Australia

Motion Pictures

There has been considerable expansion of both new equipment and facilities offered in the motion picture industry, centered largely in Sydney and Melbourne.

Colorfilm Group of Companies

The Colorfilm Group of companies provides laboratory services, post production, and video production. Colorfilm laboratory installed two bi-directional, wet-gate panel printers together with two high-speed positive processing machines operating at 133 ft/min. A second Oxberry aerial image optical effects printer has been placed in service to complement the existing optical effects equipment. A Dolby stereo camera for the production of Dolby stereo optical sound negatives from magnetic originals has been installed. This camera is the fifth that has been placed in service throughout the world (Fig. A-1).

Colorfilm Videolab commissioned a new Grass Valley video switcher (Fig. A-2) and added a new "C" format editing suite. The Teledyne CTR2 color kinerecorder has been updated to CTR3, employing separate RGB displays. The increased brightness of the three displays permits the use of a smaller lens aperture with markedly improved resolution in the final film recording.

Filmlab Engineering Pty Ltd., the laboratory-equipment division of the Colorfilm Group, has moved to larger premises to provide the space necessary for increased production to meet both local and export demand.

Atlab Australia, the laboratory division of the Seven Network's Television Centre in Sydney, commissioned a new postproduction stage that includes stereo sound. Also during the year, facilities were installed for the production of 35-mm prints from super 16 negative material, using a liquid gate printer. For increased positive print production, a new 16/35-mm liquid gate panel printer was installed.

Super 8 Services Pty Ltd. has continued to expand its specialized facilities, which now include the production of super 8 copies on reversal, striped print stock from 16-mm prints using an optical reduction printer. The company also installed facilities for transferring super 8 and regular 8 print material to $\frac{1}{2}$-in VHS or Beta cassettes.

Television

During the year, there were significant advances in the application of new technology to the improvement of the Australian commercial television service.

Channel 9 Network announced completion of arrangements for a privately leased transponder on the Intelsat IV satellite to provide continuous television relay between its new TV studio in Los Angeles with Network Headquarters at TCN Channel Nine, Sydney. This is the first Australian television station to be licensed to operate its own earth station working with an international satellite. The Channel Nine Studio in Hollywood would operate through the Network earth station located at Santa Paula, California.

Channel 10 Network, with headquarters at Channel 10 in Sydney, has also completed conversion from 2-in quadruplex to "C" format for videorecording. A digital standards converter was placed in service during the year, and another outside broadcast vehicle added to bring the Sydney total to four.

The Sydney outlet, ATN Channel 7 at the Television Centre complex, implemented full operation of a 220-page broadcast Teletext service 7:00 A.M. to midnight seven days per week, plus an "in-picture" service 9:00 A.M. to 9:30 A.M., five days per week. The system is UK Teletext, with an estimated 5,000 teletext-equipped receivers in use in the Sydney area by the end of the year. Approximately 200 pages of this service are updated daily, plus 26 updated automatically through computer feeds. In addition to two manual edit terminals, various sources are fed automatically from other computers such as the Totalalisater Agency Board's (TAB) pre- and post-race horse racing dividend information for at-home clients of this betting service (Fig. A-3).

During the year, the network sustained its high involvement with sports, and this year its Sydney engineering team supplied the in-car cameras for the CBS telecast of the 1981 Daytona 500. The system provides two remotely controlled cameras, capable of panning and tilting to views of the driver through any of the windows of the car while racing. The video signal is carried via microwave up-link to a helicopter repeater overhead. The cameras are controlled by a very rugged telemetry system and are operated by a cameraman in the production trailer. CBS was awarded a Technical Emmy for this telecast in 1981.

The State of the Market

Both the television and motion picture industries are enjoying prosperity, and the outlook for both is encouraging. The reason for this can be attributed to the quality and variety of the television transmissions and the acceptance of the motion picture industry's film productions for both television and theater release. Prosperity and the availability of funds with a promise of expansion has created the climate where boards of directors are prepared to invest more money to take advantage of new technology, with a resultant expansion of activities. An indication of this trend is the growth of color television, introduced in Australia in 1975. After six years, 82.5 percent of homes have color receivers, an increase of 5 percent in the last year, reflected by increased advertising revenue. In 1981, Australian commercial television

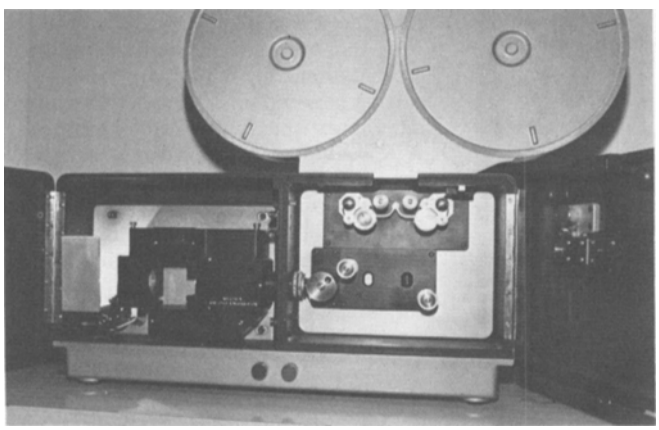

Figure A-1. Dolby stereo camera at Colorfilm.

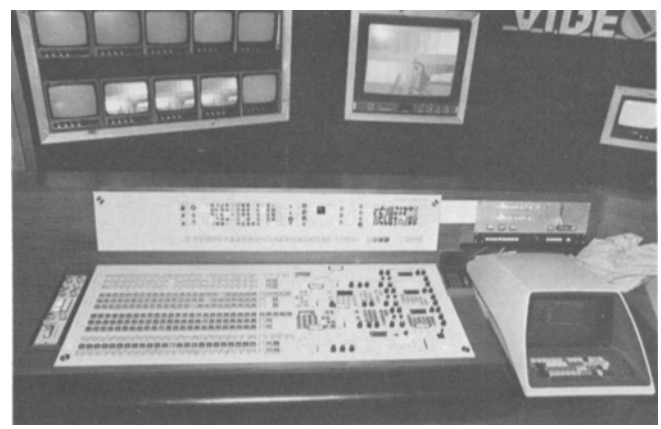

Figure A-2. Grass Valley switcher at Videolab.

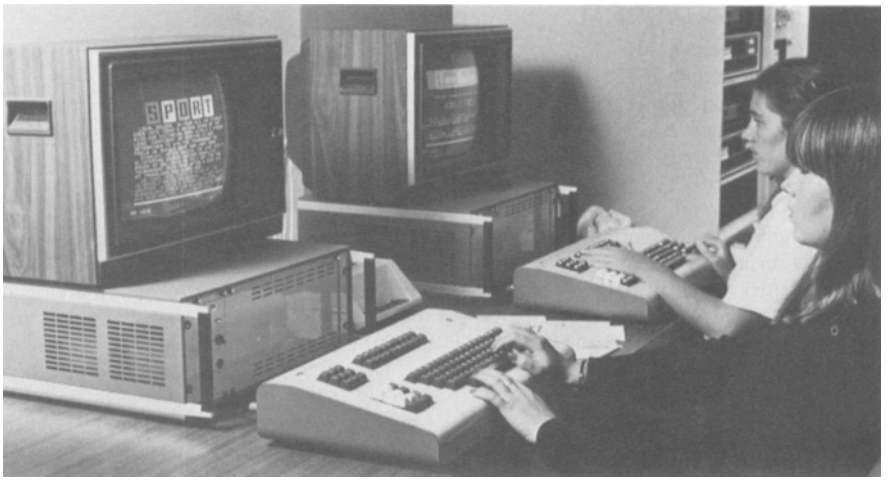

Figure A-3. Operators at the edit terminals of the ATN-7 Sydney teletext service.

attracted 32.8 percent of the Australian advertising dollar, compared with 30.3 percent in 1980, as reported by the Commercial Economic Advisory Service Australia.

Belgium

RTBF

The French language broadcasting organization RTBF has started the up-dating of its audio equipment in the existing TV studios. The main TV production studio in Brussels (1000 m^2) has been equipped with a 48-input console. Radio production studios in Brussels and Liege are also being re-equipped. New facilities have been installed in the Broadcasting Center in Brussels for copying to U-matic (high- and low-bank) for archives and to consumer cassettes for previewing and marketing purposes. A two-machine ENG editing suite has also been added.

In the town of Charleroi, a dubbing studio has been installed. It is equipped with two C-format VTRs, two four-track audio recorders, and a synchronizer. One 20-kW unit has been added to the transmitter park.

BRT

The Dutch-speaking broadcasting organization, BRT, has commissioned its first C-format machines consisting of six portable and nine studio VTRs, and an editing suite with four more VTRs, two four-track recorders, an editing unit, two caption cameras, and a production switcher (Fig. B-1).

EFP operations have been expanded by the addition of a number of cameras and VTRs, and OB van equipped with two cameras, one studio and one portable VTR.

ENG has moved to permanent quarters, with three editing rooms, one sound booth, and a "replay" room. Orders have been placed for a large routing matrix, four three-machine VTR suites, and an additional VTR suite equipped with four VTRs as well as a dubbing studio and a two-channel digital effects unit.

Figure B-1. VTR editing suite at BRT Broadcasting Center.

The teletext experiments continue, RTBF with Antiope and BRT with the British system.

