch Fernseh presented their fiber-optic LFS transmission system for the simultaneous transmission of studio quality video and audio signals up to a distance of 8 km. Transmitting and receiving units with their appropriate optical cables have been developed for the transmission of digitized TV signals using the 140 Mbit/s PTT hierarchy. Component-coded TV signals with sampling rates corresponding to the EBU 12 MHz : 4 MHz : 4 MHz proposal can be easily converted to this PTT hierarchy bit-rate by blanking removal. AEG-Telefunken offers such a 140 Mbit/s optical communications system, designated as LE 140. A V-groove GaAlAs injection laser is used in the transmitter, and a silicon avalanche photodiode is used in the receiver. A graded-index multimode fiber which permits repeater spacing of more than 4 km is employed as the transmission medium. The direct binary code is used for yielding low bandwidth and transmitter power requirements. The transmitter and receiver include a scrambler and descrambler in order to guarantee clock regeneration for all possible data sequences. Control circuits are implemented at the transmitting and receiving end for compensation of the temperature and long-term parameter changes in the laser and the photodiode.

Teletext

Simultaneously with the two *Bildschirmtext** field trials of the Deutsche Bundespost in the Düsseldorf region and in West Berlin, the German broadcasting companies started a countrywide *videotext** field trial on 1 June 1980. The coincidence of the *videotext* and *Bildschirmtext* field trials was chosen in order to realize the possible applications of the two text media, to carry out comparative acceptance tests, and to stimulate the efforts of getting compatible system parameters for the two systems. In the present *videotext* field trial the U.K. teletext system is used because of the fact that only for this system would decoder boards for TV sets be available in sufficient quantities at a moderate price. In accordance with the *Bildschirmtext* field trials the character repertoire of the present U.K. teletext standard was modified in order to include the German umlauts.

*In German terminology, *Bildschirmtext* means videotex and *videotext* means teletext.

At present, the *videotext* computer, installed at the location of the common editorial staff of ARD and ZDF in Berlin, is supplied with three simultaneously operating keyboards that allow fast editing of actual text information, the input and insertion of time-code controlled subtitles for the corresponding TV programs into the normal transmission cycle, and on-line subtitling of actual TV programs. In order to reduce the access time the present *videotext* test program is limited to 75 pages.

The British teletext standard was the system chosen for this field trial, for which a duration of at least two years was established. German broadcasters emphasized that this preliminary choice does not anticipate any future decision concerning the system that will be adopted. Within a German *videotext* standardization group consisting of representatives of the semiconductor industry, TV set manufacturers, broadcasters, and the Deutsche Bundespost, discussions are still going on. Pro-

Figure G-3. Albrecht time-code pocket calculator.

Figure G-4. Arri Report 200 HMI.

posals for a future *videotext* standard exceed the capabilities of the basic U.K. system and are hardly oriented to the proposed character sets and display facilities of the CCITT (Comite Consultatif Internationale Telegraphique et Telephoniques) (International Telegraph and Telephone Consultative Committee) (ITU) draft videotext recommendations. The complete character repertoire attributes of countries using Latin alphabets, as defined by ISO, or down-loaded character sets — DRCS (Dynamically Redefinable Character Sets) — are requirements for a future *videotext* standard. They are also required for high compatibility between *videotext* and *Bildschirmtext* or for the compatibility of a future *videotext* standard with the system parameters used in the present field trial. As defined by ISO, these attributes are character-defined (parallel) attributes for changing the display attributes (such as color, size, flashing, boxing) at any character location. In fulfilling these requirements, not only enhanced versions of the British fixed-format system (e.g. the Polyglot-C system developed by Philips) but also the French variable-format Antiope/Didon system are under discussion within the German national standardization group.

To obtain information on the variable-format and fixed-format systems with regard to the main problem of transmission reliability in wireless distribution, the IRT and the Deutsche Bundespost carried out simultaneous comparative propagation measurements with the British *teletext* system and the French Antiope/Didon system during the first six months of 1980. Different decoder instrumentation affected to some extent the measurement results of the comparative field trials, but no significant difference in transmission reliability could be found between the two systems at all measuring points. The same bit rate of 6.9 Mbit/s was used for both systems. In general, the British teletext system gives a greater protection for the layout, whereas the French Antiope/Didon system gives a greater protection for the data regarding certain control and display functions. The usefulness of the bit rate of 6.9 Mbit/s could be proved in connection with an earlier *videotext* field trial in the Federal Republic of Germany in 1978, during which no complete congruence between the service areas for *videotext* and TV could be found, but error-free *videotext* reception was obtainable only at less than 10% of the most critical measuring points.

Film Time Code System

The EBU film time code system developed by IRT has been used by the German television station WDR since 1976. Late in 1980 another television station, Zweites Deutsches Fernsehen (ZDF) started a test in order to provide practical experience with the time code procedure. Meanwhile IRT developed some new film time code equipment, an improved and modified setting device and a unique code transfer-and-

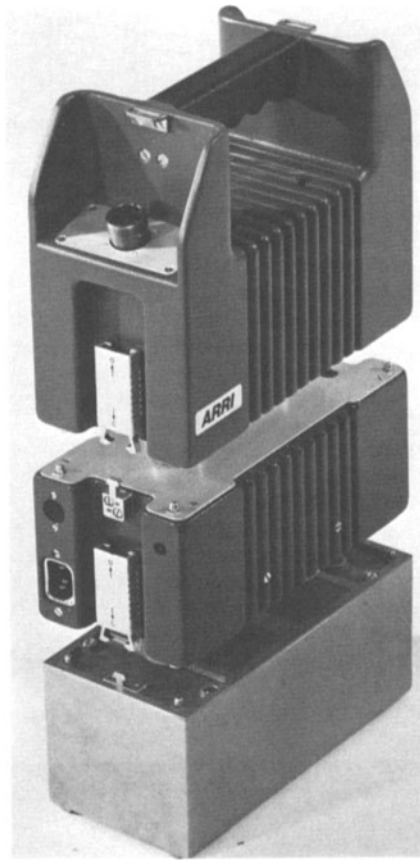

Figure G-5. Arri Report 200 HMI electronic compact set, operating unit, buffer unit and battery unit (top to bottom).

processing device. The setting device is based on a microprocessor and allows both setting the slave clocks and checking them by comparing the data and the incremental phase of the one-second pulse with those of the master clock. Coincidence is indicated by LED's. The code transfer device is a low-cost version with all facilities for reading out, displaying, and transferring the information from the magnetic tape to magnetic film, using mainly digital techniques for processing. Despite low expense it can display time code in forward and reverse running from very low speed up to 50 times nominal speed. It can also be combined with any type of audiotape machine and magnetic film recorder, these machines requiring no modification. In addition, it provides a pilot signal to control the 16-mm recorder automatically both from a time code recording and from a standard pilot-tone signal at 50 Hz. A microprocessor interface plug may soon be available for optional film-time-code data processing.

Measurement of Film Friction in Camera Gate

Operators occasionally experienced difficulties when using film in television. When running in the camera, film materials are occasionally transported irregularly, because of inappropriate friction of the film surface in the gate. Besides increased noise this can cause excessive picture jitter and abrasion deposits in the picture gate or in extreme cases even a film break. In general, film friction tests carried out by the raw film manufacturers give only rather unreliable information on the effective friction behavior of film stocks in the camera. It becomes necessary to consider the temporal sequence and magnitude of the individual friction forces (both static and dynamic) during the intermittent film motion.

To analyze and measure these friction forces in a manner similar to the practical use of the material, the IRT has modified a currently-used model of a film camera. The friction forces are determined by measuring the pressure against a piezoelectric device. The pressure is controlled by movement of the gate, which had previously been made movable. By this procedure the average friction coefficient of emulsion and base side can be measured. The results show that film friction is considerably influenced by climatic conditions and speed of film movement.

An Application of User Bits

To utilize ingeniously the memory capacity contained in the 32 user bits of the SMPTE/EBU Time and Control Code, an ARD/ZDF Working Group was charged with the composition of a suitable data format. In order to keep manual input and visual output devices simple and inexpensive and to avoid additional temporary storage, data such as production number, take number, pickup number, and reel number are repeated according to a fixed arrangement for an adequate sequence of code words. According to an EBU proposal, alphanumeric characters may be inserted in the tape leader in a configuration to provide a recording index. A data format conforming to *videotext* is used to enable a data display on conventional home receiver equipment.

Finland

Television

News Facilities

Oy. Yleisradio Ab., which owns and operates YLE (the Finnish Broadcasting Co.), has concentrated radio and television news staff under the same roof in the 1000 m^2 open-plan newsroom in the news wing of the new radio building alongside the Pasila television studios in Helsinki. In one end of the newsroom are two small radio studios for broadcasting news in Finnish and Swedish. Television news studio and other television facilities are located immediately adjacent to the other end of the large newsroom (Fig. F-1). The studio has a floor area of about 200 m^2, and a free height of 7.5 m. At the studio floor level there is a 75 m^2 combined production, vision and sound control room, offering

clear lines of sight to the studio floor. There is, also, a small isolated sound commentary booth in the back corner of the control area.

The studio has four Philips LDK 25 cameras, two of which are provided with Evershed Power Optics remote control pedestals, and a Philips Video 80 camera for captions. The vision mixer is a Central Dynamics CD 480-5, and there is a Cap-Gen electronic character generator for titling (Fig. F-2). The studio lighting system has 48 motor-driven Arnold & Richter telescoping poles and a minicomputer-driven Strömberg Novalit lighting control unit having 80 circuits (Fig. F-3). The audio console is a 24-channel Kajaani mono-desk (Fig. F-4).

The news studio has its own videotape and telecine center. There is also space for the editing of news film and ENG material, and two sound recording studios. The film laboratory described in the Progress Report for 1979 (*SMPTE J.*, p. 340, May 1980) is one floor below the studio and serves news as well as other productions.

Videotape Recording

In early March 1980, studio managers decided to use 1-in C-format and an order was placed for 13 Sony BVH-1100 P/S studio recorders and two RCA TH-50P (Sony BVH-500P) portables. Before the decision making, both operational evaluations and technical measurements were made for several types of B- and C-format recorders. For instance the machines were tested under low temperatures. Satisfactory operation down to at least −20°C was a requirement.

Six of the new recorders are installed in the news studio area with two Datatron Tempo 76 editing units and two GVG 1600-1L mixers in two editing control cubicles. Four of the new recorders are in the Helsinki main VTR center and three in Tohloppi Television Center in Tampere. The RCA recorders are installed in two mobile EFP units.

During 1980 ENG operations were considerably expanded. Eleven Sony BVU-200 recorders, six Sony BVU-100 recorders, and four Sony BVU-50 recorders were acquired for ENG purposes. The news studio has two BVU-200 recorders for transmission and two ENG editing units with two BVU-200 recorders and a BVE-500 ACE editor in each.

Commercial Television

At Oy Mainos-TV-Reklam Ab (MTV) an enlargement of about 4000 m² of the production center was made fully operative in 1980. At the beginning of the year the audiocassette duplication facilities and record pressing facilities moved into the new building, which also contains one television studio which began operation in June 1980. The studio, which is equipped with two LDK 25 studio cameras and a Sony TVT 300T portable camera, is intended for the production of commercials; it will also

Figure F-1.
Oy Yleisradio Ab's news studio.

Figure F-2.
Cap-Gen electronic character generators used in YLE for titling.

Figure F-3.
Strömberg Novalit lighting control equipment in the news studio.

serve as a news studio if MTV gets the right to broadcast news. This, a hot political problem affecting the entire broadcasting industry, was left open until 1980. The political decision was in December 1980. MTV was given authority to broadcast news, but a final agreement of extra air time, the hiring cost of the transmitting network from YLE, and some other problems remain still unsolved. A special working group has been formed by members of both companies, YLE and MTV, to come to an agreement by the end of January 1981.

At the same time when studio M4 was taken into service, MTV made a major decision to use one-inch recorders and also to use EFP production methods.

During the summer of 1980, MTV acquired one Sony TVT 300T camera and a portable 1-in Sony recorder for EFP purposes, one portable recorder for replacing a quad machine in the OB van, and two studio versions of Sony one-inch recorders.

The EFP equipment was placed immediately in operation on a test basis to gain experience on the EFP operation. The equipment will be taken into normal service at the beginning of 1981.

In the fall of 1980, MTV acquired a Chyron IV graphic generator which was taken into operation mainly as a part of the post-production system, but it can also be used from each of the MTV's four studios with the aid of a portable keyboard. During the summer of 1980 the second music studio was refurbished and the end result was very successful according to the response given by the television scoring team.

At the beginning of the year MTV signed a contract with Finnskandia, the largest music publishing company in Finland, to buy all their cassette duplication facilities. MTV is now the largest music cassette duplication company in Finland.

India

Motion Pictures

1980 kept up the record-breaking tradition of the Indian film industry by chalking up 742 productions during the year. Out of these, color features numbered 635 (85.6%) compared to 714 and 513 (71.8%) during 1979. All this was despite rising costs.

The year has been significant for India in many ways. Three laboratories were set up to process 16-mm color negative, thus giving an impetus to young film makers who were able to shoot on 16-mm color negative. Laboratories also installed blowup printers — one Debrie additive, one Debrie subtractive, and one Seiki. The results produced were very attractive, and three features released during the year were all technically very acceptable.

The Film Finance Corp. Ltd., the Government body through which imports of raw film were channeled during 1980, were taken over by the National Film Development Corp. Ltd. (NFDC) during the year.

Figure F-4. Sound recording studio for newsfilm with Kajaani audio desk.

NFDC activities are planned to help the film industry in every possible way. One of their commitments has been to create a proper arrangement for 16-mm production, distribution and release throughout India. This step will provide India with the much needed increase in theater outlets which stand at a small level of 10,500 at present.

Prasad Film Laboratories (PFL), Madras, were equipped for 70-mm release printing and also for six-track re-recording and mixing facilities. PFL, within a period of four years, emerged as one of the best laboratories in Asia. They have the latest equipment including Bell & Howell Modular Dry and Wet Printers, HFC Panel Printers, HFC Immersion Printer, Bell & Howell Model C Printers, and several color analyzers. This is the first laboratory in India equipped for 70-mm printing and processing and the first to provide six-track re-recording and mixing facilities for eventual transfer to 70-mm release prints. PFL has installed the MCI JH 500 Series fully automated console for providing music track on mono, two-track stereo, four-track stereo (CinemaScope), and six-track stereo, fully equipped with necessary Pan Potting (Panaromic). PFL also uses Westrex 6000 series High Speed equipment for re-recording together with the Kinoton High Speed Reversible Projector which is duly interfaced with other Westrex equipment.

The console for re-recording, manufactured by Westrex, has 46 inputs, is expandable with facilities for sub-grouping, and has six discrete master outputs. PFL also possesses Ursa-Major, Dolby Systems for best results in sound reproduction.

A magnetic striping machine was imported from Doel Engineering Company, U.K., for striping 70-mm six-track, 35-mm four-track (Scope), and 35-mm single track.

The recording theater has been fully designed, taking into consideration all the aspects of acoustics for re-recording and music scoring. There is also an optical department with an Oxberry Optical and Animation Stand. With all the above facilities, PFL can provide all services up to the release print.

While PFL at Madras made a lot of technical innovations, the Kerala State Film Development Corp. Ltd., in Trivandrum, at the southernmost part of India, built up a film complex which is close to being a dreamland. The complex spans 75 acres of land comprising film shooting floors, processing laboratory, recording and re-recording facilities preview theater, editing facilities, and accommodations for artists and technicians. The famed Kovalam beach is adjacent to the complex.

Krishna Gopal, an SMPTE Fellow, reported that "During the year 1980 Processlabs (Pvt.) Ltd. provided equipment to various laboratories for the changeover to "hot process." As a result not much development work could be undertaken. Even the X-ray sheet processor which has completed factory trials, could not complete field trials.

The first high speed 9000 ft hot process machine has been completed and is currently being installed. Three more 5247 processors are under construction. The first of the series has already been installed and is under full production.

Efforts are also being made to revamp the older but serviceable machines to accommodate the new process at higher speeds."

Television

Television has completed two decades of service in India. The growth has been slow. The present network consists of 18

centers including three relay centers. Twelve of these have studio facilities. The gross transmission time is roughly 1700 hours per month. There are an estimated one million black-and-white television sets in the country.

The Government recently announced its intention to install color TV in the country.

Video

Esquire Video Film Services, Pvt. Ltd., situated in the duty-free zone in Bombay, is equipped to transfer feature films onto video, for sale overseas.

The Government of India allowed the import of video cassette players by Indian nationals on payment of 320% import duty. Taking advantage of this, there is a growing number of video players in this country. The film producers are quite concerned with these developments because there can be a lot of pirating which can result in loss of business for them. The National Film Development Corp. Ltd. recognizes this problem and is trying to work out suitable precautions.