Canada

Canadian Broadcasting Corporation

One of the most important projects of 1981 was a new television program which was first shown on the English Network on January 11, 1982. *The Journal* is a five-nights-a-week current affairs show which follows *The National News* at its new prime time of 10:00 P.M. It is designed to conduct live interviews from anywhere in the world, often simultaneously involving more than one remote pickup.

With same-day immediacy in mind, and with the constraints of time zones ever present, videotape plays an important part in the production of the show. The techniques for its use include the ability to conduct a three-location interview interconnected only by phone lines, with ENG units at the distant points making local recordings for later use.

Studio One at CBC Toronto was completely rebuilt as the anchor studio, and dry runs for *The Journal* began at the end of 1981. This was one of four main engineering projects associated with the show. The others included nine electronic news gathering units for world-wide assignments; a microwave mobile unit for use in Ottawa, the nation's capital; and ancillary facilities at CBC Toronto, principally videotape editing suites.

In many respects, the new Studio One Control Room (Fig. C-1) represents state-of-the-art design, except that the "people" space has been made larger. The Vital video switcher incorporates Squeezoom among its special effects. The audio console is by McCurdy, and the incoming phone lines have a Studer interface. The cameras are RCA TK47, and an Adda slide store is available for titles and graphics.

The associated videotape area uses nine VPR-2B 1-in machines working in conjunction with two Epic editing systems. Packaging with time-coded post sync is done on those interviews originally recorded elsewhere and fed to Toronto via Anik-B or overseas satellites. The resultant presentation, in addition to the normal cutting between sources, shows the studio interviewer apparently watching two rear screens (keyed insertion) in a three-way conversation as if it were live at that moment.

The facilities and techniques used for the program are capable of handling all the combinations of presentation from fully network-connected interview to the assembly of three tapes recorded independently at widely separated locations.

With a view to immediate access to an interview subject in Ottawa, a microwave mobile unit was designed and constructed

Figure C-1. Control room for *The Journal*.

Figure C-2. The Telidon system.

for use there. Essentially an RF device, it can be used in conjunction with one of the ENG units, or incorporated into a complete mobile production. The facility uses a 15 GHz link from the camera to the main unit, which has a range of about a quarter of a mile; and a 7 GHz link to the nearest designated receive point which, given excellent conditions, could have a 50-mile range. The 7 GHz transmitting antenna, with remote control pan and tilt head, is of the same type that was first used on the chase planes at the time of the *Columbia* space shuttle's first landing. The antenna is mounted on the top of a 10-ft solid aluminium mast that lies along the roof of the vehicle while at rest. As a safety precaution, it can only be raised from outside the vehicle, and in its raised state, the antenna is 16 feet above ground.

Each of nine ENG packages uses a Hitachi SK 91 camera in conjunction with a Sony recorder, either a BVU-50, the latter being record-only. To help gain time in the reporting of a feature story, the International Relations Department of the CBC published a booklet, *Guide to Production Teams Assigned Abroad*, which has proved especially useful for crews taking equipment with them. It outlines for each country of the world the requirements for visas, filming/recording permits, immunization, and customs. Canadian customs people were given documented information on ENG units, with photographs, in order to avoid delays and explanations.

A little closer to home, coverage expansion continued with 57 new transmitters entering service, 46 of them being constructed under the Accelerated Coverage Plan, a program designed to bring broadcast coverage to previously unserved areas having a population of 500 or more. Fifteen radio transmitters use the FM band, and two are in the AM band. The remaining 40 carry television service, some of which, like the ones in Armstrong and Temagami, take satellite service from a TVRO, engineered by CBC as a part of the package.

Closed captioning for the hearing-impaired began in 1981, but only for programs previously captioned in the United States. The first Canadian-produced program to use captions, *Clown White*, was aired on November 25, 1981, on the English network, and two days later on the French network. Other shows have followed, all of which use the National Captioning Institute Center in Falls Church, Virginia. A Canadian captioning center is in the process of formation, and is expected to begin operations later in 1982.

A radio mobile unit constructed in a 30-ft Revcon front-wheel drive vehicle has been assembled by CBC Engineering for the French Services Division in Montreal. Suitable for use on larger broadcasts such as political conventions, the unit contains a Studer console and tape recorder, two AG 440 recorders, and two Technics turntables.

The capabilities of the film service in Montreal have been extended with the recent installation of a fully automatic animation table. The unit, a Cinetron 800 system with H.P. computer, received an Oscar award for its design. It is highly probable that one of its users will be Frederic Back of the Montreal staff, who is himself a previous Oscar-award nominee for animated film.

CBC engineers are taking a detailed look at how well an existing television distribution system will pass teletext signals. Tests began in October 1981 with off-air measurements within the Grade A service area of a television transmitter operating on VHF Channel 2. Subsequent tests will do the same for VHF Channel 9 and VHF Channel 25, and for rebroadcasting stations. Studio tests have begun on videotape machines. Preliminary results of the off-air tests in a metropolitan environment show that about seven percent of the locations chosen gave good results. In this case, the measurements were made using a CBC standard quality control monitoring vehicle at random locations in the city of Montreal. The signal from Channel 2 utilized the Canadian Telidon system for teletext information.

A report of the engineering activities of 1981 would not be complete without a reference to the work CBC engineering has been doing towards the establishment of digital video standards. Beginning with the SMPTE San Francisco Conference in February 1981 and continuing with greater levels of detail, the pages of the *SMPTE Journal* have chronicled the progress made by all the parties to this important undertaking. CBC takes great pride in the accomplishments made to date.

Telidon in TVOntario

TVOntario is in the third year of an extensive field trial of Telidon, the Canadian-developed videotex system, which has won international recognition for its high quality graphic capability (Fig. C-2). The trial, which has been jointly funded by TVOntario and the Department of Communications, is specifically directed towards the exploration of Telidon's potential in education and, through participation with more than 100 Ontario schools, colleges, universities and public libraries, has provided extensive opportunities for educators, students and the public to obtain direct experience with this new medium.

The project has two major components. The first is an interactive Telidon service, via the telephone network, which enables users in some fifty locations in Ontario to access and interact with a data base of some 4,000 Telidon pages. These pages cover a wide range of educational applications, including learning games, quizzes, maps, diagrams, and general resource material dealing with most of the educational disciplines. The second component of the field trial is a broadcast teletext service over TVOntario's Toronto transmitting facility, in which 100 selected Telidon pages are continuously cycled through an encoding system. This inserts formatted teletext data, at 4.6 Megabits, on four lines in the vertical interval of each transmitted field. The system has a cycle time of approximately 20 seconds, which determines the maximum page access time.

The user terminal facilities employed in the trial consist of a dual-mode decoder, selectable to on-line or teletext operation, which provides RGB input signals to a combination receiver/display unit. Pages may be accessed, in either mode, by means of a keypad, but for interactive use, a keyboard is preferred. The program content of

the broadcast teletext service has recently been expanded to include a news service, weather maps, and calendars of events. It is anticipated that in 1982, the transmission standards will be converted to the proposed North American Standard of 5.72 Mbits when the CBC is planning to commence operation of a teletext service at three major centers in Canada.

TVOntario considers Telidon to be an educational medium. Characteristics that contribute to that application include the potential of delivering educational experiences to anyone, regardless of location or time; Telidon's interactive capability allows each learner to proceed at his or her own pace, with periodic feedback on his progress. Computer-assisted learning over a distance, therefore becomes possible; its graphics capability can provide a wide range of educational illustrations such as music scores, charts, graphs and maps; and it has the ability to provide pages of information that unfold at a controlled rate, focusing the viewer's attention and pacing the learning experience.

Much of what TVOntario has been doing with Telidon these past two years has issued from the main objective of testing educational applications of videotex. We have worked mainly with dual user-terminals that are equipped with numbered keypads, which can summon up pages from a numbered database or the teletext page cycle.

Under this configuration, the design and production of programmed learning sequences on a page-creation terminal requires no knowledge of languages such as NATAL and CAN-8. The learning materials thus developed can approximate many of the features of more familiar CAI materials, using branching pathways to give the user a choice of answers. Whether or not the host computer can offer the user manipulation of data within the general framework of a numbered database, is entirely a matter of whether the designers of the software incorporate software routines to permit such things as calculation of mortgages, generation of random responses, and so forth.

Across Canada, other islands of Telidon activity can be discerned in the process of development, often spurred on by individual educators in school systems or the post-secondary field, and sometimes promoted systematically by provincial ministries of education. The objectives include the provision of information services to schools, colleges, and universities, and the export of educational services to the community — the concept of distance education.

Denmark

Motion Pictures

The Danish Filminstitute Information Department reported that the number of tickets sold in 1981 declined a little from the number sold in 1980 but that the proceeds were practically unchanged due to increasing prices. Local productions share 22 percent of the income, although the number of Danish feature films released during 1981 is slightly less than those released during 1980. Half of the imported films, nearly 300, have an English soundtrack, shown with subtitles. Cinema division is taking place but at a slow rate, leaving a total of 350 theaters with 478 film-showing rooms.

To encourage talented young people, the Danish Filminstitute established a department called "The Workshop," which offers the opportunity of getting hands on equipment and realizing a production in Super 8, 16 mm and ¾ video (Sony U-Matic highband). The support consists of free production facilities, cameras, recorders, negative rawstock, mixing facilities, and laboratory expenses. The equipment includes Super 8: crystal-controlled Leicina, Nagra SNN (mini Nagra); 16-mm: Aäton or Arriflex BL, Nagra IS and Nagra IV: Video: Sony 6000 P, BVU-110 (BVU-50), and editing facilities ACE 500. A small mixing studio is available, equipped with three Sondor MO3 machines, slaved by a Super 8 projector or 16-mm KEM 1000 P. Rock 'n' roll is provided with four times normal speed. For work with sound effects and to make use of the existing perforated tape machines, a Sondor EPS 8000 modular synchronizer using SMPTE/EBU timecode, recorded in video TC and perforated tape cue-track, slaves the perforated machines to the VTR (BVU 200P). The system also makes it possible to edit all later perforated soundtracks on a normal editing table. Only one of the perforated tracks carries the timecode information, while the rest are governed by the Sondor biphase interlock signal (TTL). The system will later be extended to comprise an editing table slaved to the VTR and EPS 8000P and a TV monitor, making it possible to edit the soundtracks to a final edited videotape, as is done with film. The timecode will also be used in video editing.

Television

About one-half of the television programs are produced in Denmark, and the other half are imported. The use of imported programs requires a subtitling process, as postsynchronization normally is considered too expensive. Subtitling has been used for decades in Danish cinema theaters and is generally accepted.

The amount of subtitling performed can be illustrated by a few figures. A typical feature film uses approximately 12 subtitles per minute, and our annual production of subtitles amounts to about one million lines. One hour of air time requires about 40 hours of work. The translation itself does not take much time, but the necessary shortening to match reading speed and the final editing are very time-consuming. In our traditional process, subtitles are typed on a 165-mm-wide paper strip, which, in turn, is moved in front of a vidicon camera. The resulting video signal is keyed into the television waveform. The interpreter is present during transmission time and controls the timing manually with pushbuttons. Occasionally, however, the program is re-recorded on videotape prior to transmission. This equipment was designed and made by Danmarks Radio, and it has been used in its present form for ten years.

During 1981, a transition to a fully electronic subtitling system was made. The new equipment was designed by the English firm, Screen Electronics, according to a specification made up by Danmarks Radio. It is based upon a character generator, controlled by data-words recorded on a floppy disc. The program material is copied on a U-matic workprint, and both tapes are provided with identical EBU time codes. If the program is on 16-mm or 35-mm film, the time code and the original soundtrack are recorded on a 16-mm perforated sound tape, run in synchronization with the film. The soundtrack allows a synchronous restart during transmission in the unlikely case of a film breakage.

The subtitles are written into the floppy disc in their natural sequence and then advanced manually during replay of the U-matic tape. Each such manual operation causes an automatic transfer of the appropriate EBU time code indication from tape to floppy disc. This process can be stopped at will and mistakes can be written over. During transmission, the EBU time code on the original tape controls the floppy disc, which in time causes each line of subtitle to appear in the picture at the desired moment. As the production process is completely off-line, it can be accommodated outside the already crowded film, tape, and continuity areas. Such a center has been operational since spring 1981. It contains eight sets of equipment of the type described; and at present, more than 80 percent of all non-news subtitling is performed here. Three sets of equipment are installed in the film and tape area for transmission purposes, and four more sets for the news service.

Sound Radio

Live outside broadcast concert programs have gained new interest when produced with equipment approaching present-day studio complexity. For this purpose, Danmarks Radio acquired a multitrack sound control van from Dell Technical Vehicles, Ltd. (England). The van is 12 m long, 2.5 m wide and 4 m high. It is equipped with a Solid State Logic, Ltd. (England) 44-channel sound control desk, modified for simultaneous stereo broadcasting and parallel recording on a 24-track tape recorder. Also contained in the van is a small studio that can be used as an announcer studio, for interviews or dubbing. Special

attention has been paid to excellent sound proofing against external noise. The conditions for sound quality monitoring have been optimized by use of bass-trapping techniques.

Federal Republic of Germany

Television

In 1981 an Ad Hoc Working Group of the German broadcasting organizations ARD/ZDF completed the second edition of *Specifications 12/10 on TV Color Film.* These specifications determine the technical requirements of television broadcasting organizations for all types of raw film stock used in television (color reversal and negative camera films as well as color prints) and also indicate measuring and evaluation procedures for the determination of characteristics and tolerances necessary for the communication of the film manufacturer and the user. The mechanical characteristics of raw film stock and important sensitometric data (speed, contrast, exposure range and latitude, minimum and maximum density, color balance) and photographic film characteristics (resolution, granularity and rendition of neutral gray and colors) are determined. Minimum requirements are given for each parameter. A universal test chart (T13) and a film measuring instrument (Steffelbauer FEM3) carry out the measurements of these parameters.

In order to eliminate scratches and abrasions during the printing process, it is a common practice at professional laboratories to apply a liquid to the film surface with an index of refraction approximately the same as the film. There are different systems for wet printing, but at this writing no European manufacturer of television film scanners has introduced a wet scanning system. Since negatives, with their rather sensitive surface, are scanned in the telecine there is a need for a wet scanning system of films in television. In the Federal Republic of Germany two different wet scanning systems are being tested. Geyer Video Berlin, a professional laboratory, developed an aquarium gate which is installed on a Rank Cintel Mark III telecine. The film passes through an optically flat thin glass cell, through which the liquid is continuously circulating. The system is similar to that used in optical effects printers and has the same advantages and limitations.

Another method, designed and manufactured by Kodika, Bad Tölz, uses the so-called surface layer system. An extremely thin layer of liquid is sprayed on the film surface. By a proper dosing of the liquid scratches are filled, and the remainder evaporates before it reaches the picture gate. The system is adaptable to all types of printers and telecines, preferably ahead of the picture gate. One of the main advantages is that it permits an immediate change from the wet to the dry mode and vice versa.

Film Time Code

Thoma in Sauerlach, near Munich, introduced a new setting device, the prototype of which had been developed by IRT. This mobile battery operated device is based on a CMOS-microprocessor which, in addition to the presetting of the slave clocks, makes possible readout of all data in plain language, as well as the verification of the synchronism by data and phase comparisons. Phase deviations of the one-second clock pulses are measured and indicated in milliseconds. The master clock can be preset with the data of any slave clock. This additional feature is helpful for playback when the code information must be transferred from the audio tape recorder to the film camera.

In order to identify operational results using this film time code system and to discuss the present situation, a working group was formed by the FSBL (Chiefs of Operations of German Television). Technical directives for the realization of time code equipment were established, in which the main characteristics of the time code equipment and of the interfaces are listed. A report on the results of this working group is published in EBU document GT G3 033.

Bevier Ingenieurbüro in Hamburg developed a read-out decoder which makes it possible to read the code information on a picture film by simply pulling the film through a light sensor. The information can be read in both directions.

Service for TV Journalists

Bosch-Fernseh received an order from the European Parliament for the construction of an outside broadcast (OB) unit, to be made available to journalists from television companies. It will provide facilities for continuous recording of all parliamentary debates and public hearings of committees in Brussels, Luxembourg and Strasbourg.

The OB unit is equipped with three studio cameras (KCP 60), a portable reporting camera (KCA 100) and three BCN 1-in recording systems with electronic editing as well as mixers and monitors.

This is the first service of its kind to be offered to television companies in Europe.

Two main switching centers for news studio complexes in Madrid and Barcelona will be supplied by Bosch-Fernseh to RTVE (Radio Television Española). Bosch, working in cooperation with the Spanish company Piher, is carrying the total systems responsibility for the project.

Bosch is supplying six RME compact production mixers and 50 optical fiber

Figure G-1. Bosch-Fernseh BFS9 single frame display unit.

video links which will be used to transfer incoming radio link signals from a radio tower to the studio complex in Madrid. The Madrid studio center will be used extensively during the transmission of the Soccer World Cup Games in 1982.

RTVE has awarded a major contract for 40 OB vehicles to Piher (Madrid) to be carried out in cooperation with Bosch-Fernseh. There are eight large, 12 middle-sized and 20 small OB vans to be used at the Soccer World Cup Games in 1982. The vehicles contain 74 cameras of types KCK, KCP 60 and KCA 100.

Equipment

Videotape Recording

The single frame display unit BFS9B of Bosch-Fernseh (Fig. G-1) is used with the BCN 51 (May 1981, p. 389) videotape recorder and digital store, to provide rapid access to individual frames on videotape. A 90-minute reel of 1-in tape can accommodate 135,000 frames, providing a compact archive for pictures, diagrams, logos, etc. All the stills necessary for a day's broadcasting can be sought out in advance and an on-air cue list prepared in a very short time. The unit contains an internal memory which stores locations of up to 99 single frames which can then be recalled as required for checking or alteration.

Outside Broadcast

The 300th OB vehicle build by Bosch-Fernseh in the last 25 years is a Daimler

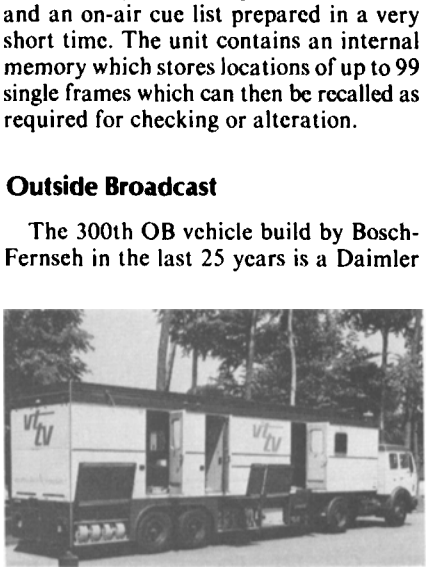

Figure G-2. The 300th OB van of Bosch-Fernseh.