Italy

During 1980, a total of 163 feature films in the 35-mm format were produced by Italian Filmmakers (20 more than in 1979) and 409 were imported from foreign countries (381 in 1979), of which 152 were from the United States, 104 from France, and 41 from Germany. Although this report shows an increasing activity in theatrical film production and distribution, competition from public and private television staions is very keen. The TV producers seem to prefer to import programs from abroad instead of giving work to the Italian filmmakers.

During 1980, it was reported that 2460 programs costing 12 billion lire were imported for public TV. A total of 18 billion lire was spent for programs imported for the private television stations. In addition, the proliferation of private television has practically determined the end of the super-8 market for domestic use and has caused a very serious increase of piracy on videotape.

Competition between public and private TV is also of interest. From 1977 through 1979 public TV lost about 10% in audience and in sales of advertising to private TV companies.

Laboratories

A major technical change resulting from many requests for programs on magnetic tape is the installation of video departments in most of the Italian Laboratories.

A typical example is that of the L. V. Luciano Vittori Laboratory, well known in Europe for modern technology, now completing a new plant in Via Anagnina, not far from the Cinecitta studios. It is expected to be fully operating by the end of the summer.

In the same building the L.V.R. Video Recording Laboratory equipped with the Rank Cintel MK III flying spot telecine, TOPSY and floppy disk (PAL-SECAM-NTSC) provides transfers from negative to magnetic from any format, even from CinemaScope, with scene-to-scene color correction, scene reductions, etc.

A more simple telecine for registrations from 8-S8-16 and 35 positive feeds a multirecording center for videotapes and videocassettes. Ampex VPR 2B, JUC Editing 8200 — JUC VHS and Betamax are the recorders used. The Lab will be completed with a department for electronic special effects and titles.

Technospes Laboratory, now owned by a new financial group, is planning further investment on film and magnetic to provide efficient and high quality production. Figure I-1 shows the latest model of a high-speed printing machine, designed and built during 1980. The printer is equipped with the additive system produced by Digital Electronics Co. The machine can print at 350 ft/min with scene-to-scene color corrections without any problems.

The laboratory of Cinecitta, lately, has set up a system to obtain a particular color quality.

It is well known that many directors feel a certain nostalgia for black-and-white, but they do not really want to return to it.

The system that has been studied at Cinecitta permits obtaining black-and-white with certain details in color which can be graduated in continuity in accordance with the artistic results desired in order to accentuate those details. For example, you can obtain a close-up of a woman where the only detail in color is the red lips or, in a landscape, you can color certain specific details. The effects, which are presently being perfected for use in an important film to be launched in the near future, are made in the laboratory while preparing the internegative or the color reversal internegative.

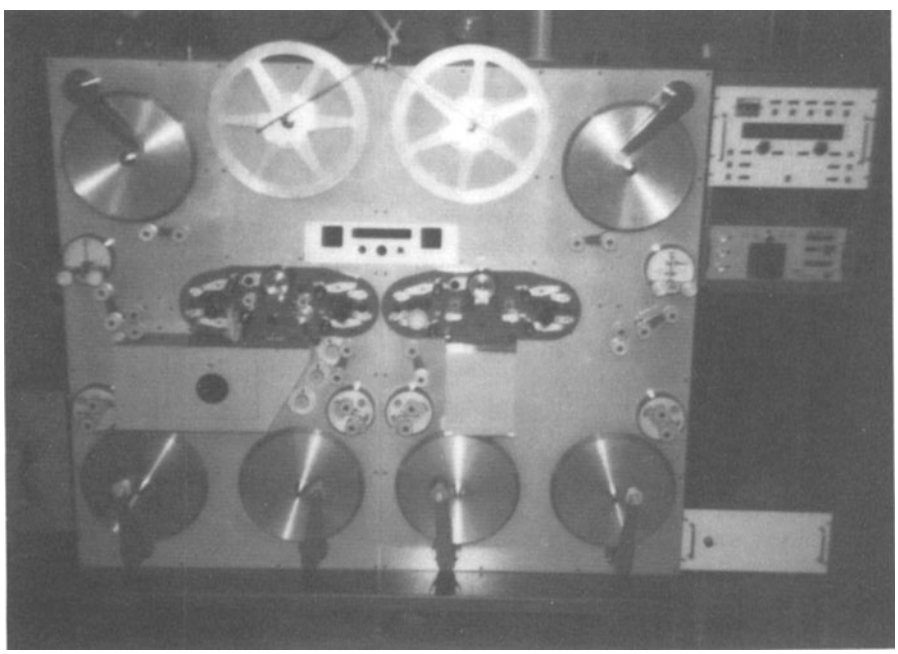

Figure I-1. High speed printer.

Japan

Motion Pictures

Film

Two new films were developed by Fuji Photo Film Co. as reported in the "Motion Pictures" section of this report.

Laboratory Practices

Tokyo Laboratory Co., Ltd., developed an automatic pan and trimming system for optical printers. When a 16-mm film for television is printed from an anamorphic 35-mm negative film, in the flat print of conventional aspect ratio, important action is lost at the sides or the top of the picture; in this system, however, the copy lens, controlled by punched tapes, can be moved laterally or vertically during step optical printing to bring the required action into the field of view.

An automatic roll-slide film as a set onto a roll of film was also announced. Its printing function can last until the roll of film comes to an end or the preset counter operates to stop it.

Fuji Photo Film also reported installation of a 35-mm color positive film processor manufactured by Otomo Engineering Co. The processor has a demand drive film transport system with improved spring-centered rollers with a maximum processing speed of 300 ft/min.

Toei Chemical Industry Co., Ltd., reported that a television monitor system has

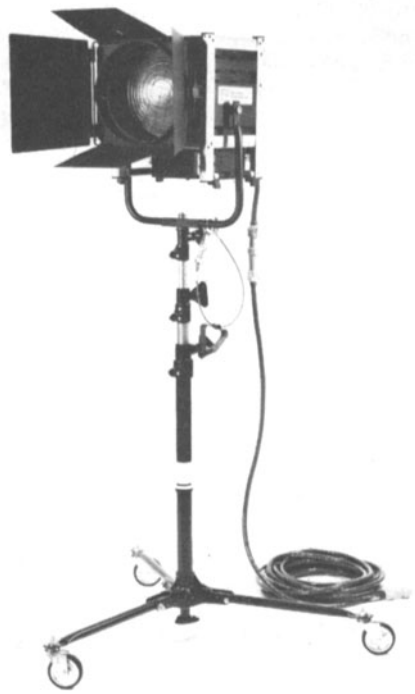

Figure J-1. HMI/Tungsten universal spotlight 4000-W.

been added to the optical printer in the film laboratory. The system enables several persons to view a large image of the picture being printed.

Sound

Yokohama Cinema Labs. Inc. developed a 16-mm optical stereo/bilingual sound recording system using a laser beam, with the technical guidance of the Technical Research Labs. of NHK (Japan Broadcasting Corp.). An earlier system was reported in "A High-Quality Optical Sound Recording System Using a Scanned Laser Beam" by Teichi Taneda et al., a paper published in the February 1980 issue of the *SMPTE Journal*.

In the laser stereo/bilingual sound recording system, a pulse-width modulation (PWM) circuit converts the audio input into PWM signals. The laser beam scans continuously the soundtrack area of the film. This is achieved by means of the acousto-optical deflector (AOD) driven by a 100-kHz sawtooth signal. Simultaneously, the laser beam is modulated by means of the acousto-optical modulators (AOM) driven by a 100-kHz PWM signal to generate two-soundtrack exposure of a variable-area type on the 16-mm film.

Lighting Equipment

The HMI/Tungsten Universal Spotlight series (Fig. J-1) of daylight balanced luminaries was announced by Ryudensha Co. Features include a Fresnel lens which permits a smooth field of light and a wider focusing ratio from spot to flood. The lights are convertible to HMI or tungsten lamps by replacing the insert assemblies.

The Universal Spotlights are shielded against direct ultraviolet radiation spill.

Other products announced in 1980 are Uni-Focus HMI 200/575 and Uni-Focus Quartz 650/1000. They are designed for film and TV location lighting to provide high efficiency daylight at 5600 K.

The Uni-Kit contains a wide selection of quartz halogen lamps for TV location, newsfilm, and motion picture applications. Uni-Focus 200 HMI with an HMI 200-W discharge lamp, uses a 24-V, 8-A Ni-Cad battery as the power source. The Automatic Lamp Replacing Light has two 1000-W single-ended halogen lamps, one of which is an extra lamp to be transferred automatically if the other lamp burns out.

Toshiba Electric Equipment Corp. reported a remote control lighting system with a 2-line transmission system. The dimmer and the remote control unit are linked with a single cable, but owing to the compact size and light weight of the unit, this control system can be carried easily from one location to another on the studio floor.

Exposure Meters

Two exposure meters, Auto Meter III and Spotmeter M, have been reported by Minolta Camera Co., Ltd. Auto Meter III offers the combined advantages of microprocessor technology and liquid-crystal digital/analog display memory capability. With a high-sensitivity silicon photocell and a specially designed microprocessor circuit, it makes precise measurements of incident or reflected light. Simply pressing the appropriate key input changes ASA and time settings, and gives the applicable EV or number readout to within $^1/_{10}$ of a stop. Besides digital/analog display of exposure data, it also incorporates a memory circuit that can store one or two previous measurements and display them on the analog scale, which simplifies comparison of readings for determination of exposure and lighting ratios.

Spotmeter M, using microprocessor technology and liquid-crystal digital/analog display, gives a precise measurement of 1° spot in the finder by a high-sensitivity silicon photocell, that includes the processor-calculated exposure-zone control system that adjusts display indication to bias exposure towards highlight or shadow areas of a scene or average them for best overall exposure.

Also announced was the Color Meter II, and the Chroma Meter Color Meter II (Fig. J-2), a three-color meter combined the latest LSI microprocessor circuitry with a liquid-crystal display, employing three high-sensitivity silicon photocells to make simultaneous measurement of both the blue/red and green/red light ratios. And the light-balancing and color-compensating indexes are immediately displayed in digital form. It has a three-position preset film-type selector to allow instant setting for the most commonly used film types.

Chroma Meter is a light and compact tristimulus color analyzer. It utilizes three high-sensitivity silicon photocells filtered

Figure J-2. Color Meter II.

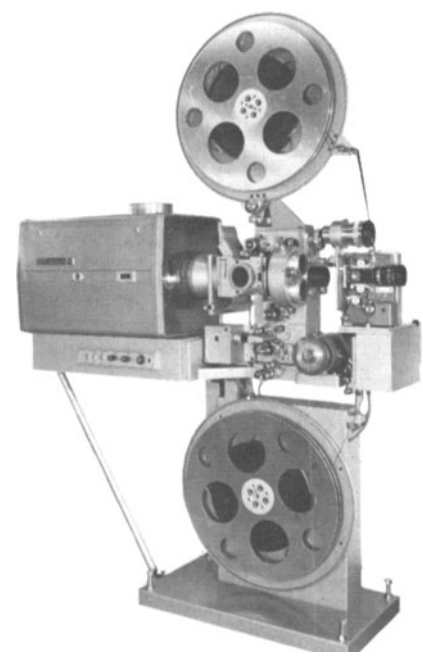

Figure J-3. Dual head projector.

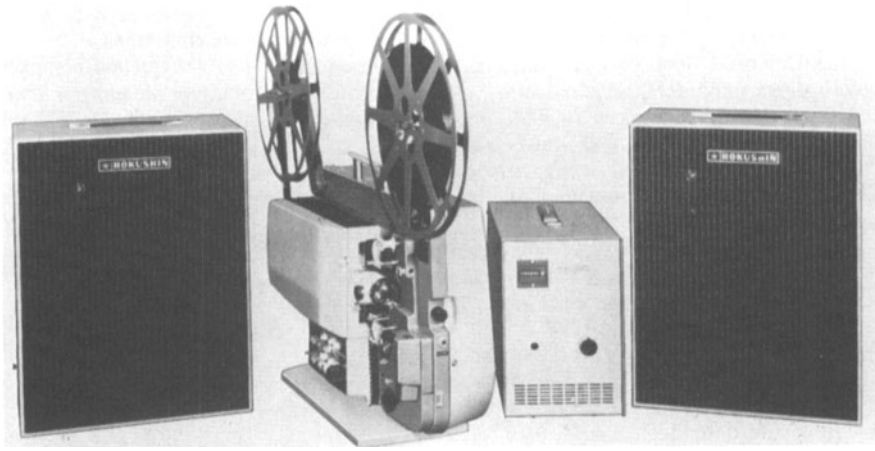

Figure J-4. Multisound projector.

Figure J-5. 8-mm cameras, P500, ZX550 and Z850.

to match CIE (Commission Internationale de l'Eclairage) Standard Observer Response. When a button is pressed, these cells make simultaneous readings of light source or subject color through an integrating diffuser. Chromaticity coordinates (X, y) and illuminance (Y) as well as color temperature in Kelvin are calculated by the meter's microprocessor. Measurements are indicated digitally on a liquid-crystal display by pressing appropriate keys below the readout window.

35-mm Projector

The TSR-6000B Sound Projector (Fig. J-3), a dual head projector for 35-mm and 16-mm films, was reported by Tokiwa Co., Ltd. Its 35-mm projector head has a 3-lens turret consisting of a spherical lens and an anamorphic lens for 35-mm film projection, and a condenser lens to be used to project 16-mm film. The lamphouse, rectifier, and sound reproducing system can be used for projection of both 35-mm and 16-mm films.

16-mm Projectors

The SC-210, a 16-mm sound projector, and X-500W, a 16-mm multisound projector (Fig. J-4) were announced by Hokushin Electric Works, Ltd. The SC-210 projector, equipped with a 40 mm *f*/1.2 lens, and a 24-V 250-W halogen lamp, features easy film loading, X-500 W projector, equipped with a 50-mm *f*/1.2 lens, and xenon-arc lamp as the light source, reproduces not only optical mono sound but also magnetic stereo or bilingual sound.

Elmo Co., Ltd., developed three 16-mm xenon-arc sound projectors, with xenon-arc projection lamps for extremely high luminosity, pure white light and excellent color reproduction, suited for use in theaters and auditoriums. In addition to the conventional sound system, one of the projectors functions as an optical 2-track/stereo playback system.

Three models of an 8-mm sound camera (Fig. J-5) for 8-mm filming were announced by Fuji Photo Film Co., Ltd. The P500 sound camera, equipped with a Fujinon MA-Z zoom lens has a snap focus system to keep a sharp focus automatically as well as macro filming capability. The Z850 sound camera is equipped with an *f*/1.8 Fujinon zoom lens, 8 to 64 mm. The ZX 550, equipped with Fujinon MA-Z zoom lens, can provide stop motion filming for animation by the use of an optional remote-control switch.

Elmo Co., Ltd., announced three models of a super-8 sound camera with an automatic focusing zoom lens.

Other cameras reported by the same firm included the 2400 Auto Focus Macro Camera with a zoom lens and the 2600 Auto Focus Macro Camera (Fig. J-6), which also has a zoom lens. Both cameras can accept 200-ft cartridges with full automatic operations in focusing, exposure, and recording sound.

8-mm Projectors

Two models of an 8-mm sound projector were reported by Fuji Photo Film Co., Ltd. Fujicascope Sound SH5 DeLuxe (equipped with a Fujinon PJ-Z zoom lens and a halogen projection lamp) and the Fujicascope SD-Auto (also equipped with a Fujinon PJ-Z zoom lens and a halogen projection lamp) were designed for fully automatic operations, including film, starting and stopping projection, and reverse winding of the film. Its two-soundtrack system can record and reproduce magnetic sound and optical sound.

Elmo Co., Ltd., announced several models of a super-8 sound projector. GH-1200 Solar, equipped with either an Elmo Telephoto zoom lens or Elmo Wide-Angle zoom lens, a metal-halide lamp as its light source, GS-1200 P-COM model (Fig. J-7), equipped with the same lens as the GH-1200 Solar model and a 250-W xenon-arc lamp as the projection lamp, has a built-in noise-reduction system, and also a microprocessor which controls two tape recorders which automatically record the sound of the magnetic tapes on the film.

Figure J-6. Auto focus macro camera, 2600.

Figure J-7. GS-1200 P-COM projector.

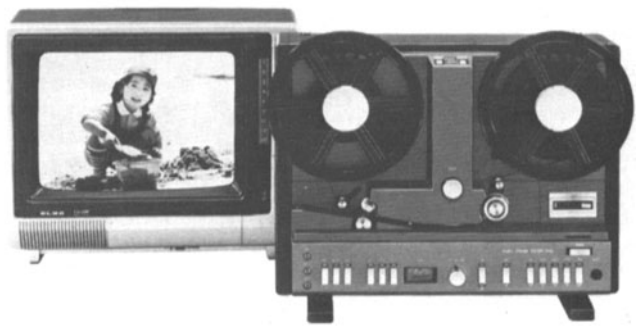

Figure J-8. Transvision 600.

Other similar projectors were developed.

The HiVision SC-30, equipped with a projection zoom lens and a halogen projection lamp, has a built-in screen. The reels and arms are not seen outside of the projector because the film is contained inside the projector body. The Elmo two-soundtrack system incorporated in the SC-30 projector can provide sound recording on both magnetic stripes of the film. Tranvision 600 (Fig. J-8) is a sound projector used to convert a film picture into a video picture by a flying scanner system. By connecting the Tranvision 600 to a conventional color television receiver, the 8-mm movies can be shown on the TV screen.

Miscellaneous

Two useful tools have been introduced by Niho Eiki Co., Ltd., one of which is an "L"-shaped tripod head attachment (Fig. J-9) that can tilt the camera from 0° to 90° by a crank that permits fine adjustment of the angle. The other is a sliding lens supporter, particularly designed for Oskar Heiler Hydro-120 tripod, to hold a heavy lens such as Cook Varotal, Angenieux Zoom, or Canon Macro Zoom on a camera.

Television

Broadcasting Networks and Number of Households with TV Sets

Nippon Hoso Kyokai (Japan Broadcasting Corp.), the only public radio and television broadcasting system in Japan financed through audience fees, leads the progress of broadcasting technologies in Japan. The extensive experiment of satellite broadcasting has been carried out. An experimental emergency alert broadcasting system, performed successfully in early 1980, can supply the audience with urgent information in case of impending disaster. A special coded signal was superposed on regular programs to automatically turn on the otherwise switched-off receivers. NHK broadcasts television programs in full color on its two nationwide networks. NHK maintains, as of December 1980, the following television stations including transposers.

Network	Number of Stations	Air-time (per day)
General	3190	17 h 28 min
Educational	3129	18 h 00 min

In addition to the television broadcasting service by NHK, every region in Japan is provided with its commercial broadcasting services operating on the basis of income from advertising through their commercials. NHK and some commercial broadcasters present sound multiplex television programs regularly. As of November 1980, there were 94 commercial broadcasting companies operating 4431 stations including transposers.

The number of households with television receivers, as of November 1980, were:

Black-and-white	2,818,571
Color	26,242,200
Total	29,060,717

Satellite Broadcasting

Experiments using the Medium-Scale Broadcasting Satellite for Experimental Purpose (BSE) launched in April 1978 were carried out jointly by the Radio Reserch Laboratories (RRL) of the Ministry of Posts and Telecommunications and Japan Broadcasting Corp. (NHK), with the collaboration of the National Space Development Agency (NASDA) of Japan, as in previous years. Some of the technical experiments were measurement and evaluation of received television signals from the satellite, characteristics of satellite-borne mission equipment and terrestrial facilities, techniques relating to operation and control of the satellite, characteristics of radio-wave propagation, and transmission characteristics of high-definition television signals. Almost all of the technical experiments scheduled in this satellite program were completed.

Application experiments relating to operational aspects of satellite broadcasting were also carried out, including evaluation of various received signal quality through the transmission of NHK's aired broadcast programs. Unfortunately, these experiments had to be discontinued in June 1980, when the 100-W on-board transmitters ceased their operation. Since then, the experiments have been limited to use of the 12-GHz beacon signal to measure the radio-wave attenuation due to rainfall and

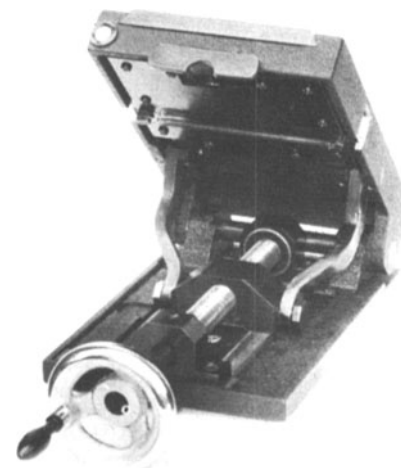

Figure J-9. Tripod head attachment.

"In Japan, extensive experiment of satellite broadcasting has been carried out. In early 1980, an experimental emergency alert broadcasting system that can supply the audience with urgent information performed successfully."

operational characteristics of the bus equipment of the satellite.

In parallel with carrying out these experiments, studies are being undertaken on modulation parameters suitable for the 525-line NTSC television signals with two sound channels in the 12-GHz band. Also being undertaken are studies on the technical characteristics required for the feeder links, prediction of solar eclipses (eclipses of the sun by the moon), which will affect the normal operation of satellites, etc. In addition, technical assistance has been provided by the NHK Technical Research Laboratories for domestic and foreign manufacturers concerning the techniques of low-noise, low-cost home receivers for satellite broadcasting.

As the second step toward operational satellite broadcasting, the Space Activities Commission of Japan decided to launch the operational BS-2 satellite in 1983. The satellite is similar to its predecessor, BSE, in weight and size. Detailed studies on this program are underway at the Ministry of Posts and Telecommunications, NHK, Telecommunications Satellite Corp. of Japan, and NASDA.

Multichannel Sound Television Broadcasting

The multichannel sound television broadcasting using the FM-FM multiplexing system developed by NHK began in the autumn of 1978 as a preliminary service by NHK and several commercial broadcasters in the Tokyo and Osaka areas. As the microwave transmission routes were completed for an additional sound channel capability in 1979, the multichannel sound televsion broadcasting service has expanded rapidly.

As of December 1980, in the areas of Tokyo, Osaka, Nagoya, and other principal cities, at least one station of NHK and 38 commercial broadcasting companies were producing and broadcasting multisound programs, and 44 main stations in the country are transmitting multichannel sound signals, providing a total coverage of about 24 million households (75% of the total number of households in Japan).

The services consist of stereophonic programs such as music and sports, bilingual programs of motion pictures and news. The total broadcast hours of multichannel broadcasting at each station are different. The maximum for both stereophonic and bilingual programs is 30 hours and 40 minutes a week, and the minimum for both is 3 hours and 40 minutes a week; an average is about 14 hours a week. There were no complaints from viewers concerning disturbances of picture quality or the main channel sound signal. Since the start of the multichannel sound broadcasting services, two years ago, by October 1980 about 2.5 million multichannel sound receivers had been shipped from the manufacturers to the distributors.

Teletext for Ideographic Information

Since 1972, NHK and the Asahi Broadcasting Corp. have been working independently on development of teletext systems. In December 1978, the basic parameters of the technical standards for the Japanese teletext system were unified on the basis of NHK's system by the Radio Technical Council (Advisory Committee to the Minister of Posts and Telecommunications).

In March 1980, the tentative technical standards for the Japanese teletext system were submitted to the Radio Technical Council; work for preparing the standards will be continued to the following year, with a target for completion of March 1981.

In 1980, NHK developed equipment for program editing and transmission, and a standard decoder and receiver which satisfies the tentative standards. The field tests on the reception quality of teletext were conducted from early September to mid-November, to confirm the teletext broadcasting service areas and to measure the influence of various conditions; such as signal strength, multipath propagation, impulse noise and group-delays of rebroadcasting stations. The signals were radiated from NHK's Educational Television stations in Tokyo and Osaka. About 200 locations were selected as measuring sites, including areas of five multistage rebroadcasting chains and four cable television systems. The results of the tests were used to determine the technical standards.

The principal parameters for the tentative standards are: (1) the pattern transmission method; (2) a transmission bit rate of 5.73 Mbit/s ($8/5\ f_{sc}$); (3) types of display mode — texts or graphics on full television screen in fixed and vertical scroll modes, superimposed texts of two rows in fixed mode, and one row in horizontal scroll mode on television picture; (4) a text format of 15 characters in 8 rows for standard-size characters, and 31 characters in 16 rows for smaller characters; and (5) eight colors.

In Japan, thousands of complicated Chinese characters are used, in addition to the Japanese alphabets. The code transmission method used in European teletext systems has been regarded as inappropriate for the Japanese system because the character generator would raise the home receiver cost. However, as the cost of memory devices is decreasing rapidly, an economical character generator for home receivers may be available within a few years. Since 1977, research and development on code transmission methods for the Japanese teletext system have also been conducted at NHK. In June 1980, NHK introduced an experimental teletext system using the code transmission method. In this system, the receiver is equipped with a character generator which has a capacity of about 3400 characters and, for characters which could not be prepared by the character generator, they can be transmitted by the pattern transmission method. The mosaic graphic system is used for displaying graphics. The system can also be used for the teletext of the pattern transmission method, because the fundamental signal format and the data packet format are the same for both pattern and code transmission methods. The receiver can receive the teletext signals of both patterns and coding methods.

Research is being conducted to solve problems in the code transmission method, such as influence of errors of ideographic characters on the displayed text and selection of characters to be stored in the character generator. Asahi Broadcasting Corp. is also conducting research aimed at developing a teletext system of its own using the code transmission method.

A character information system which transmits information through public telephone lines, called the Captain System, has been developed by the Ministry of Posts and Telecommunications and the Nippon Telephone and Telegraph Public Corp. Since December 1979, an operation test has been conducted using 965 households in Tokyo area which had been selected as monitors. More than 188 organizations such as newspaper companies, publishing companies, and department stores participated in the test. The Captain System uses the same display formats as that of the Japanese teletext system. It is planned to put this system into practical service in 1983.

High-Definition Television

High-definition television (HDTV) equipment with 1125 scanning-lines, experimental cameras, 70-mm telecine devices, color signal encoder, wide-bandwidth FM modulator and demodulator, wide-screen displays and portable receivers for receiving satellite transmission test signals and other equipment have been developed, and transmission tests have been carried out three times using this equipment via the experimental satellite in 1978 and 1979. Signals for the tests were sent from NHK Technical Research Laboratories in Tokyo, and received in Tokyo (NHK Broadcasting

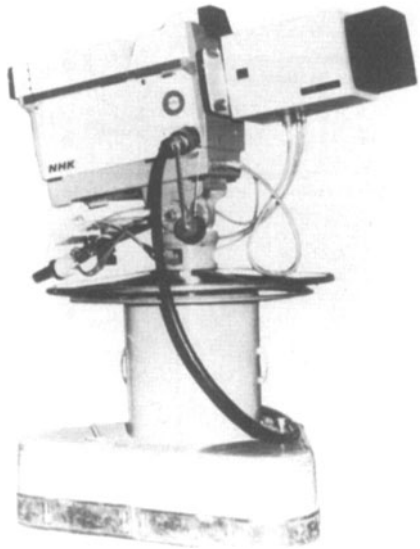

Figure J-10. Color camera for high definition television using DIS-type one-in Saticon.

Center and the Ministry of Posts and Telecommunications) and Osaka (NHK Osaka Station). After collecting technical data on picture and sound quality of PCM multiplexed sound transmission, the 70-mm motion pictures were experimentally transmitted to confirm the effectiveness of high-definition wide-screen television.

A pick-up tube, the 1-in Diode Gun Impregnated Saticon (DIS), employing a new electron gun structure capable of high resolution with excellent signal-to-noise ratio and less image lag, was developed, and a live camera using the tubes was built (Fig. J-10). This camera can memorize color misregistration data for red, green, and blue separately in every 19 × 30 portion in the picture, and then read out in synchronization with the scanning; thus it has a digital registration function.

During 1979, the experimental laser telecine device for high-definition 70-mm motion pictures, on which research and development have been continued, was completed. This telecine system, combining red, green, and blue laser beams, traces the film in continuous transport and scans it at high speed. A high picture quality in regard to definition and signal-to-noise ratio was achieved by this system.

A wide-screen 55-inch high-definition projection type unit was developed in 1979. In this display, a digital convergence circuit is used to avoid color misregistration on the projected screen area (Fig. J-11). Also in 1979, a light-valve high-definition display with 1125 lines was developed in collaboration with General Electric Co., U.S.A. This display, employing a single light-valve, is for reproducing the high-definition color image of NHK's experimental standards. The picture aspect ratio of 5:3 is obtained by use of an anamorphic lens. So far, a bright, large-size picture has been obtained, but the resolution is not sufficient.

The introduction of digital techniques is indispensable for practical HDTV. To cope with this target, A/D and D/A converters for HDTV signals which operate at a sampling frequency of 100 MHz and have quantization of 8 bits/element were experimentally built. From now on, studies on HDTV in digital form are to be sought positively.

As for high-definition television broadcasting systems using a new medium, transmission tests on 38-GHz band and by optical fiber were successfully performed.

New Products and Systems

Color Television Cameras for Studio and Outside Broadcasting

The studio and outside broadcasting color television cameras having auto-setup capability by means of a microcomputer are finding practical uses at broadcasting stations.

At NHK Technical Research Laboratories, computer controlled color cameras and high performance photoelectric conversion units with a 1-in Saticon were developed to study advanced television camera systems of the future.

The techniques of using microcomputers for auto-setup operation were applied to the Type PK-40A camera of Toshiba Corp. and Type HK-357A camera of Ikegami Tsushinki Co., Ltd., in 1978. In 1979, Hitachi Denshi, Ltd., developed the Type SK-100A camera with an additional maintenance system.

Handheld Camera for Broadcast Use

The performance of handheld cameras for electronic news gathering (ENG) and electronic field production (EFP) has been greatly improved; the cameras have become compact in size, light in weight, and are regularly being used at broadcasting stations.

Sony Corp. developed a new high performance Type BVP-330 handheld camera employing a $^2/_3$-in Plumbicon pickup tube. This camera employs a diode gun Plumbicon XQ-2427 operating at high field mode (operated under a high voltage of 750 V) to increase its resolution drastically. By improving the circuit, a signal-to-noise ratio of 57 dB was achieved by the conventional system of obtaining the signal from the target ring. In addition, registration is adjusted by means of employing a newly developed automatic centering system in which neither specific patterns nor external adaptors are required.

Type HL-79D of Ikegami Tsushinki Co., Ltd., employing a $^2/_3$-in low capacity diode gun Plumbicon, has a signal-to-noise ratio of 57 dB. Resolution at the fringe area is improved by its dynamic focusing arrangement. A distortion compensating circuit is added to each deflection circuit of red and blue channels, so that registration can be adjusted. A wireless controlled Type PP-10 field pickup device was developed which can be used in combination with the handheld camera.

Single tube handheld cameras have been improved by the use of Saticon tubes. Maintenance of ENG and EFP systems in broadcasting stations is an important problem. NHK Technical Research Laboratories has developed a system to maintain batteries used in ENG and EFP systems by aid of a microcomputer (Fig. J-12). The microcomputer contained in the battery pack can predict the remaining battery capacity and can also supply necessary information.

Single Plate Type Color Camera for Mounting in Aircraft

In September 1980, Matsushita Electric Industrial Co., Ltd., completed its Type AK-2020 single-plate color camera for use in aircraft (Fig. J-13). The camera employs

Figure J-11. Projection type display for high definition television.

a new CPD (Charge Priming Device) solid-state pickup element.

This camera is to be installed in the aircraft cockpit and used for shooting take-off and landing scenes. It is specially designed in a compact and lightweight form with high reliability for operation under severe environmental conditions. The camera unit is built in an extremely compact form; the diameter is 45 mm and the depth is 85 mm, so that it will not obstruct the pilot's vision. The camera is used in combination with a very small specially designed lens (diameter 39 mm, depth 77 mm).

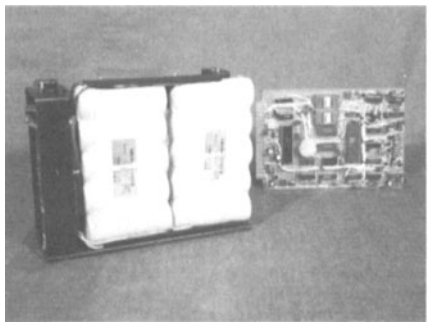

Figure J-12. Battery pack for ENG/EFP color camera with microcomputer battery maintenance system.

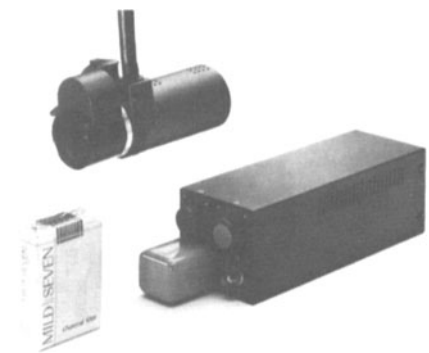

Figure J-13. Single plate color camera for mounting in aircraft (L. camera head; R. CCU).

Figure J-14. High speed videotape duplicator.