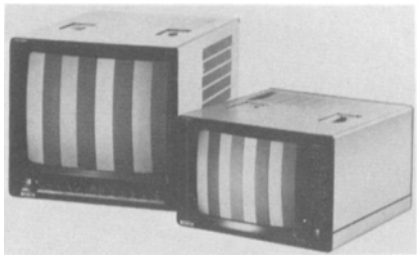

Figure G-3. The new Bosch monitors MC 37 BA and MC 51 BA.

Benz 1632 S truck pulling a specially built trailer containing separate rooms for technical control, video production, and sound production (Fig. G-2).

Production Switcher

The RME production switcher was designed by Bosch-Fernseh. The 16 input single-level version and the two-level version with 16 or 24 inputs have, apart from traditional mixer features, separate preview and key buses, title insert, RGB chromakey, borderliner, flip-flop stage, and pulse processing as standard equipment. A new kind of dual mixing stage can process six inputs simultaneously. The stage is split into two parts, one of which performs mix or wipe transitions with colored pattern borders. The resultant signal passes to the second part and is used as a 'background' signal for chromakey and titling.

All switching functions and the data transfer between the switcher panel and the separate electronics are controlled by microprocessors.

Color Monitors

Two color monitors, the MC 37 BA and MC 51 BA of Bosch-Fernseh (Fig. G-3), are available with high-resolution delta gun or standard resolution tubes. The MC 51 BA delta gun monitor can be equipped with standard, medium or high-resolution tubes.

The 37-cm monitor is intended for VTR or telecine use, whereas the 51-cm unit is intended for studio/OB applications. The monitors are available with EBU or standard U.S. phosphors, or alternatively with special phosphors for the printing industry or data display applications.

Figure G-4. Dieter Poetsch has received the Royal Television Society's Geoffrey Parr Award for his work on CCD broadcast applications.

Persons

Dieter Poetsch (Fig. G-4), head of telecine development at Bosch Television Systems Division in Darmstadt, has received the Geoffrey Parr Award, which is presented annually by the British Royal Television Society for outstanding achievements in the field of television. He received the award for his work on the FDL 60 — the first telecine to employ solid state charge coupled devices (CCDs) instead of pickup tubes as picture sensing elements.

Finland

Television

There are two television networks in Finland, both owned and operated by Oy. Yleisradio Ab., YLE (the Finnish Broadcasting Co.). Network 1's viewing area reaches 99 percent of Finland's 4.8 million people. It has 33 transmitters and 57 repeaters. Network 2 has 24 transmitters and 42 repeaters and covers 97 percent of the population. The microwave link network has a length of 14,597 km.

The networks are shared by two program companies: the state-owned, noncommercial YLE, and a commercial company, Oy Mainos-TV-Reklam Ab, MTV. A total of 4,400 hours of programming was transmitted in 1981, of which 1,550 hours were produced by YLE and 350 hours by MTV.

A cable television company, Helsinki Televisio Oy, operates in the Helsinki capital area.

Transmitters

Two new transmitting stations were built in 1981, and one new Network 2 transmitter was added in an existing station. Two old transmitters were replaced by new ones. All transmitters were manufactured by NEC (Nippon Electric Co.).

All new transmitting stations are built according to the same principles. A good example is the new Tampere station in Teisko. It was built on a new site to replace an old station in Ylöjärvi. The new site has more efficient equipment and has considerably increased the service area of the station.

The new station is on a site of 23 hectares (57 acres) (Fig. F-1). It has a 304-m

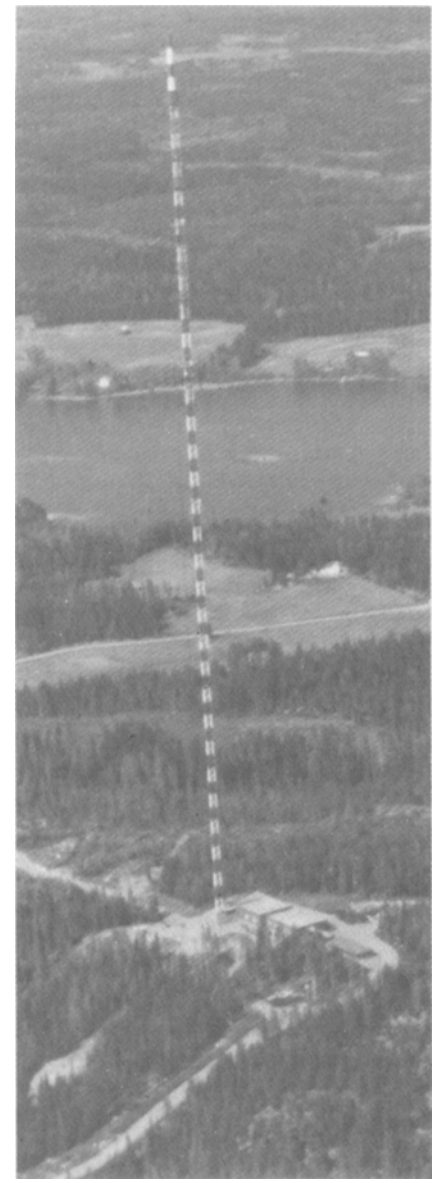

Figure F-1. The new Tampere transmitting station situated on a low hill.

steel lattice mast, on top of which is a 21-m UHF television aerial for TV2, covered with a glass fiber-reinforced plastic cylinder. Below that, are VHF aerials for TVI and FM radio. There is an elevator up to 300 m. Because the station is on a small hill having a height of 175 m, the top of the construction is almost 500 m above sea level (Fig. F-2).

The frame tubes of the mast have the same dimensions throughout its entire height, and the dimensions are standardized in all new masts, allowing the use of standard aerial fittings in all heights in all masts (Fig. F-3).

There is a two-floor, 4,430 m^3 station building, with a total floor area of 1,000 m^2. FM radio transmitters, microwave link equipment, and auxiliary power generators for the whole station are sheltered underground in the basement. The television transmitter hall, station control room (Fig. F-4), maintenance rooms, offices for the district engineering staff, and personnel

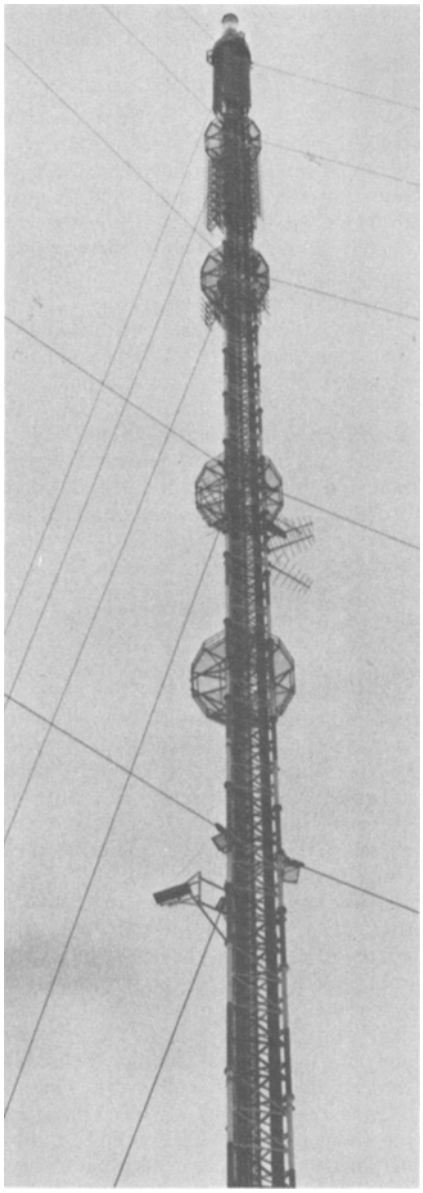

Figure F-2. The 325-m mast for the Tampere station's television and FM radio aerials.

Figure F-3. The Tampere mast under construction.

Figure F-4. Control room of the Tampere transmitting station.

social facilities — including a sauna — are situated on the main floor. This long building extends away from the mast, and has an open garage with only a roof at its outer end. This arrangement provides a 60-m-long shelter against the hazard of ice dropping from the mast in the winter.

The television transmitters are:

TV1	10 kW NEC VHF	80 kW ERP
TV1, spare	10 kW NERA VHF	80 kW ERP
TV2	40 kW NEC UHF	1,000 kW ERP

In addition, there are six FM radio transmitters.

There are two auxiliary power generators, one for television transmitters and the other for FM radio transmitters: Volvo/Strömberg, 190 kVA; Scania/Strömberg, 250 kVA.

The heat of the television transmitters is used for heating the building by a heat exchanger plant.

The wind vibration of ice-loaded masts and guys has been a problem. Automatic vibration-logging equipment is used to gather data for solving this problem (Fig. F-5).

Regional Centers

YLE has nine regional centers with television facilities. They all have black-and-white television studios and have film teams for mobile operation. Refurbishing work is going on. The old equipment is being gradually replaced with equipment for ENG and EFP. A new building has been built, another is under construction, and still another is in the planning stage.

ENG equipment had been installed in seven regions at the end of 1981, and one center was equipped with EFP production facilities in a studio. ENG quality is adequate because the main task of the regional operations is to provide local news for the main news department in Helsinki, which serves both of the networks.