The 2/3-in CPD solid-state pickup element used in this camera is new. The photoelectric conversion section is composed of photodiodes, and the signal readout section is composed of a charge coupled device (CCD). A new charge priming transfer system is being introduced for linking the photoelectric conversion section and the CCD; thus, it has the advantages of both the metal-oxide-semiconductor (MOS) and CCD systems. Hitachi, Ltd. completed Type VK-C 1000, a compact, lightweight color video camera for home use that employs a new type of single plate MOS image sensor. The body of the camera measures 58 × 100 × 155 mm; the weight, including a 6 × 1 zooming lens, is 1.1 kg; and the power consumption is 3.8 W. Each picture element is composed of four elements, with four complementary color filters to improve sensitivity.

High Speed Duplicator for Off-Line VTR Editing

In collaboration with Sony Corp., NHK developed a high speed videotape duplicator, which can duplicate 1-in helical-scan videotape onto 3/4-in U-format videotape at a speed five times of standard. With the increase of ENG and EFP programs at broadcasting stations, videotape editing must be efficiently carried out. In order to increase the working rate of 1-in VTRs, the practice of duplicating the original 1-in tape onto a 3/4-in cassette for off-line editing is increasing. The time required for this duplication work is equivalent to that of recording onto the original tape, and speeding up has been desired.

In the equipment (Fig. J-14), the tape speed is increased to five times that of standard; by mounting five video heads, the television signal is divided into five parallel signals and duplicated simultaneously. The rotational rate of the drum and the relative velocity between the head and the tape are the same as standard.

One-In Helical-Scan Long-Play VTR

Hitachi Denshi, Ltd. and Asahi Broadcasting Corp. have jointly developed a 1-in long-play VTR (SMPTE Type C Format) for broadcast use capable of recording three hours at maximum. This VTR (Fig. J-15) is suitable for long programs which are prospering at present and is expected to be useful for continuity transmission of midnight programs. At present, most VTRs for broadcast use are 1-in helical scan machines rather than the 2-in quad type. However, because the existing 1-in type VTR has a maximum playback time of 90 minutes, a number of these recorders must be used, with switching from one to another for continuity in transmission of programs.

Other features of this VTR are: (1) autotracking is possible from a quarter of reverse speed to twice forward speed; (2) the life of video head and tape are extended and the danger of head clogging is reduced

Figure J-15. One-in helical scan long-play videotape recorder.

because the tape is not in contact with the video head in the stand-by, fast-forward, and rewind modes; (3) because of an air guide in the tape transport, the magnetic coating of the tape is kept away from the guide and is in contact only with the head, thus dropouts are reduced; and (4) the tape loading of Type C VTRs is easier because the guide to the drum is moveable.

Videotape Electronic Editing System for Professional Use

Matsushita Electric Industrial Co., Ltd. developed a professional U-format (3/4-in cassette) video automatic editor which automates the complicated editing processes by means of a microcomputer. Features of this system are picture search in 10 different speeds, and program control of editing points appointment, previewing, editing, and reviewing. Victor Company of Japan, Ltd. developed an almost similar automatic editing system for U-format. This system contains new techniques, such as a mechanism for high reliability shuttle search function for easy location of program materials and an FM duplicating system for less picture deterioration.

A video system, using 1/2-in cassettes, that has an electronic editing function was developed by Sony Corp.

A Camera Incorporating a Handheld VTR

Two different companies have an-

Figure J-16. Video movie incorporating camera and videotape recorder.

Figure J-17. Mag-Camera incorporating camera and videotape recorder.

nounced single plate color cameras, incorporating compact handheld VTRs. These machines feature simplicity of recording and reproducing of VTRs with the convenience of 8-mm film cameras.

The camera of Sony Corp. was tentatively called Video Movie. It weighs 2 kg (with battery) and has a power consumption of 7 W. The camera section employs a 1-chip CCD image device (horizontal resolution 250-TV lines) of 570 × 490 picture elements, a lens with a zoom ratio of 3, an optical view-finder, and an auto-iris mechanism. The VTR section employs a cassette about the size of an audio microcassette, and adopts helical scan slant azimuth recording. By using a 5/16-in width metallic tape, it is possible to record a maximum of 20 min. The video and sound signal recorded with the Video Movie can be edited or duplicated onto other VTRs by the attached Home Editor (Fig. J-16).

The trial equipment made by Hitachi, Ltd. is tentatively called Mag-Camera. It weighs 2.6 kg (with battery). The camera unit employs a 2/3-in MOS image sensor (horizontal resolution 240-TV lines) of 484 × 384 picture elements. The VTR section uses a tape cassette about the size of an audio compact cassette, and a maximum of two hours of recording is available with a 1/4-in tape. The recording system is a 2-head helical scan slant azimuth recording, and for the sound signal, a new system of multiplex recording onto the video track was developed. This equipment is provided with functions of assemble-mode-recording, still picture playback, high speed picture search and post-recording for sound (Fig. J-17).

Fixed Head VTR

Four experimental types of the fixed-head VTR using endless tape were developed by Toshiba Corp. Up to two hours can be recorded with two channels being recorded simultaneously (Fig. J-18). The tape width is 1/2-in, tape speed is 5.5 m/s, with a track width of 35 μm. In February 1979, the company developed an endless type VTR having one hour recording time.

NHK developed an experimental model of a compact shoulder-strap fixed head VTR for ENG, in collaboration with Mitsubishi Electric Co., Fuji Film Co., Ltd., and Omron Tateishi Electronic Co. Its reproduced picture quality is said to be excellent, comparable with that of the 1-in helical scan VTR for the reason that multichannel recording is used. By using the Newell tape drive, two minutes of recording were performed by two round operations. The tape width is 1/4-in and tape speed is 4.5 m/s.

VTR for Home Use

Reproduction of still pictures and the development of assemble-mode-recording are new for 1/2-in VTRs.

Sony Corp. and Toshiba Corp. developed VTRs which have exclusive playback heads of the same azimuth. In conventional VTRs, in case of slow motion or still playback mode, picture fluctuation will occur because the pictures on two adjacent tracks are reproduced alternatively. With the new VTR noted above, a picture from one track is obtained with no fluctuation.

Funai Video Co. developed a new format portable VTR called the CVC (Compact Video Cassette) system. The size of the cassette is about the same as that of a compact audio cassette. It employs a 1/4-in tape, and the maximum recording time is 30 min. The equipment weighs 3.2 kg with the battery, and its power consumption is 8 W (Fig. J-19).

Portable Television Standard Converter

A portable television standard converter of excellent maneuverability was developed by Oki Electric Industry Co., Ltd. (Fig. J-20). This equipment employs a combination of 16 K random access memories (RAM), high speed IC's of low power consumption, and a high-density printed circuit board to make the device compact and to reduce power consumption.

The size of the equipment is 450 mm (width), 610 mm (depth), 266 mm (height), and it weighs 40 kg. The power consumption is 450 W.

Beam-Indexing Color Picture Tube

A new beam-indexing color picture tube was developed by Sanyo Electric Co., Ltd. (Fig. J-21). This tube, unlike the conventional picture tubes with three electron beams and a shadow mask, has no shadow mask and operates with a single electron beam.

An advantage of the beam-indexing tube is low power consumption. By eliminating the shadow mask, the efficiency of the electron beam is increased to a value over 50%, whereas in conventional tubes, about 80% of the beam energy is lost in the shadow mask. The picture tube requires only one heater for the electron gun, so the power consumption can be greatly reduced.

Figure J-18. Fixed head videotape recorder (1/2-in tape).

Figure J-19. Videocassette recorder (1/4-in tape).

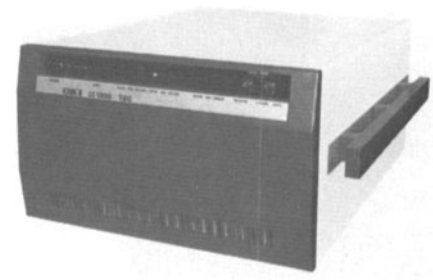

Figure J-20. Portable television standard converter-Type LT-1200.

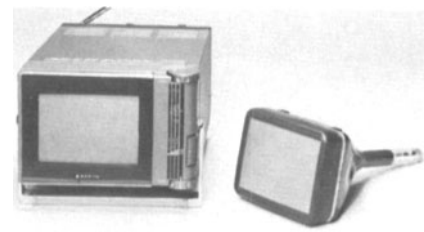

Figure J-21. Beam-indexing color picture tube (six-in) and compact television set.

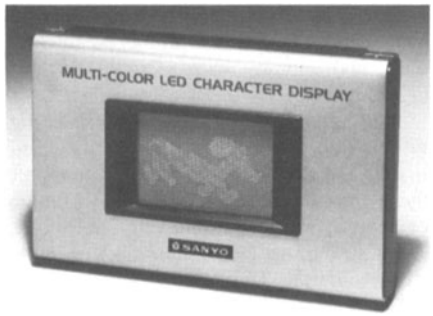

Figure J-22. Multicolor flat panel display.

On the basis of the new high electron-optics technology, a proprietary electron gun with a narrow electron beam was developed and incorporated in the tube for the reason that the electron beam itself is the color selecting element in this tube. A high sensitivity and low cost photodetector consisting of a photodiode and a light collector was developed for the detection of a light pulse signal. In a conventional beam-indexing tube, a very expensive photomultiplier has been used.

A Multicolor LED Flat Panel Display

A multicolor LED flat panel device (Fig. J-22), which can display characters, figures, and pictures in various colors (such as red, green, orange, and yellow) was developed by Sanyo Electric Co., Ltd. This device is fabricated by mounting the newly developed GaP multicolor LEDs on a ceramic substrate in a matrix pattern. The ceramic substrate has 96 metallized lines and 64 horizontal lines isolated from each other. The LEDs are arranged so as to correspond to the intersection of the vertical and horizontal lines, and the total number of LEDs is 6144 (96 × 64).

The typical brightness of the display is 50 fL at a current of 0.5 mA/dot. The pitch of the element is 1.0 mm; this is much smaller than the pitch of the two-color LED display, reported previously, which has two LEDs in one picture element.

This display can be applied to various fields, such as computer displays and control apparatus. This device is considered to be the basis of future full-color flat television displays. Improvements sought include greater emission efficiency, reduction in the pitch of the elements, and development of blue LEDs.

Pocket-Size Liquid Crystal Television Receiver

A pocket-size liquid crystal black-and-white television receiver, which has rapid liquid crystal response and a high contrast ratio (Fig. J-23) was developed by Toshiba Corp. The receiver measures 17 cm × 8 cm × 1.6 cm and has a 3 cm × 4 cm display panel. It has 220 × 240 picture elements. The receiver weighs 300 g and can be carried in a pocket or handbag.

Liquid crystal displays have been used in many fields, such as in low power consumption equipment and/or in thin structured equipment. There were some problems involved in the development of a pocket-size television including a long response time and a low contrast ratio; however, Toshiba improved the liquid crystal response time (less than 30 ms) by the development of the DS (Dynamic Scattering) mode of low viscoelastic materials. The contrast ratio has been increased (20:1) by modulating each picture element by MOSFETs which are integrated on a VLSI (very large scale integrated) circuit, 51.36 mm × 41.36 mm.

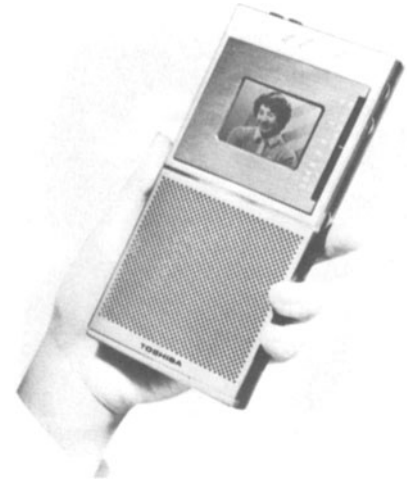

Figure J-23. Pocket-size liquid crystal black-and-white television set.

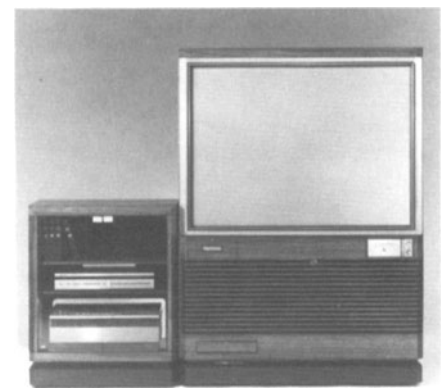

Figure J-24. Cinema Vision 45 video projector.

A black-and-white television receiver using a quadruple matrix liquid crystal panel was developed by Hitachi, Ltd. The picture size of this set is 45 mm (height) by 60 mm (width), and the number of picture elements is 120 (height) by 160 (width).

A rear projection type video projector called Cinema Vision 45 was developed by Matsushita Electric Industrial Co., Ltd. (Fig. J-24). Cinema Vision 45 employs a rear projection type screen and two reflectors. The depth of the device is 68 cm, which is much less than that of conventional video projectors. By use of two reflectors, the necessary projection distance is ensured and the depth of the projector has been successfully shortened.

An electronic color display system which luminesces the respective three primary colors by adopting a very small size high luminance was developed by Mitsubishi Electric Corp. The device, called Aurora Vision, can reproduce bright color

Figure J-25. Aurora Vision installed at Dodger Stadium, Los Angeles, California.

images even in daylight on scoreboards or outdoor advertising towers (Fig. J-25).

In this outdoor color display system, three very small cathode-ray tubes (28.6 mm diameter × 132 mm length) which produce luminescence of red, green, and blue colors are arranged in a latticed structure forming one picture element, to constitute a large color display picture. Thirty-two steps of half-tone can be reproduced.

FPU Transmitter and Auto-Tracking Receiver

A lightweight PP-10 type FPU (output power 100 mW) device, small enough to be held in the palm, for use with a wireless handheld camera (Fig. J-26), was announced by Ikegami Tsushinki Co., Ltd. This transmitter operates for about two hours on 10 flashlight batteries (UM-3). The total weight is 1.5 kg with the batteries loaded. A sleeve antenna equipped with an automatic directing reflector plate reduces the multipath propagation. The transmitter operates at a single frequency in the 6.5-GHz or 7-GHz bands, and the effective transmitting distance is about 300 m.

A PP-10 B type compact power amplifier which contains this PP-10 was also developed. The output power is 1 W. It can operate for about two hours on 10 flashlight batteries (UM-1) and weighs about 4.5 kg including batteries. The effective distance is about 1 km.

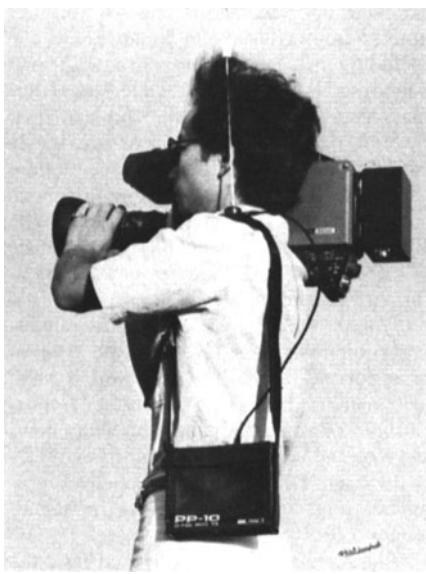

Figure J-26. PPU-10 portable FPU transmitter unit.

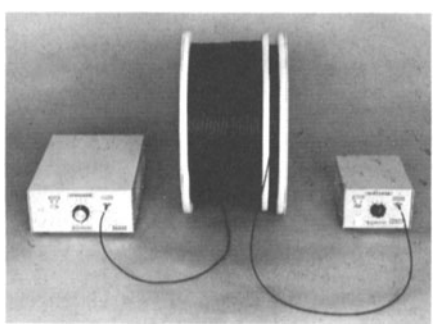

Figure J-27. Television signal transmission system using optical fiber.

An auto-tracking receiver (Type HDF-5) was developed to ensure reception of a transmitted wave from a moving body. The FPU receiver, tracking receiver, and indicator monitor are all contained in one case. On the indicator monitor, the azimuth of the moving transmitter is displayed by luminous dots, and the received picture and received input level are also displayed simultaneously.

TV Signal Transmission System Using Optical Fiber

NHK developed an optical transmission system of VHF multichannel television signals for CATV in collaboration with Hitachi Cable Ltd. Analog wide-band transmission systems using multi-mode fibers, laser diodes, and photodiodes had been thought to be impractical because of four main problems. The problems and the solutions are set forth below.

Problem: Distortion generated at the laser diode due to nonlinearity of characteristics. *Solution:* A new type of laser diode with large optical output power and excellent linearity (Hitachi type 3000) was developed.

Problem: Noise caused by fluctuations of the emission wavelength due to temperature drift of the laser diode. *Solution:* The laser diode was contained in a Peltier thermoelement to control the temperature within ±0.1°C.

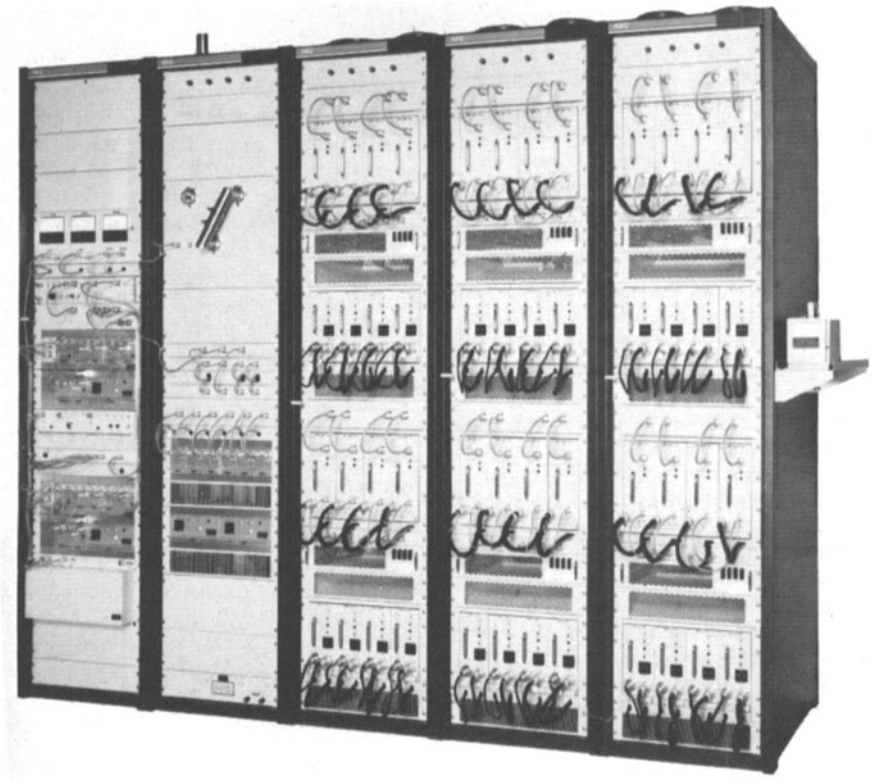

Figure J-28. 1-kW solid state UHF television transposer.

Problem: Noise caused by interference of the laser diode due to reflection between emitted and reflected waves at optical connectors and other discontinuous portions. *Solution:* The fiber ends at optical connectors and other discontinuous portions were cut at an oblique angle.

Problem: Modal noise and distortion generated in the fiber due to multi-mode propagation. *Solution:* An optical fiber with a core of large diameter and a small numerical aperture was adopted.

An optical transmission system available to transmit seven channels of television signals in the VHF band has been realized through a multi-mode fiber of 2 km length (Fig. J-27).

The signal-to-noise ratio is 43 dB, intermodulation is −50 dB, and cross-modulation is −60 dB.

One-kW Solid State UHF Television Transposer

A 1-kW solid state UHF television transposer (TB-674) which amplifies simultaneously the vision and sound signals (Fig. J-28) was developed jointly by Nippon Electric Co., Ltd., and T.V. Shinshu Co., Ltd.

The standby system in which the load is automatically switched from the main unit to the standby unit is employed in the basic transposer equipment. Twenty four UHF 50-W power amplifier modules are used in parallel in the power amplifier section to support the backup system. Color intermodulation which is apt to be problematic when vision and sound signals are amplified together is −54 dB or better.

Mexico

Thirty-six motion pictures were produced in Estudios Churubusco, and the same number of films were produced in Estudios America. Of the features shot in Estudios Churubusco, some are co-productions and some are foreign productions coming mainly from the United States.

The National Bank of Cinematography resumed its operations. The producers created a credit union that will work together with the National Bank and some of the credit institutions; therefore, production of motion picture features is definitely on the upswing.

An outstanding event during 1980 was that all laboratories in Mexico changed from 5381 print film to 5383; this service is now available in all the labs throughout Mexico.

Most of the feature films in 1980 were not made in Mexico, so the distribution segment had an outstanding year.

There were no significant changes in the television industry except all the TV stations changed their system; instead of using 2-in tape, they went to the 1-in system.

Netherlands

After a two-year preparatory period NOS (Nederlandse Onroep Stichting) started, in 1980, its Teletekst Service, following the British teletext system. The service began on 1 April, by coincidence April Fools' Day, but the immediate and increasing success of the system showed that at least in this instance April Fools' Day boded well for the undertaking.

At first, Teletekst provided a public service of 54 pages. About 1000 TV sets were adapted to receive the service. By Christmas, 30,000 households were regular users of the Teletekst service and audience research reported that 68% were very enthusiastic about it. Another group of 28% was reportedly "mildly enthusiastic." NOS then decided to press ahead. The service now runs to 100 pages, of which 20 are for news, 50 for service, 15 for sports and 15 for the broadcasting societies that make up Holland's radio and television network.

Teletekst sends 100 pages simultaneously on two channels, but will expand in 1981 to 100 pages for each channel, thus offering 200 pages. Two picture lines in the vertical blanking interval are used to transmit the digital information. Two more may be added in the near future, thus halving the public's "maximum waiting time."

Teletekst policy is to never go beyond 25 seconds, and to do whatever is technically possible to increase the number of pages without penalizing the public by increase of the maximum waiting time. The addition of picture lines necessitates new computer software and some hardware, but makes no problems on the receiver's side. Present decoders can handle this expansion.

NOS, which runs the service in frequent consultation with, and on behalf of, the broadcasting societies, started Teletekst on 1 April with a staff of four. It was on the air five days a week, from 10.30 to 21.00 hours. At Christmas time, the staff had grown to 21, and the service was available seven days a week from 09.00 to 24.00 hours. The service includes specialized subtitling for the deaf and hearing-impaired, enabling them to view Dutch-language programs which, up to then, had been lost for most of them. Another service for the deaf and hearing-impaired is a news bulletin of 14 Teletekst pages, each containing a crisply written news item. This service is run four times a day for 5 minutes each time. This also is a huge success, attracting thousands of viewers with no handicap at all.

A number of projects are now underway or at least in the planning stage, including the opening of a new film editing facility with more than 50 editing rooms. Next year's report from the Netherlands will contain full details.

Norway

Networks

A large proportion of the budget of the Norwegian Broadcasting Company (NRK) has, during the last few years, been used for increasing the activity at the regional centers, for both radio and television. At present there are 14 regional centers, and two or three more will be established in the near future. After that there will be one center in almost every county. These regional centers contribute their programs to the national radio and television networks, and also produce programs for local or regional transmissions for radio; however, at present, there are no regional television transmissions.

Due to the topography of the country, the TV transmitter network is a complex pattern of 44 main transmitters and more than 1200 transposers. The radio distribution network is built up in a similar manner. During the hours of regional transmissions the network is broken up into sections corresponding to county coverage. There is also a regular exchange of programs between the regional centers and the main center in Oslo.

A program distribution system has been planned and has been partly in operation since last fall consisting of three parallel two-way radio relay links. One link is used for a television signal and, on top of that, there is a 2.048 Mbit/s PCM signal carrying five 15-kHz sound channels, two stereo programs and one mono TV sound. The second link carries an 8.448 Mbit/s PCM signal comprising a number of 7-kHz and 15-kHz program channels in addition to telephone and data circuits for communication and coordination purposes. The third link constitutes a spare channel which automatically replaces one of the others in case of failure. The communication and data circuits are expected to be finished by mid-1982.

One aspect of the increase of the regional activity has been to build suitable studio and production facilities. For that purpose, a building system has been developed, where the dimensions of each facility unit — such as studios of different sizes, editing booths, control rooms, workshops, stores, etc. — are specified with regard to the characteristics of their construction, acoustics, electrical installations, ventilation, and other factors.

Based on the activity expected at a specific center, a suitable building can be put together by combining the different facility units. Later expansions can be accommodated. The first four of these buildings are ready, and the experience with this system has been very good. Planning time and cost have been reduced, and there is an increased improvement in all details from one building to the next. Figure N-1 shows the regional station at Tromsoe in northern Norway, the first studio center built according to the system.

The building is a combined installation for radio and television. The TV facilities at this station consist of a 2-camera OB van including 1-in tape recorders, an EFP unit using the HL-79 Ikegami camera, a B-format recorder, and 16-mm film cameras. Several regional centers have previously established film facilities to cover television activity. The present intention is to equip most of the regional stations with ENG or EFP equipment, based on the use of either $^3/_4$-in tape cassettes or the 1-in B-format, depending on the main field of activity at the station. The complexity of editing equipment depends upon the type of program produced. The new link system has increased the flexibility and possibilities of presenting a fast-breaking news story on the network. Two regions have 2- or 3-camera OB units. The heavier OB production units are stationed at the main center in Oslo.

A new OB van was delivered near the end of 1980. This is a 4-camera unit made by Robert Bosch in Germany. The cameras are of the KCK-type, and the vision mixer is made by Grass Valley. The sound installation is quite simple, and a separate larger sound production van is planned.

Since 1969 there have been regular television broadcasts at Longyear City at 78° N. The program is recorded in Oslo from regular network broadcasts and sent by plane once a week to Spitsbergen for playback over the local television station. The smaller meteorological stations in the arctic area expressed interest in this service, and it is expected that places like Bear Island and Jan Mayen will be included beginning in 1981. The recording will be made on $^1/_2$-in tape in Betamax format. The transportation to these places is occasional, and during some mid-winter months some stations

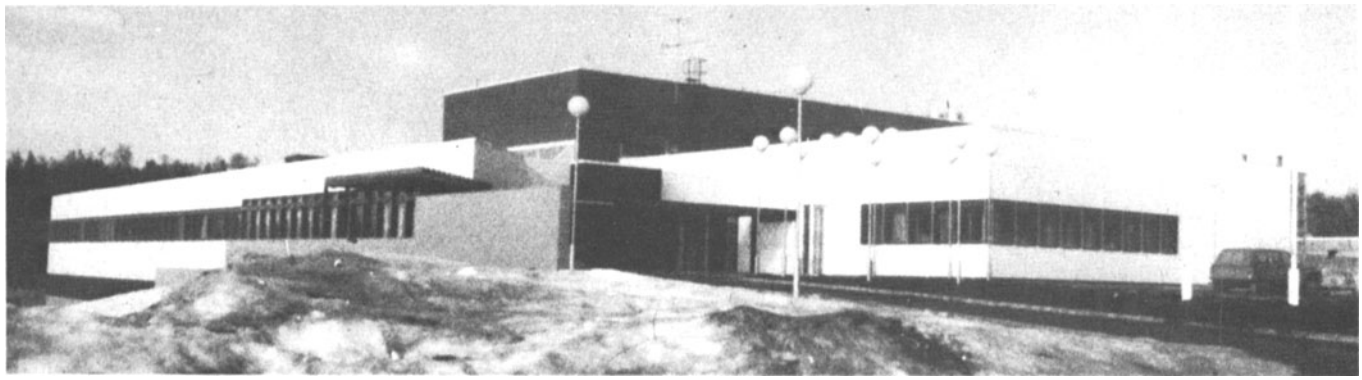

Figure N-1. Regional center at Tromsoe in northern Norway.

have to rely on air drop of the TV cassettes. There has also been a TV service for several years for merchant ships. NRK has delivered master tapes which have been copied to 3/4-in cassettes in the U-matic format. Some 100 ships have taken part in this distribution. A decision has lately been taken to change to the VHS format, and at the same time the program offered will be extended to give a better news coverage.

South Africa

The motion picture industry in South Africa is going through a boom period. Most productions are in 16 mm for television broadcasting, but several feature films have been produced in 35 mm, mainly for international distribution.

Several international companies from Japan, Italy, Germany and America make features and documentaries in Southern Africa, where, mainly because of the weather conditions, there is virtually no down time, and also because of the availability of technicians at lower prices than home base, and also because they are not bound by trade unions.

There are still only two major motion picture laboratories, Irene Film Studios between Johannesburg and Pretoria, and the Central Film Laboratories in Salisbury, Zimbabwe, both of which offer complete services. All the necessary and most sophisticated equipment is available for rental or purchase. The necessary film stock is also readily available.

Excellent commercials were produced for telecasting and cinema use in South Africa but only a few feature films were produced for local consumption because of the restricted revenue from local cinemas. Most of the features are made for worldwide distribution.

A typical overseas film producer estimates that he saves over 50% on his costs of production by using local technicians and facilities.

The activities in the dubbing field have increased considerably, where both foreign and English language films are dubbed into the local Afrikaans language for telecasting. The latest techniques are used and the results are excellent. Many new producers have entered into the field because of the booming industry, and good supporting technicians are available for any film production.

Several companies have pioneered in the production of films for the South African Negro market. The films are produced using actors native to the country and in their own language. The South African Broadcasting Corp. Channel 2 is for the Negro population only. There is a considerable increase in the production of films for the Negro market, mainly for telecasting and to a lesser degree for showing in cinemas. Intensive training courses have been conducted for nearly a year at the South African Broadcasting Corp. for Black producers, directors, cameramen, editors and technicians in readiness for the opening of the Black channels in the very near future.

South Africa is basically not a manufacturing country and there is not much in that field apart from the manufacture of batteries for cinematographic cameras and associated equipment, while the majority of the other equipment is fully imported and readily available.

Spain

1980 was not a particularly prosperous year for the production of new films. To be precise, the figures were 86 new productions in 35-mm., of which 34 were coproductions.

An important project initiated by the Government was the request for proposals for the production of a number of serials for television. This enterprise was assigned the amount of 1300 million pesetas ($16 million), its essential condition being that all scripts presented should be based on well-known works of Spanish literature.

Up to the present, 18 serials have been awarded to different national production companies, some of which have already commenced shooting. The project will not only increase the variety of normal television programs but will also result in increased activity for the film industry as a whole.

The present economic difficulties being suffered by the industry have not hindered the implantation of the Dolby system in at least three cinemas (two in Madrid and one in Almería). In addition, three dubbing studios, two in Barcelona, have been equipped with this system to a greater or lesser extent. The Spanish film *El Divorcio Que Viene* was one of the first to use the Dolby system, although not in stereo.

As to other aspects, the video industry is gradually becoming more important in Spain. A number of companies have been formed, mainly in Madrid and Barcelona, to cover the growing demand for videocassette duplication, film-to-tape transfer and video editing.

Sweden

Television

General

Television broadcasting in Sweden is conducted according to the agreement with the Swedish government and is regulated by certain rules. The programs are produced by Swedish Television (SVT) and distribution and transmission are carried out by the Swedish Telecommunications Administration (STA). Normally STA is also responsible for temporary circuits for distribution of signals between different production centers and OB locations and SVT has only limited resources for microwave distribution of its own. Microwave distribution within OB locations and for news gathering in Stockholm is the responsibility of the program production company. In the regions there is a close cooperation between SVT and STA.

SVT is currently in an intensive period of reinvestments. All major production resources were built up during the late '60s which means that most cameras, VTRs etc. must be replaced during the next few years.

SVT is authorized to transmit an established number of hours a year in each channel. Almost half of the programs are imported from other countries. All these programs must be translated into Swedish and that can be done either by dubbing or subtitling. Almost all foreign programs are subtitled and one of the major reinvestment projects is to replace the old subtitling system and introduce a sophisticated micro-

Figure S-1. Special OB van built by the Swedish Telecommunications Administration.

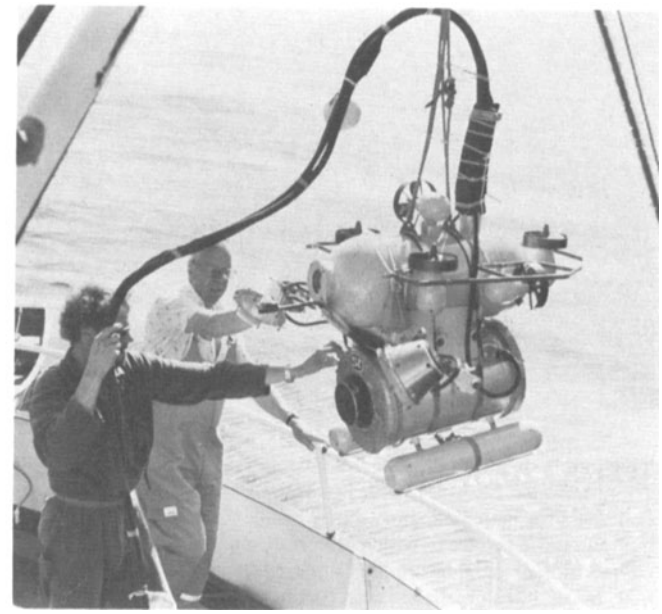

Figure S-2: The Seaowl with the camera housing underneath its belly. Two 500-W lamps are mounted on the robot.

processor-based system with electronically generated text. The system is designed by the Swedish company Tele-Ekonomi.

The use of ENG and EFP is increasing at the expense of film. This is valid especially in news production and in the regions. Film has still a strong position in drama and documentary production and SVT is on its way to replace its film laboratory which is a large investment. The new laboratory will be equipped with machines for advanced regeneration of chemicals.