A good example of the new regional centers is the Eastern Finland Center in Kuopio. The new building was completed early in 1980 and it was equipped for television production in 1981. The 16,140 m^3 building which houses both radio and television studios is built on a site of 5,300 m^2 (1.3 acres) and it has a floor area of 3,610 m^2. Functionally, it is divided in two separate parts. One is an office block and the other a production block, with a television studio and three radio studios. Sheltered in the basement is an additional emergency radio studio for use in periods of crises. The 100 m^2 television studio (Fig. F-6) has a vision control-room and a sound control-room combined with a low reverberation radio studio for music and radio plays. The television production facilities also include videotape and film editing equipment. The studio has two Ikegami HL-79 cameras, one of which is also used for news gathering outside the studio (Fig. F-7). There is a 10-input CDL vision

Figure F-5. Vibration of the masts and guys are continuously monitored by automatic logging equipment.

Figure F-6. Kuopio Regional Center has a 100 m² television studio using EFP cameras.

mixer, and the lighting is controlled by a 30-circuit YLE/Strömberg control system.

Two Sony BVU-100s are used for mobile recording, and two Sony BVU-200 Ps for studio recording and editing. A Sony BVE-500 ACE is used for editing control and a Microtime 2080 timebase corrector for transmissions.

Commercial Television

In March 1981, a final agreement was reached. It granted MTV permission to broadcast news for a test period of two years, beginning in September 1981. Recruitment of news department personnel and technical operators was started immediately, after which the total number of MTV employees rose to 660. Studio M 4, which began operation in June 1980, had been planned to serve as a news studio, but at that time it lacked equipment specially designed for that purpose. In 1981 the required equipment had been acquired including a Chyron IV Graphic Generator, a Quantel 5001+ connected to the Ampex Mixer, prompting equipment, and extended monitoring facilities. A specially built news room near the studio contains a comprehensive line of monitoring facilities as well as intercom.

Two ENG Groups, established to operate in the Helsinki area, use Toyota Landcruisers equipped with Sony BVP-330P cameras, and BVU-50P and BVU-110P Highbank U-matic Recorders. To collect news items throughout Finland, contracts were signed with independent producers in 11 towns. These operate mainly with films. The film is transported every evening to MTV, Helsinki, for processing and editing. The Highband U-matic material coming from the Helsinki area is edited from Highbank U-matic to C-format, by using two edge editing systems with Sony BVH-1100 APS recorders (Fig. F-8). The same machines are also used for transmission.

For international material, contracts were signed with news agencies to receive their news bulletins every day, using Intelsat satellite and Tanum land station. A computer-based information system was also established in conjunction with the news department.

After an intensive training period from the beginning of June to the beginning of August, rehearsals started August 10. The news was prepared every evening in the normal way, but not broadcast. The real service started September 1 as planned. Simultaneously, with the preparations for the news in spring, a Rank Cintel Mark III telecine was put into operation, and preparations in the VTR area were made for installation of a new editing system (CMX 340) (Fig. F-9). The system uses two BVH-1100 APS 1-in machines for playback and one for recording. The CMX 340 also controls a Grass Valley 1600-IX mixer to which the Quantel 5001+ is also connected. In the editing suite, there is also a caption camera and control facilities for a Chyron IV Graphic Generator.

During the year, plans were made for the fourth construction phase of the company's premises. When this phase is completed, at the end of 1982, the total floor area of the building will be about 30,000 m².

The company offers technical consultancy on the planning and installation of broadcasting facilities, and obtained new projects in the Middle East from Damascus and from Tripoli. The work in Baghdad, which started in 1978, is coming to completion during the first part of 1982.

Figure F-7. The Kuopio ENG group in operation.

Cable Television

The private cable television company, Helsinki Television (*SMPTE JOURNAL*, p. 341, May 1980) is still expanding its network. At the end of 1981, after six years' operation, 74,000 homes were connected to the system with some 390 km of trunk and feeder cable and 1,150 km of distribution cable. It is estimated that at the end of 1982, the network will serve nearly 70 percent of the households in the area.

The company's own production has been nearly given up, and the television studio and outside broadcast facilities are used for commercial video production. The Helsinki channel transmits mainly series programs for about six hours per week. The information channel still presents program news and other topical information as well as music, for 24 hours a day. The most important is the entertainment channel, which is a subscription channel transmitting over 100 hours a month. There were 12,500 subscribers at the end of 1981.

Besides these three channels, the network conveys YLE's television programs, a received Estonian television channel from the Soviet Union, and five YLE FM radio programs. The full capacity of the system is 12 television channels and 20 radio channels.

There have been changes among the shareholders. Sanoma Corporation, the biggest newspaper publisher in Finland, which also owns a great part of the videotex company Telset, now holds 79 percent of the shares. The company policy has also been changed. The cable network is now mainly a distribution system which is commercially available to any interested parties. The main program activity is pay television in the subscription channel.

Teletext and Videotex

YLE has transmitted test pages since

Figure F-8. News editing suites using edge editing systems.

Figure F-9. CMX 340 editing system.

early in 1977. Regular teletext program transmissions began in October 1981. The UK-teletext system with the Finnish/Swedish character set is in use (Fig. F-10).

At the end of 1981 there were five magazines on the air, totalling about 100 to 170 pages. Two lines per field were used (lines 17 and 18 plus equivalent lines 330 and 331), and pages were transmitted by both YLE networks, TV 1 and TV 2. Two languages, Finnish and Swedish, were used. Only information pages were edited. Sub-titling for the hearing-impaired and for translations in Finnish and Swedish are planned to commence in the fall of 1982. Finnish radio manufacturers have produced teletext receivers for export since 1977. In the fall of 1981, 11,000 receivers were sold in Finland.

The equipment used for editing teletext pages consists of a Digital Equipment Corporation PDP 11/34 computer, Aston TCG3 Teletext Character Generators (editing terminals), and an Aston Teletext Graphics Unit. New private videotex services have been opened. Besides Helsinki Telset (*SMPTE JOURNAL*, p. 342, May 1980), by the end of 1981 there were videotex services in Turku and Tampere. Three more services were being installed at Jyväskylä, Lahti, and Vaasa. Besides these, trial service, using the equipment of Helsinki Telset, is going on in Kotka, Joensuu, Kajaani, and Kuopio.

Motion Pictures

The mass-production era in the Finnish motion picture industry ground down to a standstill at the end of the 1950's. The advent of television had an adverse effect on film production and threatened to wreck the whole motion picture industry. During the 1960's, box office ticket sales dropped to the minimum and many cinemas were closed.

At present, the situation is somewhat better. Public aid for Finnish film production has increased considerably in the last few years; however, the part played by public financing is less in Finland than in other Nordic countries.

The number of cinemas has increased during recent years, beginning in 1977; since then the number has increased from 309 theaters in 1976 to 360 theaters at the end of 1981. In 1981, eight new cinemas were opened, mainly due to the trend toward multicinemas. With several small theaters in the same building, it is easier to keep costs down. Savings on equipment and staff are possible in a multicinema, and there is an additional advantage in that good films can be run for a small audience.

There has also been a slight increase in film production. Eleven feature films were made in 1981. The main production items, however, were about 1,000 commercials for television and about 150 for cinemas. There were also a great number of sponsored 16-mm films for commerce and industry. Filming is done mainly in 16 mm, even for many features. Thus lighter equipment can be used, and savings achieved in material, transportation, and personnel costs.

The big motion-picture production companies have vanished, but there are about 25 small, feature-film producers, a half-dozen of which are continuously active. There are about 30 short-film producers. The old film studios have been closed, and shooting is mainly done on location. The Finnish Film Foundation, a national institution for the promotion of Finnish motion pictures, is planning a new production center. Negotiations are going on with the city of Helsinki for a suitable site.

Figure F-10. Staff at YLE. UK telext system with Finnish/Swedish characters in use.

France

Motion Pictures

In France, theater attendance, which has been stable during the last three years, is expected to reach 180 million in 1981, i.e. an increase of approximately 10 percent compared to 1980.

There are 4,540 theaters for 35-mm film, with a total of 1,408,835 seats. These theaters were supplied with 694 feature films in 1981. French productions numbered 201, coproductions 37, U.S. productions 135, Italian productions 55, U.K. productions 26, and others 240.

In 1980, 189 feature films were shot in France; 55 of these were coproductions.

The films are produced, distributed and released through Industries Techniques, the Federation of Motion Picture Technical Industries, usually located in the Paris area. The raw stock used is French, Belgian, Japanese, or American. Some equipment is imported and some is manufactured in France.

Recent developments include the 16-mm animation bench manufactured by Atlas. Its compound table moves at a speed of 0.035 mm to 7.5 mm per second, with a precision tolerance of 1 percent in the moving constancy, regardless of the angles or speeds required.

The Picot 2000 recorder made by the firm Fougerolle (Picot Division) features up-to-date technology and excellent performance. Features include sprocketless monocapstan tape drive without pinch roller, and a built-in digital memory of position error which keeps the tape aligned on pilot regardless of operating conditions. It permits operations such as moving frames manually on any machine to align it on other machines. In 16 mm the nominal unwinding speed can be increased by 30 times. The Picot 2000 accepts both 16-mm

and 35-mm large capacity tapes (1,800 meters or 5,900 feet). It takes only a few seconds to change the head unit and core holders to switch from one format to the other.

Other developments include IDEF's HG 4502 C unwinder (capacity 4,500 meters or 14,750 feet), and its "Plateau 5000", and the traveling motion picture theater, with 110 seats, manufactured by Cinemobil.