Teletext

Teletext has gone through an unexpectedly fast growth in Sweden. After less than two years of test transmissions with a limited program service, by January 1981 approximately 30,000 teletext receivers had been sold. Predictions are that another 75,000 receivers will be sold during 1981.

Teletext or Text-TV as it is called in Sweden, started as a service for deaf people and now more than one million people (from a total of 8.5 million) want Swedish programs subtitled. But the interest for teletext is big also among the ordinary TV audience and only some 20% of the 30,000 teletext owners have hearing defects.

Sweden has a long tradition in subtitling both movies and TV programs. All foreign programs are subtitled and not dubbed into Swedish which means that the deaf always have been able to understand and enjoy foreign films.

On the other hand, the deaf have not been able to understand Swedish programs as they have not been subtitled. For the television company, SVT, subtitling means more viewers which makes subtitling via teletext worthwhile. Since the start of the trials, over 200 programs have been subtitled with teletext.

New methods have been developed in order to help the deaf to get a higher degree of understanding. With colored texts and positioning, teletext acquaints the viewer not only with the dialog but also with other sounds of importance to the story.

In Sweden teletext is also used for making live comments in sports programs. This was a great success when the Olympic Games in Lake Placid and in Moscow were commented on with teletext.

Besides these services, normal news and information is transmitted via teletext. There are pages with the latest news, weather, sports, etc.

ENG in the Regions

The use of ENG in the regions is still increasing and today 15 units are in operation around the country. Norrköping, 200 km south of Stockholm, is the main test station and it has gone 100% ENG.

The news gathering is carried out with LDK 14 cameras and BCN 20 recorders. To compensate for the heavy recorders, a very versatile 2.5 GHZ portable microwave link is used in many situations.

All recordings are made with time code. During the journey back to the base station the recording is reviewed with time-code and the editing is prepared. At home, the editing is performed with a semiautomatic editing system from Elnama, Sweden.

For most other regions the normal combination of equipment is Ikegami HL 79 cameras together with U-matic BVU recorders. Some regions are large and the main advantage of electronics over film is the possibility of transferring the material back to the base station over the fixed microwave network. This is done more and more, saving time, transport costs and providing better working conditions for the crew with less stress-causing car driving.

The trend is toward decreasing the use of film in news gathering. More than 60% of the total in the news departments is now ENG and it is increasing. However film is still used to a great extent in all other productions within SVT and the growth of EFP is slower than that of ENG.

Temporary Radio-Relay Circuits

In January 1980 The Swedish Television started regional television transmissions over the Eastern district (Norrköping). The field production equipment is based wholly on ENG (three complete systems). There is also a camera link which can be used to connect the camera to the OB or ENG van.

As there is often a very short time between the decision to make a news story and the transmission time, the Swedish Telecommunications Administration (STA), which is responsible for the arrangement of temporary circuits, has built radio relay receiving terminals in three cities, injection points for VTR in two radiorely stations and a special link OB van (Fig. S-1).

The terminals have permanently installed receivers which are remote controlled from the switching center of the link OB-van. The latter has the usual control equipment and a built-in 13-m telescopic antenna mast. The radio link works in the 2.5 GHz band and has the capacity of one vision channel, and two 15-kHz sound channels. The system will therefore be used also for the sound stereo productions. For the communication, a special one-channel link (400 MHz) can be arranged to the link terminal; there it can be connected to the public telephone network. In the OB van this circuit can be arranged as a four-wire commando system.

Temporary circuits are arranged several times a week for both regional and national television needs as well as for stereo transmissions. One or two persons are needed for this. The system has been found to be very useful and will probably be estab-

lished in other parts of the country as a complement to the resources hitherto used for temporary circuits.

Television Under Water

One of the more exciting development projects during the last five years has been the attempt to achieve underwater television. It started in 1975 with very simple equipment based on a 2-vidicon color camera manually handled by a diver.

Since then, several interesting programs have been made under water around the shores of Sweden. The Baltic has a special interest as ships wrecked more than 300 years ago are very well preserved thanks to special conditions and a low content of salt in the sea water.

Today, progress has been made in production methods and better and safer equipment is used. The pictures are made by an Ikegami HL 79 ENG camera which is driven by a remote controlled robot.

The robot, called The Seaowl (Fig. S-2), is made by the car and airplane manufacturer Saab. It can be operated down to depths of more than 100 m, and its mobility is very good, thanks to five independent pancake motors. The robot is controlled with joy sticks from a remote position on the sea's surface. The greatest advantage of the robot is that of freeing the human cameraman from the very difficult underwater job. All risks are now eliminated.

The use of electronics in underwater photography has obvious advantages under many conditions, in rough weather, when long scenes must be made, and if a special action can not be foreseen.

Motion Pictures

The multicinemas seem to be quite a profitable way to increase the income for the cinema owners and decrease the labor costs. In the motion picture industry in Sweden, because of the high cost of labor, automatization of the multicinemas is of the greatest importance. Today, more than 50 multicinemas are running more or less automatically.

A typical multicinema holds three different auditoriums with 75, 125 and 200 seats, respectively. Plans are underway to enlarge the number of auditoriums and to reduce the number of seats in each screening room.

Two examples are Filmstaden and 7 Rigoletto, both in Stockholm. Filmstaden was built in a not very successful shopping center in Stockholm. The 11 new cinemas in Filmstaden have a total of about 1200 seats and they have turned the not very profitable shopping center into a successful one, not only for the shops, but also for the cinema business. 7 Rigoletto was a former furniture store close to one of the better known cinemas in Stockholm, Rigoletto, with 1200 seats. After the reconstruction, Rigoletto now contains not only the old, big cinema, with a tradition to play American films such as the "James Bond" and *Superman* films, but also six new smaller auditoriums with a total of 600 seats. With this system the popular movies may be screened many more weeks than before and with a good profit for the cinema owner.

A technical advantage in the six cinemas is the capability of projecting the same print of the film through all six projectors at the same time. The copy is transported via rollers from projector to projector. Whenever necessary, it is possible to drop one auditorium after another and at last screen the film in the smallest one, with only 80 seats.

7 Rigoletto is operated only by one projectionist from a control room in the entrance hall. The projectionist can start and stop the projectors, correct the focus via CCTV monitors, control the sound level in the auditoriums, and watch all control indicators for the safety of the cinemas. The CCTV monitors are also visible to the audience as a preview of the different films. The projectors have a complete system for automatic performances. After a pushbutton signal from the projectionist, all controls are taken over in the projector. It starts the performance, turns down the

Figure S-3. Central operation desk in Seven Rigoletto.

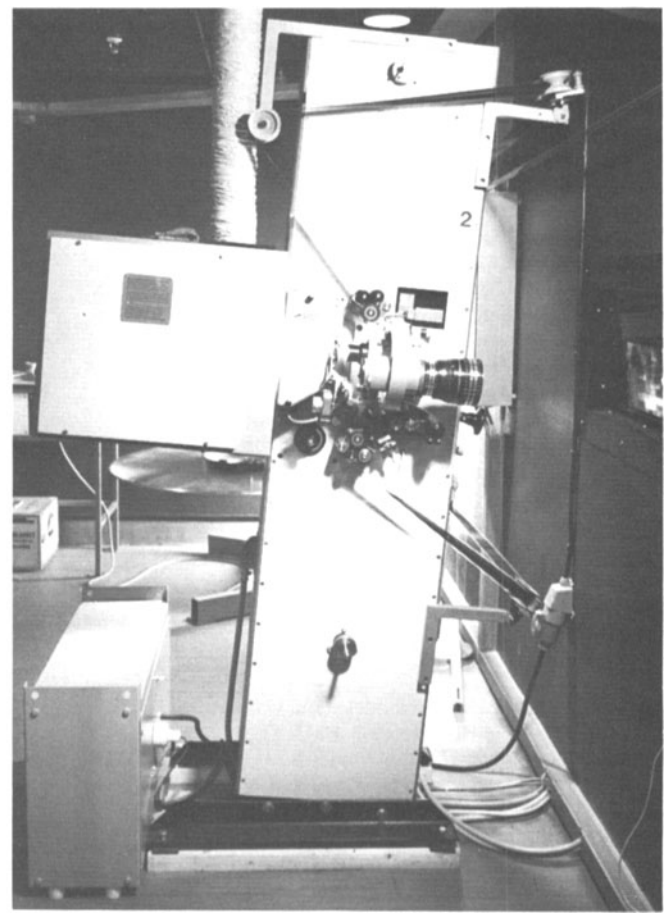

Figure S-4. The automatic projector.

lights, changes the lenses and apertures, controls the air conditioning, closes and opens the exit doors, and if something should happen to the projector or the film, it stops the performance and starts to play music from a tape recorder. Some of the equipment in 7 Rigoletto is shown in Figs. S-3 and S-4.

Most of the newly built cinemas are equipped with the ability to reproduce optical stereo sound. The improved results of these installations together with cinema equalizers have made the magnetic sound system more or less unnecessary in the small cinemas. The magnetic sound system is now only necessary to the big cinemas with 70-mm projectors. The number of optical stereo cinema installations was, by January 1981, about 70. About 20 of these installations are manufactured in Sweden and the rest are the Dolby system.

United Kingdom

Motion Pictures

The overvaluation of the pound sterling boosted by North Sea oil during 1980 produced difficult trading conditions for industry in general, and the motion picture studios and laboratories were no exception. Film production dropped from 61 films in 1979 to 38 in 1980, although the number of films produced at the major studios rose from 27 to 29. EMI Elstree had its best year ever. Equipment manufacturers found difficulty in exporting their products, but the traditional British innovational skills produced some interesting new equipment designs.

Film Inspection Equipment

A completely new version of the Vedette bench top viewer was introduced by Lipsner-Smith Co., Ltd. All functions of the Vedette II are controlled by a microprocessor. The synchronous mode operates at 24 and 25 frames/s; in the manual mode, the machine will rock and roll at a variable speed up to 400 ft/min. The digital LED linear film counter provides instant readout in frames, feet and frames, meters, or screen time in minutes, seconds, and frames. The screen is almost double the area of the original model. An option is available for double speed sound reproduction by means of the Quik-Trac speech processor. The 35-mm version is shown as Fig. UK-1.

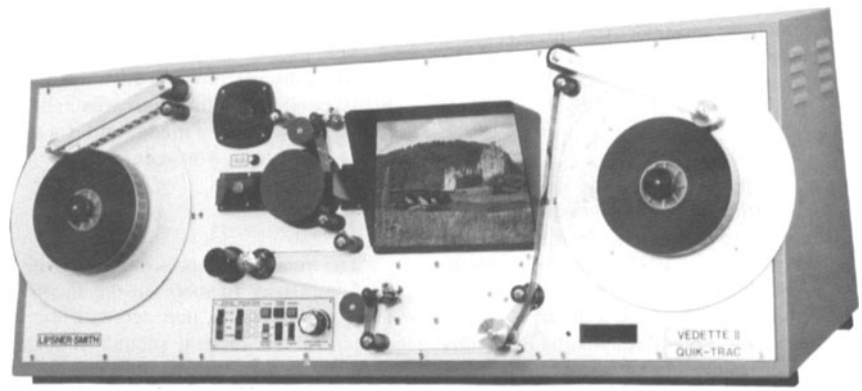

Figure UK-1. Vedette II film viewer with microprocessor control.

Animation Equipment

A computerized studio model stand was developed by Neilson-Hordell Ltd. The camera is a Neilson-Hordell Model 83.00 attached to an elevation column, about 8 ft (2.44 m) high. The column is fixed to a rigid platform which runs on precision tracks laid along the studio floor (Fig. UK-2). The camera is mounted on a geared pan and tilt head. An alternative camera mounting position is on a cradle suspended from the pan and tilt head enabling the lens to be brought down below the level of the platform. A snorkel lens can be attached to the camera, providing for fluid floor level or table top level operation.

For the model stand, the camera viewfinder has been reconfigured for ease of continuous viewing by eye; however, another standard feature of the camera is an optional beam-splitter viewer system that permits filming and viewing at the same time. By using the TV camera option, all viewing can be done on a TV monitor and recorded on tape-to-disk for instant playback. A digital computer controls the tracking, rise and fall, pan and tilt, and camera-focus functions.

To further utilize the high-speed capability of the Model 83.00 special-effects camera, a high-speed table top and compound has been produced for use with it on the animation rostrums (Fig. UK-3). When shooting with computer control, the increased output greatly improves cost effectiveness. The high-speed table top and compound is also ideal for video animation, and the company is currently producing computerized video animation stands for UK and Dutch television broadcasting stations.

The design and manufacture has been completed for both 35-mm and 16-mm rotoscope projectors which enables the rotoscoping function to be taken off the main animation stand. The projectors, mounted into a tracing table, have forward and reverse drive in single frame and high speed modes with a predetermined footage and frame counter. They are fitted with a zoom lens giving field size variations from just

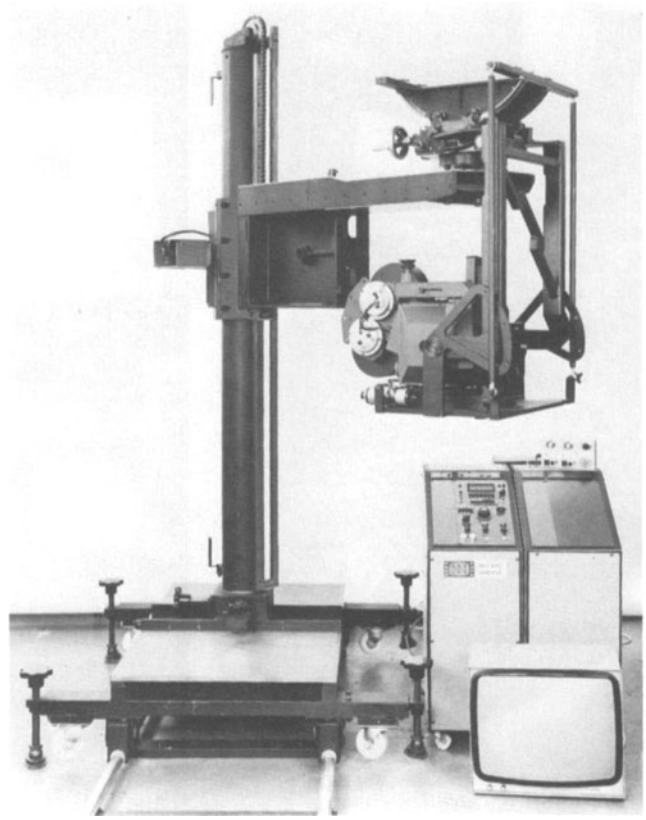
Figure UK-2. Computerized studio model stand.

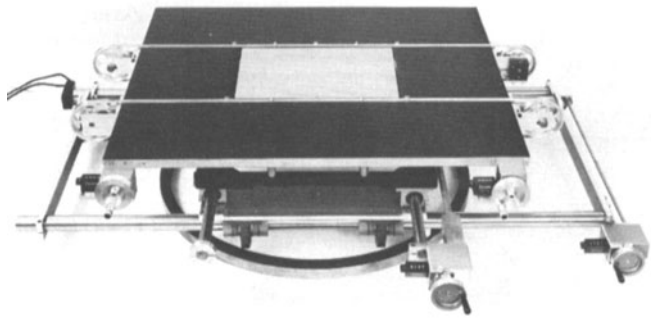

Figure UK-3. Table top and compound for animation production.

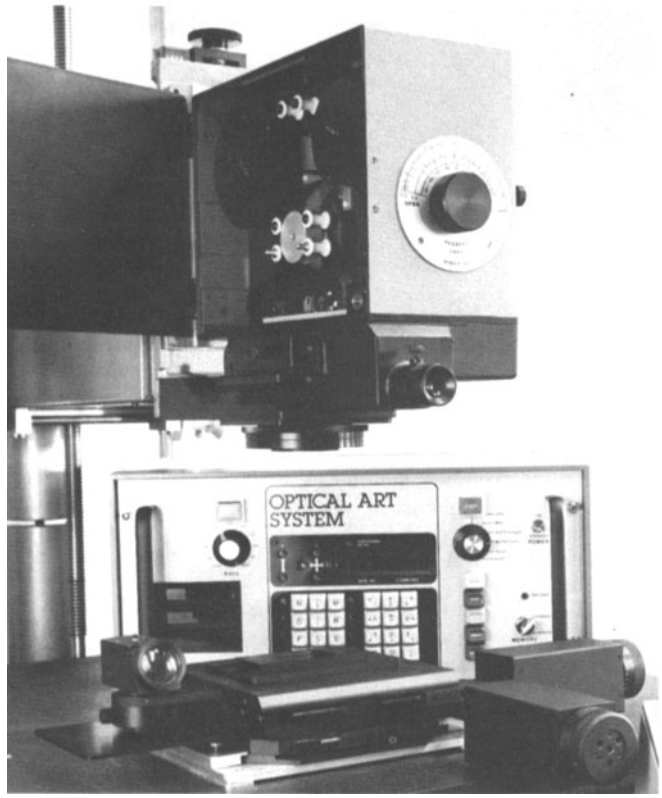

Figure UK-4. Optical Art System 3.

under 8 in (203 mm) to 14½ in (368 mm). Alternative lenses are available. The 35-mm projector has interchangeable registration pins to accept positive or negative perforated film. Standard film capacity is 200 ft (60 m) with the option for 1000-ft (300 m) magazines. Approximate dimensions are 20 in (508 mm) square by 30 in (762 mm) high.