Brandt Frères (Beaulieu), which specializes in super 8, introduced the 6008 S and 6008 Pro Cameras (200 foot magazines) and the super 8 708 EL Stereo High Power Lamp Projector housing an Osram HTI 250 W lamp, with a color temperature close to 5500°K).

The Aäton 16-mm camera, model 7 LTR, has a noise level below 26 dB; its patented claw movement guarantees image positioning stability up to 1/2000 of frame height. Depending upon the editing methods of the user, the 7 LTR's time processor exposes time addresses onto the film edge; it can be CTR (Clear Time Recording) or IRT/TDF binary code bars (4 bits per frame), or SMPTE binary code modulation.

The Debrie continuous daylight printer, model TCOE 16/16, with total immersion of the original, is designed to print preselected scenes of a film. The automatic selection of the scenes to be printed is controlled by an 8-channel program tape, which also controls the light changes and the fades. This printer is equipped with an additive lamphouse. The light changes can be initiated by the Debrie FCC (Frames Count Cueing) either on a separate tape or on a composite tape, together with light and fade information. All the program tape instructions are recorded and stored into memory before printing.

The new Debrie TAI optical printer is designed for reduction of 35mm to 16mm. Its main characteristics are: both original and print films are driven by intermittent mechanism with claws and registration pins; total immersion of the original, and an additive lamphouse.

Television

The number of TV sets registered in France on January 1, 1981, was 8,347,881 black-and-white and 7,474,503 color. The French company Thomson-CSF is now a main supplier of systems and equipment to the French radio and TV broadcasting authorities as well as to private audio and video companies. In 1981, Thomson CSF's sales figures reached 24 billion francs, 48 percent of this figure being for export. Its radio and TV division specialized in both studio and news equipments, broadcasting and transmitting systems.

Thomson CSF has exported to many countries, including Greece, Belgium, U.K., Hungary, USSR, the Middle East, Africa, Southeast Asia, and Latin America during the past two years.

Among the four types of vehicles fitted by Thomson CSF is the four-wheel drive OB vehicle, designed for production and broadcasting of TV programs in any part of a country. This vehicle, equipped in SECAM, PAL, or NTSC with two or three color cameras, is completely self sufficient and contains power generation, program production and recording (video tape recorders), transmission (microwave link), and reception (telescopic mast).

It can move on any road or track. Another, larger vehicle, with five or six color cameras, is provided with equipment to permit coverage of practically any type of program, from live coverage of sport events and theatrical performances, up to the production of complex programs, with mixing of live and recorded sequences. One or two satellite vehicles, with two or three cameras, can be associated with this master vehicle.

In the Thomson CSF color camera family are Microcam cameras which are light and easy to operate, the TTV 1603, TTV 1603 F, and TTV 1604. These are mainly intended for ENG; however, by adding a few optional devices, they can be used for EFP or studio production. At the top of the range, the new computerized TTV 1525 camera has extremely high sensitivity and low lag due to its unconventional optical system and hybrid tube configuration. It was successfully presented at various 1981 TV exhibitions. The less sophisticated TTV 1650 camera, equipped with three ⅔-in pickup tubes and driven by a conventional control unit, is designed for a wide variety of TV applications.

The TTV 2610 telecine chain allows TV signal origination from normal or CinemaScope 16-mm film and from 24 × 36-mm slides; it consists of a single cabinet supporting the picture sources (16-mm and slide projectors), optical multiplexer, the camera, and housing for the electronic units and control panel.

The TTV 2530 35-mm color flying spot telecine (or dual format 35/16 mm) is specially designed for high-quality broadcasting use, either as program origination equipment or as production equipment for direct reproduction of negative films, electronic editing, etc. It can also be used in film laboratories for timing, negative film checking, and density checking. This equipment produces the four RGBY signals from a 35-mm telecine (or 35mm and 16mm for the dual format version). These signals, fully corrected, are ready for use either locally or on the air after encoding. Provision is made for coupling to another telecine to permit manual or automatic changeover via a changeover switching unit. It can be remotely controlled from a separate control unit comprising all the operational adjustments.

The TTV 7630 P PAL encoder produces an encoded composite signal meeting the PAL specifications, either from the RGB primaries or YRGB. Driven by an internal synchro generator, it can be locked either on a composite video signal or on a mixed sync signal and a burst-carrying signal plus a 4.43 MHz subcarrier signal, or on a composite SBU 2 signal.

The TTV 7630 S is the SECAM version of the same high quality level encoder. The TTV 7610 SECAM or PAL precision decoder Serie has been specially designed for recoding and transcoding applications. The TTV Composite SECAM synchronizer could be used optionally as a time base corrector. It operates on composite SECAM or black-and-white signals and delivers an "encoded black" when no signal is applied to the input.

The TTV 5305 special effect frame memory provides still picture, off centering and reversing, aspect ratio alternation, and zooming. All these functions can be programmed.

In 1981, in France public ownership of videotape recorders amounted to 350,000 units. Some motion picture laboratories have created a department for reproducing films on video cassettes (VHS, and very recently V 2000). Their transfer capacity, estimated at 30,000 cassettes per month, is expected to be doubled in 1982.

India

Motion Pictures

1981 has been a milestone in the history of the Indian cinema, marking 50 years of sound motion pictures. Impressive golden jubilee celebrations took place at the film industry's important centers, Bombay, Madras and Calcutta. Spadework for this was done by the Indian Academy of Motion Picture Arts & Sciences, which was founded on March 14, 1981, exactly 50 years after the release of India's first "talkie," *Alam Ara*.

The number of feature films censored during 1981 showed a small drop compared to 1980 — 737 in 1981 and 742 in 1980 — but the number of color features increased to become 90% of the total production.

Other developments in 1981 included the Vijaya Color Laboratory, a new and very modern processing outfit in Madras, equipped with three demand drive processing machines and two Bell & Howell Printers. The laboratory contains modern supporting equipment such as analyzers, ultrasonic cleaners and other control equipment.

The 16-mm Arc Standard Professional Projector was developed by Mr. A. Majid of Samraz Educational Aids, Madras. The projector was designed and made in India. The main features include Geneva movement, 4000-ft loading, torque motor takeup, force feed lubrication, direct couple motor drive, conical shutter, and a built-in

30-W amplifier. A 1,000-W xenon lamp is optional. Commercial production of this projector will be on a very small scale — about 10 projectors a month.

Television

Two major developments in television are expected in 1982. The first is the introduction of color in television coverage commencing with the Asian Games to be held in November 1982, and the second is the launching of the Indian National Satellite (INSAT-1) with direct television broadcasting capability.

Doordarshan, India's television organization, acquired four mobile color television vans, each equipped with color TV cameras, microphones, vision and sound mixers and a microwave link to hook the outside broadcast location with the stationary transmitter. Also acquired were 1-in helical scan color videotape recorders employing the B format and consistent with the CCIR system B standard adopted for black-and-white television. Doordarshan has decided on the PAL color system. The equipment will be utilized for providing color television coverage of the Asian Games. On the conclusion of the Games, the vans will be located at major centers at Delhi, Bombay, Calcutta and Madras to provide color TV for the first time.

The other major development is in the area of satellite broadcasting. The Satellite Instructional Television Experiment (SITE) conducted in 1975/76 with the help of the National Aeronautics and Space Administration, U.S., and the experience gained therefrom, have encouraged the Indian Government to utilize the space segment of the Indian National Satellite to bring television to remote rural areas.

INSAT-1, to be launched in April 1982, was readied for service in June 1981. It will have two TV transponders. Doordarshan has undertaken an ambitious project to provide direct satellite service to remote regions which have remained beyond the reach of the existing communication facilities, and where large sections of India's population are practically deprived of information, instruction or entertainment. For this purpose, Doordarshan is organizing base production centers at strategic locations, up-linking facilities from main as well as transportable earth stations and direct satellite receiving stations at various centers.

Doordarshan also has plans for networking its regional TV centers via the satellite for providing its viewers with programs of national importance. All this is, of course, in addition to what has been envisaged for India's television network during the Government's sixth five-year plan whereby the TV coverage will be almost doubled by 1985 when a number of TV production centers, transmitters, and relay stations will have been installed.

Indian Space Research Organization (ISRO)

The Video And Image Processing Engineering Division of the Space Applications Centre (ISRO) developed video equipment and systems for broadcast and non-broadcast applications. A group of 15 engineers, headed by Mr. G. C. Jain, has been working for five years on several video R & D projects. The equipment and systems developed have been used in several of ISRO's projects including Satellite Instructional Television Experiment (SITE), Satellite Telecommunication Experiment Project (STE) and the Indian National Domestic Satellite Project (INSAT).

Some of the contributions made by this Group are: setting up program production facilities for SITE; installation of field recording vans for rural areas; providing consultancy to educational institutions in setting up low cost TV studio facilities; modifications and adaptation of video equipment for broadcast uses; and design and development of video and audio equipment including video distribution amplifiers, vertical interval and dc control switchers, video mixer/fader, special effect generators, processing amplifiers, equalizers, video and sync/blank mixers and several other systems; also, audio switchers/mixers, audio distribution amplifiers, audio mixing consoles, audio preamplifier, program and power amplifiers. Other equipment developed by the group includes sync pulse generators, pulse distribution amplifiers, pulse change-over units, pulse delay circuits, and digital time base correctors, with ±line delay.