During 1980 Neilson-Hordell received its largest request for a single piece of equipment. Ordered by the State Algerian TV network, it is for a special-effects optical printer with main, aerial-image and beam-splitter projector heads, automatic additive lamphouse and many optional extras. Other major equipment sales overseas were made to the U.S.A., Canada, South America, France, Holland, and Iraq.

In conjunction with the Optical Art Camera Corp. of Canada, a slide-tape to 16-mm film transfer system was completed. It is called the Optical Art System 3 (Fig. UK-4). It consists of a Neilson-Hordell Model 25.02 16-mm animation stand and camera using an Optical Art pin-registered precision slide-film compound on the table top. The compound N/S and E/W movements together with the camera zoom and all camera functions are controlled by a numerical controlled microprocessor. Preprogramming of entire sequences is possible, requiring only the manual changing of slides on cue. In addition, motion-picture type special effects can be added to the original show, e.g., spins, zooms, rotations, streaks, and slit-scan. Soundtracks can be added in any language. This system provides for easy distribution of original slide-tape programs in an internationally compatible format.

Audio Equipment

New microphones were introduced by Shure Electronics. These microphones all fall into the SM Studio Range and are therefore primarily designed for use where microphones of the highest standard and specifications are required. The two new models in the Starmaker series are cardioid with a new look and good sound (Fig. UK-5). Lighter in weight and smaller in size than their predecessors, their small profile does not obscure the face of the performer. The microphones are housed in an all new aluminum alloy case for a big reduction in weight with no sacrifice in ruggedness or reliability. Completing the new trio is the SM 63, an omnidirectional microphone.

Lighting Equipment

Galaxy, a modern memory lighting control system, was introduced by Rank Strand (Fig. UK-6). Galaxy is designed for television, theater, conference, and exhibition centers — in fact, any situation where sophisticated and repeatable lighting is required. Galaxy is designed around microprocessor technology. This latest system differs from its predecessors in the simplicity with which its operator can handle the most subtle and complex lighting programs. Galaxy deliberately avoids clever technical gimmickry, although very elaborate electronics are obviously employed within the system. Galaxy is intended to fill the same role in performance lighting that the word processor fills in modern publishing operations. It is a simple convenient way of memorizing, recording, reshaping, and reproducing a creative contribution.

The system consists of two separate units — the control desk and its electronics crate. The desk is a shallow metal box with a wooden surround into which individual panels fit. The desk can have a wooden base or it can be fitted into a control room suite. The electronics are contained in the crate which is the size of a medium suitcase and can be remote from the desk. The system is of rugged construction and can be used for worldwide touring and trouping. Connection between desk and crate is by a 4-core cable which can be up to 1 km in length.

The desk is fully portable and can be used in theaters as a stalls control. The basic system consists of four panels, channel control, two playbacks, and a memory output. These panels, plus an optional group master and/or a preset master panel, are all contained in the main desk.

Systems are available having up to 768 control channels in multiples of 48. The

Figure UK-5. Two new Starmaker microphones.

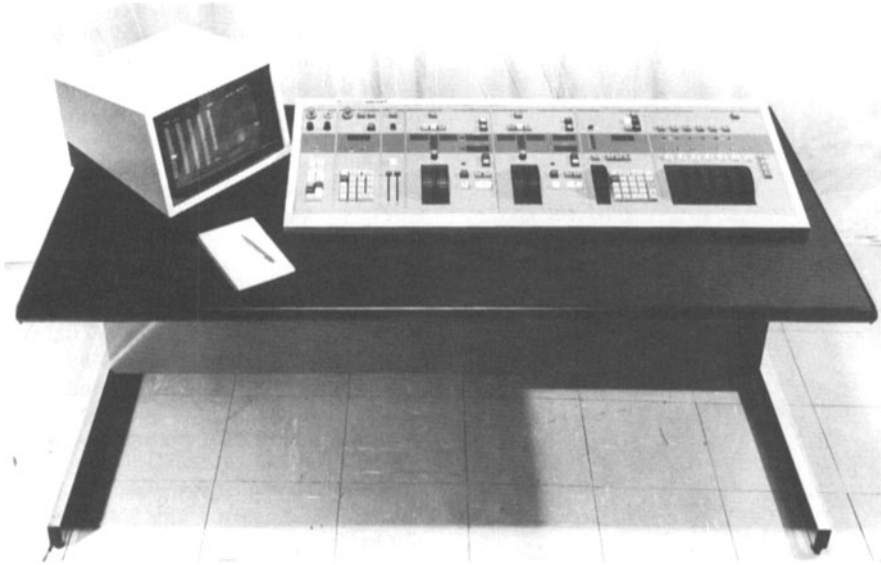

Figure UK-6. Galaxy Memory Lighting Control System.

memory is extendable by extra cards to meet any requirements. Library storage is available as an optical extra by floppy disk. Among options available are a preset master panel allowing up to ten groups of memories to be allocated to individual master faders, with overall mastering facilities. There is a set of six wheel controls, onto each of which the lighting being handled by the channel controller may be transferred. Up to six groups of lighting may be balanced with fingertip control, recorded, and automatically re-allocated on playback. Information is formatted so that unused channels do not use screen space. "Paging" is available, or large systems may have multiple units. Color display is available.

Floppy disk storage is provided on standard 8-in (203-mm) computer disks. The system provides its own initial formatting. A printer to provide a record of the memory is available. A wired hand-held riggers control is available. An extra typewriter Alpha keyboard allows the operator to patch channels to dimmers, add clear language text messages to recorded cues, adjust dimmer laws, and manipulate other system functions at will.

Technical Support Organization

Mercury Cinevideo Ltd., based on Wardour Street at the center of the UK film industry, has now expanded into Africa with the opening of offices in Lagos and Lusaka. Serving government and other film production units in Nigeria and Zambia, Mercury Cinevideo West Africa and Mercury Cinevideo Central Africa provide facilities specifically geared to the African climate and conditions. These include a fully detailed planning and consultancy service, a comprehensive range of equipment for film and television production and post production, and full technical support including training and personnel.

Television

British Broadcasting Corp.

Economies

The BBC depends upon license income to fund its two national television services, four national radio services, and 22 local radio stations. Towards the end of 1979, financial projections showed that in the face of inflation it would be necessary to raise the color license fee from £25 to £41: this would allow existing services to be maintained and some modest improvements in certain areas. In fact, in November 1979 the Government set the color fee at £34 and the black-and-white fee at £12 (a license is not required for radio alone) and decreed that there would be no further increase for "at least two years." Faced with this situation, the budget for the two years ending 31 March 1982 had to be cut by £130 million, of which £40 million had to come from cuts in the existing services.

The spending cuts were a blow to the BBC's traditional role as a major patron of the arts in the United Kingdom, a fact that became apparent to the public when plans were made to disband five of the Corporation's eleven orchestras. In protest, the Musicians Union took strike action from 1 June, which immediately brought an end to all live music on BBC radio and television. The dispute was resolved in August; three orchestras still had to go, but the Scottish Symphony Orchestra was saved. Unfortunately the strike delayed the start of the Proms, the country's leading music festival, since this event is organized and financed by the BBC. Twenty of the planned 57 promenade concerts were lost.

The cuts meant the deferment or cancellation of several large engineering projects, mainly for new studios. A number of engineering activities had to be curtailed, but as far as possible, the engineering economies were made in areas where they would not affect the quantity or quality of the existing television and radio services offered to viewers and listeners.

People

On 1 August, George Howard, long a BBC Governor, became Chairman of the BBC on the retirement of Sir Michael Swann. At the end of the year, Alasdair Milne was appointed Deputy Director General, while remaining Managing Director, Television; David Webster became Director, United States; and John Wilkinson succeeded him as Director, Public Affairs. In June, Ian Trethowan, the Director General, received a knighthood in the Queen's Birthday Honours List. Unhappily we have to report that Sir Ian's immediate predecessor, Sir Charles Curran, died earlier in the year, at an age of only 58.

Events

Two major events are worthy of particular mention — the Olympic Games and the Service of Thanksgiving for the Queen Mother's 80th birthday.

Coverage of the Olympic Games was cut to only 45 hours in response to the situation in Afghanistan, but this did not reduce the need to provide comprehensive engineering facilities. A studio in the Olympic Television and Radio Complex was equipped by BBC engineers with three cameras and six videotape recorders; two small outside broadcast units were also provided to give a measure of independence from Soviet sources. The programs were transmitted via the Intelsat IV satellite and the Goonhilly ground station in Cornwall to Television Centre in London, where they were transcoded from SECAM to PAL for transmission.

The arrangements for the Queen Mother's birthday celebration were similar to those made for the Silver Jubilee broadcast of 1977. Eight mobile control rooms were used as well as the BBC's mobile communications center. Twenty-four cameras contributed to the program, including one mounted at the very top of the dome in St. Paul's Cathedral to provide a spectacular bird's-eye view of the nave.

Transmitters

The BBC began the world's first regular high-definition television service in 1936, and the 405-line 50-field interlaced system adopted then is still in use for the VHF transmission of BBC 1 and ITV programs in black-and-white only. Since 1969 both of these services have also been transmitted on 625-line UHF using the PAL color system, and BBC 2 has been transmitted on 625 lines only since it came into service in 1964. The 625-line UHF services now cover almost 99% of the population, while the 405-line transmitters serve relatively few viewers and are becoming increasingly difficult to maintain. The Government has therefore authorized the broadcasting authorities to close down the 405-line transmitters in a phased five-year program beginning in 1982. The last transmitters to

Figure UK-7. Mock-up of a small UHF re-broadcast television transmitter of the type that will be used by "self-help" groups in the United Kingdom.

be closed, in 1986, will be some of the high-powered ones in areas where 625-line coverage is less complete.

The 405-line transmissions occupy VHF Band I (41–68 MHz) and Band III (174–216 MHz). Under the WARC agreement Channel 1 in Band I has been re-allocated to the fixed and mobile services from 1 January 1987, while the remainder of the band (47–68 MHz) has been retained for broadcasting. Band III has been extended to 216 MHz exclusively for broadcasting, giving a capacity of six 625-line television channels. Naturally there is great interest in how these slots in the frequency spectrum should be used, and various proposals have been made, both by the broadcasters and by other interested parties: ultimately the decision will be made by the Government.

The present 625-line television transmitter construction program, Phase II, is intended to provide UHF television coverage for all population groups exceeding 500 people; about 70 new stations designed for the transmission of four services (BBC 1, BBC 2, ITV, and the future Channel Four) are brought into service every year. In making his announcement on the closure of the 405-line transmitters, the Home Secretary authorized the broadcasting authorities to undertake a new transmitter construction program, Phase III, to cover population groups down to 200 people where this is technically and economically practicable. The BBC has already designed a new transposer (used at the relay stations to change the frequencies of the received channels for retransmission) which is only half of the cost, size, and weight of existing equipment.

The Home Secretary has also agreed to procedures to allow small population groups that are likely to remain unserved to install small relay transmitters at their own expense (Fig. UK-7). The basic operating characteristics — frequencies, powers, possible aerial sites — are laid down by the Home Office to ensure that there is no interference between these "self-help" schemes and network transmitters. Practical advice on installing the equipment is provided by the broadcasting authorities, who are also responsible for ensuring that the installed systems will not interfere with any existing or planned service.

Satellite Links for Outside Broadcasts

Outside broadcasts sometimes require complex and expensive terrestrial transmission links to carry the pictures back to the studios. Satellite circuits now offer an alternative, and in June a comparison was made between terrestrial and satellite circuits from an outside broadcast from Glencoe in Scotland, where the cameras were required to follow climbers on a perilous rock climb. The terrestrial link required no fewer than six BBC link vans perched on hilltops across Scotland to get the signals to the Kirk o' Shotts transmitter station, where they were fed into the permanent vision contribution circuit to London.

The satellite link comprised Ferranti transportable up-link equipment at Glencoe, the European Space Agency's Orbital Test Satellite, and the Ferranti ground station at Poynton, Manchester. The up-link used a 250-W traveling-wave-tube amplifier in the 14-GHz band. The down-link was in the 11-GHz band, and both ground stations used a 3-m dish. From Poynton the signals were carried by ground-based radio link to the BBC's Broadcasting House in Manchester and then into the normal contribution circuits to London.

The quality of the two program signals compared very well, and the exercise provided valuable data. BBC Research Department is now building a transportable satellite up-link terminal that is expected to be ready for testing in the late summer of 1981.

Studios

The BBC's Television Centre in West London has eight main production studios: Studio 1 measures 108 ft × 100 ft × 54 ft high; Studios 3, 4, 6, and 8 are each 100 ft × 80 ft × 40 ft; and Studios 2, 5, and 7 are 70 ft × 50 ft × 33 ft. When first equipped for color working, Studios 6, 7, and 8 shared a common vision apparatus room and a common caption area. In practice this proved inflexible, and a refurbishment program for the three studios included the provision of separate and independent apparatus rooms each with their own caption facilities. The separation called for careful planning in order to have only one studio out of action at any one time. This work was completed in September 1980 when Studio 7 was brought back into service with completely new vision equipment, a new lighting control system, and a new 36-channel sound desk. Work has since started on the complete refurbishment of Studio 2, which for the last four years has been out of service as a studio, and has been used for storage, office accommodation, and as a viewing room.

In Manchester a new music studio was opened at the BBC's Network Production Centre. The new studio is notable for the fact that acoustic modeling was used in finalizing its design — a one-eighth scale model was constructed, and frequency-scaled tests were carried out using non-reverberant music played into the model (Fig. UK-8). As a result of the application of acoustic modeling it was found that a lower-than-anticipated ceiling height could be used, and only 400 acoustic absorbers were required instead of the 800 that would

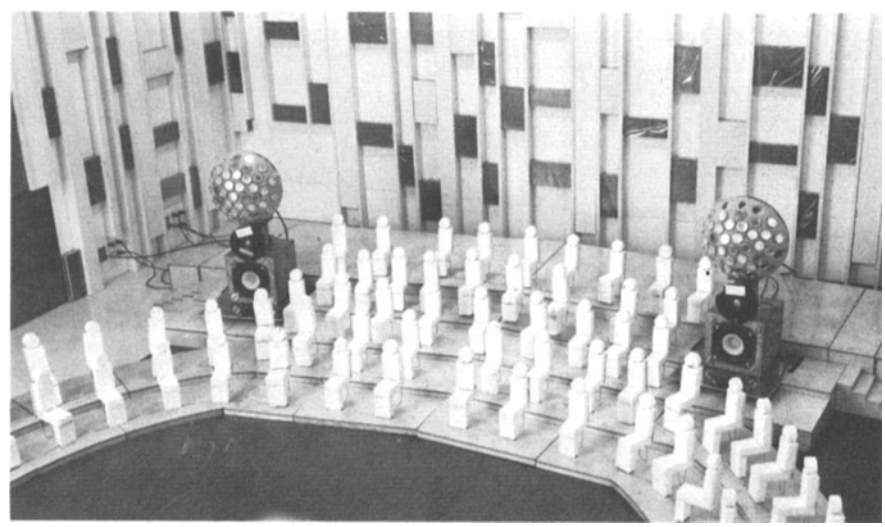

Figure UK-8. A scale model used to finalize the acoustic design of the new studio at BBC's Manchester Network Production Centre.

otherwise have been fitted. The acoustic response of the finished studio matches very closely the response obtained in the eighth-scale model, and the engineers and musicians using the studio are delighted with its acoustic performance.

New Film and Videotape Dubbing Theater

In addition to the main London studios at Television Centre, the BBC has television studios at nearby Lime Grove. In 1980 a new film and videotape dubbing theater was brought into operation at Lime Grove, using a former studio with a floor space of 3000 ft² (Fig. UK-9). The theater has been designed principally to provide the best possible environment and equipment for the sound dubbing of current affairs and sports programs, where sound effects and commentaries must often be added only minutes before transmission.

In addition to the main dubbing mixer room, the theater contains two commentary studios, an effects area, an apparatus room, and a projection room. These are laid out so that the operator in charge (the Dubbing Mixer) can maintain visual contact with the staff in both studios, the effects area, and the apparatus room, while viewing the large projection screen in front of him.

The main operation at the theater is high speed film dubbing, but videotape can also be used by using EBU time code to synchronize a helical scan videotape recorder with a multitrack audio recorder, similar to the techniques used with the SYPHER suite. Thus all the requirements for fast and economical editing of film and tape are provided under one roof.

SYPHER

To avoid the prohibitive cost of using broadcast VTR machines for post production sound dubbing, it is now usual to provide an off-line facility in a dedicated area. Such a facility in the BBC is known as SYPHER[1] (Synchronized Post Dub, Helical Scan, and Eight-Track Record): a SYPHER suite has been in use at Television Centre for six years, during which time it has been used for some 2500 programs. Basically, SYPHER enables sound editing to be carried out on a multitrack sound recorder synchronously coupled to an inexpensive helical scan VTR using standard time code recorded on both machines.

A second SYPHER suite (SYPHER 2) has now been installed at Television Centre. SYPHER 2 offers improved facilities compared with the first suite, including a 16-track sound recorder instead of an 8-track machine (this rather spoils the name SYPHER) and a computer assisted mixing console; this uses a floppy disk to store data representing the position of all the faders against a time code reference. When the number of sources is large a number of premixes can be made, but instead of recording these directly, they are stored as data describing the mixing sequences. In the final mix, all the sources remain first generation.

Second Digital Standards Converter

In 1979 the BBC brought ACE (Advanced Conversion Equipment), the world's first 4-field digital standards converter, into service at Television Centre in London.[2-3] In 1980 a second converter was brought into service, together with a microprocessor-controlled monitoring system which allows both converters to be remotely controlled from the Central Apparatus Room. The converters, both of which have 625/525 line as well as 525/625 line capability, were designed and manufactured by the BBC.

ACE is now available to other broadcasters and television companies that require the highest quality of conversion, since an agreement has been entered into with McMichael Ltd., a company within the British GEC Group, under which McMichael will manufacture and market this equipment under license.

Figure UK-9. BBC's new film and videotape dubbing theater in operation.

Video Noise Reducer

Extended trials of the BBC-designed video noise reducer[4] have proved its effectiveness. Noise reduction is effected by averaging successive pictures recirculated through a picture store. In the case of still pictures, the picture information is completely correlated from picture to picture, while noise is very much less correlated. Recirculation in a picture store results in the average noise being reduced to a very low level, while the picture information is retained. The use of this process with moving pictures would cause smearing, but this is avoided by examining successive pictures element by element with a movement detector which is used to inhibit the action of the circulating filter.

The composite PAL signal is digitized using a sampling frequency which is approximately three times the color subcarrier frequency, giving 851 samples per line. Two field stores and ten line stores are used to hold the picture information in digital form.

A production equipment (produced under license by Pye TVT Ltd.) is now in operation at the network output of BBC 1, and two more are on order.

Television Graphics Microprocessor

In response to the requirements of the Television Service, the BBC has developed a television graphics microprocessor-based computer system which allows a graphic artist to draw pictures electronically on a television monitor (Fig. UK-10). To use the equipment the artist builds up his picture on the television screen by "drawing" or "painting" with a stylus on an inclined tablet similar to a drawing board.

The system provides virtually all the variations that are available with brush, pen, and paper, including a choice from any of 256 colors, variable line thickness, and air brush effects (Fig. UK-11). Through suitable commands to the microprocessor, a straight line can be drawn between any two points, and geometric shapes such as circles, parabolas, and ellipses can be automatically produced.

The system enjoys a significant advantage over conventional methods of artwork preparation in that it allows quicker and easier assessment of artistic changes: colors can be changed in a trice, for example. And, of course, the fact that the graphics are produced directly on the television monitor means that there is no risk of an unsatisfactory transfer between paper and screen due to the different characteristics of the two media. Because of these advantages the system is expected to become one of the standard methods of graphics production within the BBC.

The facilities provided are likely to prove equally valuable to other broadcasters and video production houses, and a license has been granted to Logica Limited under which Logica will manufacture and

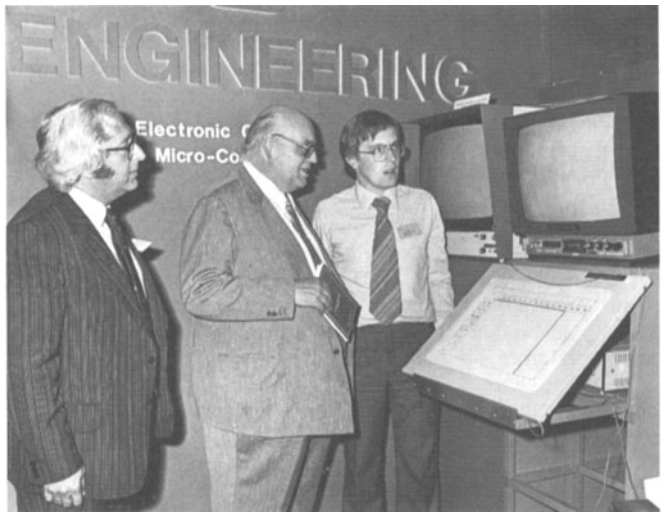

Figure UK-10. BBC's new television graphics microprocessor system being demonstrated at IBC (September 1980).

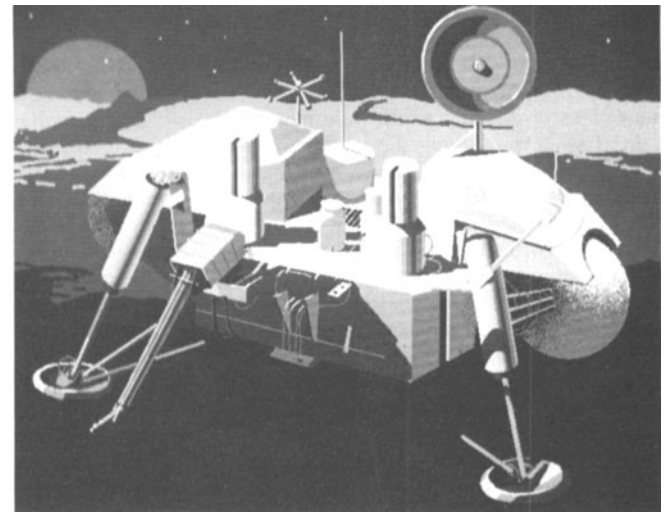

Figure UK-11. Electronic graphics that can be produced on BBC's new television graphics microprocessor system.

market the system worldwide. They have given the system the name FLAIR.

Digital Television Standards

EBU discussions on digital television coding have been going on for several years.[5] In April, some 100 engineers forming the Technical Committee of the European Broadcasting Union met in London as guests of the BBC, where they attended digital television demonstrations featuring apparatus provided by five European laboratories, including the BBC Research Department (Fig. UK-12). The aim was to show the characteristics of a system known as "12:4:4," i.e. a system using 12-MHz sampling for the luminance component and 4 MHz sampling for each of the color-difference components. The demonstrations showed that the 12:4:4 system is capable of preserving excellent signal quality, with the possible exception of its use for color separation overlay (chroma-key).

Color separation overlay is so important to modern studio production that any doubts about the performance of a digitally coded signal in this application must be fully examined. Further work is now taking place in this area, and also with regard to the establishment of the luminance and color-difference sampling frequencies that will provide an optimum compromise between quality and ease of instrumentation.

Ceefax Subtitling for the Deaf

In the UK, three separate teletext services are available to viewers — two Ceefax magazines, transmitted on BBC 1 and BBC 2, and Oracle, transmitted on the ITV network.

In addition to providing a variety of news, information, and entertainment pages, Ceefax is also used to carry subtitles for some BBC television programs. The advantage of transmitting the subtitles on Ceefax is, of course, that hard-of-hearing viewers with teletext receivers can elect to display the subtitles, while the rest of the viewing audience does not suffer an unnecessary intrusion to the program.

Unfortunately the preparation of subtitles in advance of transmission using equipment designed for subtitling foreign feature films is too time consuming and expensive to provide a comprehensive Ceefax subtitling service, and the BBC is therefore investigating other methods, including direct transcription using a modified Palantype shorthand machine linked to a computer.[6-7]

In 1980 a significant advance was made with the introduction into full service of equipment that allows a half-hour recorded program to be subtitled in about a day, where previously it would have taken at least two and a half days. The new equipment makes use of a helical-scan videotape recorder coupled to a minicomputer. In operation, the program to be subtitled is copied on to a video cassette, with the master EBU time code recorded on a spare audio track. When the cassette is played, both picture and time code are displayed on a monitor, and the operator adds the subtitles through the use of a special keyboard; the subtitles are stored on a floppy disk, together with the necessary time code data. During the subtitling operation the subtitles can be recalled for checking at any time, and hard copy can be provided on an accompanying printer.

When the television program is transmitted, the time code on the master tape is fed to an on-line minicomputer, into which has been loaded the floppy disk holding the subtitles. Under the control of the minicomputer the subtitles are released to the main Ceefax computer which controls the transmission of the magazine.

Teletext Developments

Some countries have already adopted

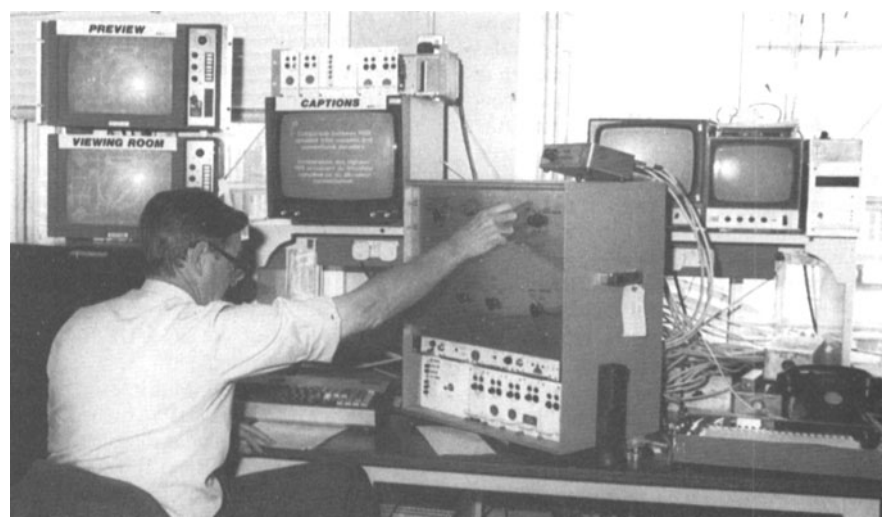

Figure UK-12. In April 1980, the Technical Committee of the EBU met in London and the BBC played a major part in organizing demonstrations of various equipments operating on a proposed digital coding standard.

the British teletext system, and others are considering the way it can be developed in the future. Many enhancements to the basic system are being discussed, with the prime objectives of offering worthwhile new facilities while preserving the inherent efficiency and ruggedness of the system, and keeping full compatibility with the existing teletext decoders and with the developments in British Telecom's interactive Prestel service.

In order to allow the full range of letters required in other European languages, a system of "soft" alphabets may be used,[8] where the working set of about 94 characters for use in a particular group of pages is specified from a repertoire of perhaps 400 available characters. When the required character is unknown to the decoder its shape can be defined approximately by transmitting a pattern of dots.[9] These two techniques of Dynamically Redefinable Character Sets (DRCS) were first proposed by the BBC.[10] In order to accommodate the occasional need to use a known character outside the working alphabet, Philips have proposed a technique[11-12] for over-writing some of the contents of the page store by using auxiliary data lines carrying coded characters along with their address within the page. This direct addressing can also be used to provide "parallel attributes" where, for example, the color of a letter and its background can be changed without a word.

In order to improve the convenience of use of the British teletext system, which is capable of addressing several million different pages, the BBC has proposed[13] several techniques for improving access to the pages, whether manually or automatically. A system of "linked" pages has been defined, allowing the viewer to select one of six pages related to a given page using only one or two keystrokes. In a multiple-page decoder these pages would be acquired while the previous page is being read so the access to the linked page would be immediate. In order to allow a series of linked pages to be stored in a file under automatic control a "page check word" has been devised.[14-15] This will allow the decoder to check that a particular page has been correctly and completely received before further action is taken. It has also been proposed that one or more additional rows associated with a page be used to contain "keywords," which would not normally be displayed, and which would allow the database to be searched in an efficient manner by an "intelligent" decoder.

The BBC has also proposed that within the teletext transmission sequence two types of additional data could be carried without interfering with the existing decoders. Blocks of data, such as computer programs ("telesoftware") could be sent as "pseudo-pages," each containing up to 1024 8-bit bytes. A series of such data blocks could be used to transmit high quality color pictures for use as part of the teletext service. Over 12 million pseudo-pages are available, and they can be linked with each other, and with normal pages, and protected by a page check word, as indicated above. In addition, totally independent "auxiliary data channels" can be defined; these can be used to carry "packets" of data for applications possibly unrelated to television and teletext. A particular application would be a "television service data line," repeated every second, which could carry information about the television channel, network, and program, together with the address of the initial teletext page and date and time information.

All these proposals are being gathered together by the broadcasters and industry into a unified document specifying an enhanced UK teletext system.

BBC Publications:

BBC Engineering

This journal, which recorded BBC technical experience and developments in radio and TV broadcasting, ceased publication with the September 1980 issue due to financial constraints. The following articles were published during 1980.

Number 114, July 1980

"Re-planning and modernising the BBC's LF/MF networks," R.E. Bliss; "Broadcasting facilities in Wales: development at Llandaff," J.P. Courtney and P.H.D. Rattle; "Measurement of the horizontal resolution of picture monitors," J.E. Noakes.

Number 115, September 1980

"Direct broadcasting by satellite for the United Kingdom," P. Rainger and G.J. Phillips; "Digital television," C.P. Sandbank; "Digital coding of the composite PAL colour television signal for transmission at 34 Mbit/s," P.A. Ratliff; "The electronic zone plate and related test patterns," M. Weston.

BBC Research Department Reports Published in 1980

(1) Weston Clean PAL;

(2) "CARFAX": An Example of an FM Signal Generated Using Digital Techniques;

(3) DIGITAL SOUND: An Investigation of Delta-Modulation/Pulse-Code-Modulation Analogue-to-Digital Conversion;

(4) Enhanced UK Teletext Moves Towards Still Pictures;

(5) The Use of the 26 MHz Band for Satellite Broadcasting;

(6) A Study of Peak Multiplexed Signal Level in the Context of 2½- or 3-channel Surround-Sound Transmissions;

(7) Crystal Palace Band II Tests: Comparison of Transmitted Polarizations;

(8) Revised Background Noise Criteria for Broadcasting Studios;

(9) A Set of Time Varying Television Test Patterns;

(10) Interference Caused by Television Receivers to Reception at 200 kHz;

(11) Colour Operation of a Solid State Sensor Telecine;

(12) An Investigation into the Mechanism of Sound-Energy Absorption in a Low-Frequency Modular Absorber;

(13) The General Design of a Digital Stills-Storage System for Use with an Electronic Rostrum Colour Camera;

(14) Investigations on the Use of a Semiconductor Laser Source for Transmission of Baseband Video Over Optical Fibres;

(15) Digital Sound: Studio Signal Coding Resolution for Broadcasting;

(16) Digital Transmission Tests of Multiplexed Video and Audio Signals at 60 Mbit/s via the Orbital Test Satellite (OTS).

Independent Television

During 1980, questions of engineering hardware were, to some degree, overshadowed by two far-reaching legislative and administrative processes. First, the protracted passage through the British Parliament of the Broadcasting Act, 1980, legislation that directly affects the administration of Independent Television by the IBA; the setting up and introduction in 1982 of the fourth national program channel in the United Kingdom; the extension of the statutory life of the Independent Broadcasting Authority, etc. Secondly, the internal administrative processes under which the IBA determined which program companies would be offered contracts for the eight year period from 1 January 1982 — and under what conditions. Further, as the year progressed, the IBA was concerned also with the creation of the Channel Four Television Company Ltd., which officially began operation from 1 January 1981. This company has been incorporated as a wholly owned subsidiary of the IBA to be responsible for providing the Fourth Channel service from about November 1982, initially to almost 80% of the population.

The Chairman of the new company is the Rt. Hon. Edmund Dell, and its Deputy Chairman is Sir Richard Attenborough, with Mr. Jeremy Isaacs as Chief Executive. The company's prime function will be to acquire, and supply to the IBA for transmission, the programs (other than advertisements) for the Channel Four service for broadcasting throughout the United Kingdom, Isle of Man, and Channel Islands, except for Wales, where the programs (including some Channel Four programs) will be provided by a new Welsh Fourth Channel Authority. In a policy statement in December 1980, the IBA noted that, in accordance with the Broadcasting Act, 1980, the Fourth Channel service will have as a particular charge the serving of special interests and concerns for which the existing television services have until now lacked adequate time, and to foster the new and experimental, complementing and to be complemented by the ITV service.

Continued on page 426