The group also set up a large CCTV system for rocket launch. It is one of the largest CCTV systems in size and complexity in the country, using about twenty different types of CCTV cameras such as high resolution vidicon, low light level Nuvicon, and color TV cameras. These are geographically located in an area of 20 km.

A vertical interval video switching system used for selection of cameras from the control center is located 10 km from the launch pads where cameras are located. The system is designed for sync and non-sync signals. The camera switching command signals are digitally encoded, multiplexed and sent over a two-pair wire system using low data rate modems.

Video equalizers and video processing are used to equalize frequency response up to a distance of 17 km. Video processing with remote control is provided to correct video signal degradations.

R & D work on advanced digital video technology has been carried out and a number of systems were designed and developed. A digital television black-and-white compression system for the APPLE utilization project using Walsh Hadamard transform coding techniques was designed to broadcast TV pictures at 30 M/bit rate. A number of digital video frame stores were designed and developed for use in broadcast and image processing uses. All the frame stores can write data from CCTV or direct video data. Reading can be carried out at video rates.

A video baseband combiner and separator was designed and developed for combining video, audio and energy dispersal signals for transmission through satellite. This system meets CCIR-B and PAL color TV requirements. It is used for broadcasting TV signals and TV networking.

A slow scan TV system was designed and developed to allow transmission of still TV data at a bandwidth of 10 kHz. This would be used for tele-education and telemedicine experiments for the APPLE project.

A digital density slicer system for analysis and processing of earth resources and weather pictures was designed and developed. The system can accept data from a magnetic transport using CCTV, videotape recorder and TV camera. The system allows measurement of densities from 0-2.2D with a density resolution of 0.008D and has variable pitch and position in steps of 0.008D. A color encoding scheme is provided to select 16 different colors. A microprocessor is provided for measuring area of any of the color encoded regions. It also has several other facilities for manipulation and analysis of the data.

A system for analysis of weather pictures was also designed and developed. It is a microprocessor based video system having the facility for gamma enhancement, enlargement, annotation, thresholding, histogram generation and equalization. The system uses a video frame store, Z-80 microcomputer and other electronics for data processing.

Video rate image processing is a newly emerging field in which image data received from earth resources or weather satellites or even from a variety of other sensors is processed in real time. Data received are stored into a video frame store memory and displayed on a normal video monitor. High speed devices together with the video frame store are used for a variety of picture processing applications. In the interactive mode of the system, the operator can modify processing functions and verify the results until a routine is finalized.

A number of proposals have been made for R & D work on Video Technology and it is expected that work will start soon on the following: design and development of a variety of TV camera systems including CCD, Saticon and Plumbicon; color CCTV systems for scientific and industrial applications; digital broadcast TV systems; scan conversion system for universal applications; educational video systems; teletext and view data systems; video image processors for real time analysis of x-ray radiographs; and advanced TV tracking for satellite launch vehicles.

Japan

Motion Pictures

Fuji Photo Film Co. Ltd, developed Fujichrome R-25, an improved 8-mm color film. The film provides softer gradation from shadow to highlight with finer grain and better color stability.

Cameras

NAC Inc. developed a high speed camera called E-10 (Fig. J-1). It has a 16-mm multi-surfaced prism system and is capable of a maximum of 40,000 frames/sec. The camera consists of the camera body, a magazine and an electric controller. The film transport and the filming speed are electrically controlled.

The camera's optical system is composed of a photographic lens, a single lens reflex type finder using a half mirror, a condenser lens, a relay lens, and a prism. Either a four-surfaced, eight-surfaced or 16-surfaced prism can be used. Seventeen different rotary disk shutters are available. A "C" mount is used as the lens mount so special lenses can be used without an adaptor.

8-mm Cameras

The 8-mm camera industry in Japan has, for some time, been adversely affected by the growing demand for portable video cameras and VTRs, but in 1981, Elmo Co. developed the Elmo Superwide F 20S-XL

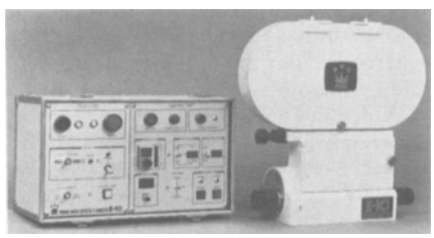

Figure J-1. E-10 highspeed camera (NAC Inc.).

Figure J-2. F 20S-XL 8-mm camera (Elmo Co. Ltd.).

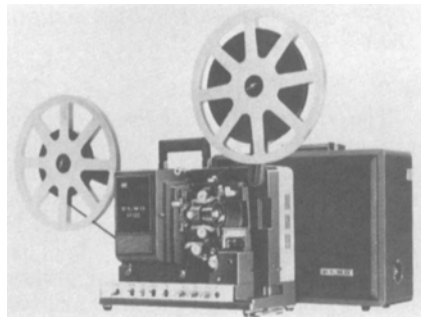

Figure J-3. XP-380 8-mm projector (Elmo Co. Ltd.).

Figure J-4. X-310 16-mm projector (Hokushin Precision Co. Ltd.).

(Fig. J-2) which is based on a new concept. The new camera differs from the conventional 8-mm camera in that it contains both a superwide lens with a focal length of 4.6 mm and a focus-free zoom lens (8.6, 18 mm $f/1.2$). A hinge placed on the exterior of the Superwide lens is used to swing the lens away from the camera. The mechanism obviates the inconvenience of mounting a zoom lens and taking it off the camera.

16-mm Projectors

The 16-mm projectors developed in Japan in 1981 are generally small in size and light in weight and have a light source providing a brilliant light. Efforts were made to achieve a design that would provide easier handling, better ability to project crisp, clear images upon large screens and better tone qualities in sound reproducing.

In 1981, Elmo Co. Ltd. developed the XP-380 projector (Fig. J-3). It employs a xenon lamp and incorporates an electric power source. The projector is contained in a small, lightweight kit. The xenon lamp becomes operative simultaneously with the starting of the projector. The sound system is modulated in the projector so that the system can correspond to the newly developed laser optical sound film.

Hokushin Precision Co. Ltd. developed a 16-mm xenon arc lamp projector X-310 (Fig. J-4). The xenon 300-W light source for the projector gives out 2,400 lux. The electric source is in the main body of the projector. Simpler film loading is assured by the SR loading system (developed by the company) which enables the operator to load a film in the projector merely by guding it along four rollers of the projector.

Laboratory Practices

Yokohama Cinema Laboratories developed a system for quality control of processing and printing using a low-cost computer (Fig. J-5). The system was described in a paper presented at the SMPTE's 123rd Technical Conference in Los Angeles ("Quality Control of Processing and Printing Using a Low Cost Computer").

The system is composed of an automatic densitometer and a microcomputer in combination. It may be applied not only to control of the developing process but also to the selection of the optimum printing steps for the printers and inspection of raw film.

Hooei Sangyo Co. Ltd. developed an electronically controlled additive color lamp system for an optical printer (Fig. J-6). Conventional light sources for the optical printers had possible defects such

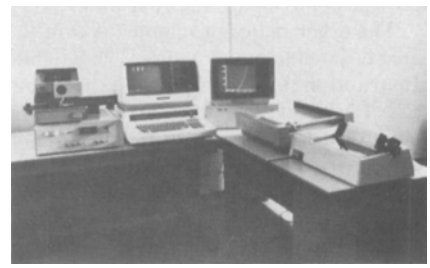

Figure J-5. Quality Control System (Yokohama Cinema Laboratories, Inc.).

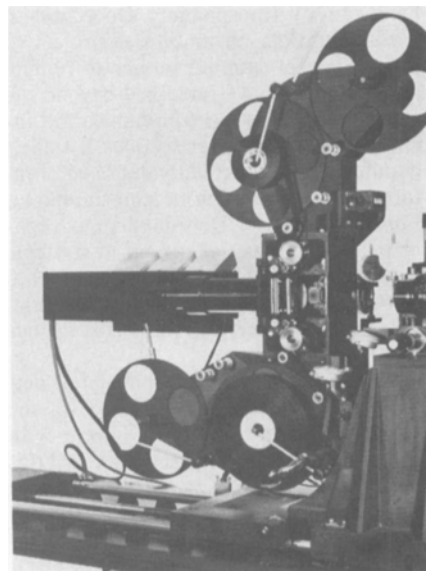

Figure J-6. An electronically controlled additive color lamp system for optical printers (Hooei Sangyo Co., Ltd.).

as lack of uniformity of the light and inconveniently placed controls. The newly developed light source utilizes three 500-W halogen lamps. Dichroic filters are used to separate blue, green and red lights. The separate lights are collected together randomly by glass fiber optics which obtain uniform brightness for each light. After passing through condenser lenses the lights are used for printing. A sensor is mounted on the end of each glass fiber and is connected to the central processor unit. Data obtained by means of the sensor are added to the film printing data obtained from the timer mounted on the exterior of the system. The data obtained are fed back to the lamps.

Lighting Equipment

Ryudensha Co. Ltd. developed the 2-kW effect spotlight. It uses a newly designed quartz-halogen lamp (Fig. J-7). The attachments to the existing 1-kW spotlight, for example, the machine and the front lens, can be accommodated on the new spotlight. The spotlight is available in five versions — 500 W, 1 kW, 2 kW, 5 kW, and 10 kW. These spotlights are interchangeable with pole-operated or manual types. The mono-pole suspension batten for lighting equipment is composed of a stainless steel pipe and a suspension wire. The suspension batten system provides safe operation and efficient performance.

Ryudensha also developed a portable lighting kit for location filming using the HMI 200-W lamp (Fig. J-8). Either a 24-V battery or or a 24-V dc power supply may be used. The kit can remain in continuous operation for four hours. A 30-m extension cable can be used for the maximum distance between the kit and power supply.

Fuji Telecasting Co. Ltd, installed new lighting equipment in their No. 6 Studio. Toshiba Equipment Corp. manufactured the equipment. The equipment consists of 450 lighting circuits which have cross connections to the control equipment of 110 channels. There is provision for 160 stored scenes into which 40 inserts can be made. Also included are two cross fader

Figure J-7. Spotlight, 2-kW effect (Ryudensha Co., Ltd.).

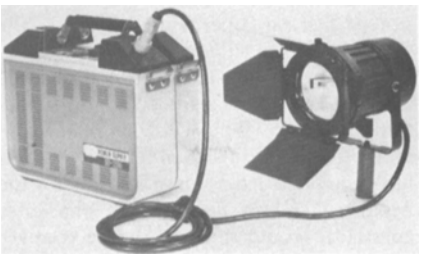

Figure J-8. HMI-200 W lighting kit (Ryudensha Co., Ltd.).

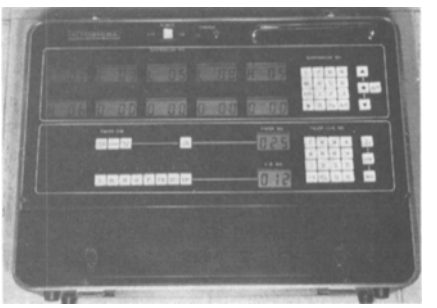

Figure J-9. Box of lighting control equipment (Fuji Telecasting Co. Ltd.).

systems for playback. In addition to normal operations conducted on the main control console, special operations can be achieved by wireless. Wireless control can be conducted from any place in the studio. A handy control box (Fig. J-9) provides up and down movement of the batten, on-off the load circuit, and various LED displays. The box controlling stage effect lighting can be used from any place in the studio.

Television

Networks and Households With TV Sets

Nippon Hoso Kyokai (Japan Broadcasting Corp.) is the sole public radio and television broadcasting system in Japan financed through receivers' fees. NHK broadcasts television programs in full color on its two nationwide networks and maintains, as of November 1981, the following television stations including transponders.

Network	Number of Stations	Air-Time (per day)
General	3,289	17 h 28 min
Educational	3,224	18 h 00 min

Together with NHK's television broadcasting service, every region in Japan is provided with commercial broadcasters operating on the basis of income from advertising through commercials. NHK and some commercial broadcasters regularly present sound multiplex television programs. There were 96 commercial broadcasting companies as of November 1981, operating 4,903 stations, including transponders.

Housholds with television receivers as of November 1981 numbered:

Black-and-white	2,712,337
Color	26,832,565
Total	29,544,902

Multichannel Sound Television Broadcasting

The multichannel sound television broadcasting, using the FM-FM multiplexing system developed by NHK, began in the fall of 1978 as a preliminary service by NHK and several commercial broadcasters in the Tokyo and Osaka areas. The multichannel sound television broadcasting service has since expanded rapidly.

As of December 1981, in the areas of Tokyo, Osaka, Nagoya, and other principal cities, NHK and 48 commercial broadcasting companies were producing and broadcasting multisound programs. Sixty main stations in the country transmit multichannel sound signals, providing a total coverage of about 27 million households (85% of the total number of households in Japan).

The services consist of stereophonic programs, bilingual motion pictures, and news. The total broadcast hours of multichannel broadcasting are different at each station. The mean service hours are 15 hours a week at NHK and 14 hours at commercial broadcasting companies.

From the start of the multichannel sound broadcasting services to October 1981, about 4.2 million multichannel sound receivers had been shipped from the manufacturers to the distributors.

Satellite Broadcasting

Experiments related to television transmission, radio wave propagation, and performance of bus equipment of the Medium-Scale Broadcasting Satellite for Experimental Purpose (BSE), launched in April 1978, have been carried out successfully by the Radio Research Laboratories (RRL) of the Ministry of Posts and Telecommunications and Nippon Hoso Kyokai (NHK), in cooperation with the National Space Development Agency (NASDA) of Japan. But, unfortunately, almost all the experiments related to the mission equipment could not be conducted because of malfunction of the transponder's output stage amplifier, which occurred in June 1980. Since that time, experiments have been limited to portions partially related to the transponder, propagation of beacon wave, and characteristics of the bus equipment, and these tests continued during 1981. The designated three-year life of the BSE was reached in July 1981, but the experiments will be continued to March 1982.

With regard to the Broadcasting Satellite BS-2 for operational purpose following the BSE project, the BS-2a satellite is planned to be launched in the winter of 1984 and the BS-2b in the summer of 1985. The development of the satellites and

preparation for terrestrial facilities are being carried out smoothly. The weight and dimensions of the BS-2 are almost the same as those of the BSE; one satellite has the ability to transmit two channels of 100 W. For the down-link, channel 11 and channel 15, which were allocated by WARC-BS, will be used. A shaped-beam will be used for covering the whole territory of Japan, and the side-lobe levels and cross-polarization level will conform to the technical standards of WARC-BS. The signal for each channel is expected to be an FM wave of the 525-line NTSC TV and two sound channels, and studies of its transmission parameters have been continued from last year. In addition, effort has been placed on integration and non-adjustment circuitries to reduce the cost of home receivers.

Teletext for Ideographic Information

Since 1972, NHK and the Asahi Broadcasting Corporation 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. In March 1981, the Radio Technical Council (Advisory Committee of the Ministry of Posts and Telecommunications) recommended technical standards for the Japanese teletext system to the Minister.

The principal parameters for the standards are: (1) the pattern transmission method; (2) a transmission bit rate of 5.73 Mbit/s (8/5 fsc); (3) types of display mode — page display, superimposed display, subtitle, vertical scroll display, and horizontal scroll display; (4) a text format of 15 characters in 8 rows for standard-size characters, and 31 characters in 16 rows for smaller characters; (5) 248 × 192 dots for graphics; and (6) 8 colors, flashing and concealing.

In 1981, NHK developed equipment for program editing and transmission, and a decoder and receiver. It also developed caption-producing equipment for the deaf (Fig. J-10) and a regeneration repeater for teletext network used at local stations. The Ministry of Posts and Telecommunications is amending the Radio Regulation and relative laws for starting practical operation of the teletext. NHK and other commercial broadcasting companies are also preparing an operation test of the system.

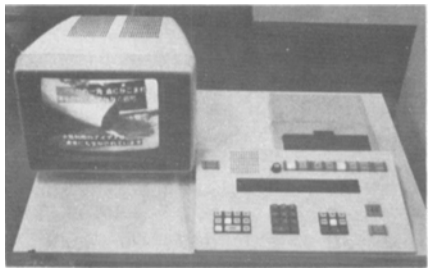

Figure J-10. Time code inserter for caption production of teletext (NHK).

In Japan, thousands of complicated Chinese characters are used in addition to the Japanese. 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 1981, NHK improved the experimental system using the code transmission method by adding new functions, such as vertical writing suitable for Japanese sentences: DRCS (Dynamically Redefinable Character Set) for fine graphic display, synthetic sound for background music and notice chime, and 2 and 4 times character display in a page.

In this system, the receiver is equipped with a character generator that has about 3,400 characters. It can receive the teletext signals of both pattern and code transmission methods because the fundamental signal format and the data packet format are the same for both transmission methods.

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

The Radio Technical Council also started discussion on the technical standards of the teletext system using code transmission methods.

In the fall of 1981, field tests were conducted in order to get information about available lines in the field blanking interval for digital data signals transmission. The results show that the 15th to the 21st lines can be used at present, and the 10th to the 21st lines a few years from now.

Videotex, a character and graphics information system which transmits information through public telephone lines, has been developed by the Ministry of Posts and Telecommunications and the Nippon Telephone and Telegraph Public Corporation. It is called the Captain System. The primary operation test was completed in March 1980. The second operation, started in August 1981, on the results of the primary test, is being conducted using about 1,200 households and 300 offices as monitors. More than 200 organizations such as newspaper companies, publishing companies, and department stores are participating as information providers. In October 1981, about 140,000 information pages were stored, aiming for 200,000 pages. The Captain System utilizes the pattern-transmission method and the same display formats as that of the Japanese teletext system. It is planned to put this system into practical service in 1983.

In the Captain System, an experimental system using a coded transmission method was developed in the middle of 1981. The system adopts the pattern-transmission method for graphics and coded transmission for characters. The system was proposed at CCITT and presented at Viewdata '81, held in London.

In NHK Broadcasting Science Research Laboratories, researches into the relation between visual function and image quality of CRT display and pattern recognition mechanism are carried out. The problems of letter recognition are studied. It was discovered, for example, that the span for letters to be read with brief exposure (less than one second) is limited to between two and five letters, also that it takes more than one second to understand a Japanese sentence averaging about 13 characters, and in understanding a Japanese sentence, there is no difference between sentences written vertically and horizontally.

Emergency Alert Broadcasting System

An emergency alert broadcasting system is a system that provides important and urgent information, such as predictions of disastrous earthquakes or tidal wave warnings, through conventional broadcasting media. The system transmits a signal before the beginning of an emergency broadcast program warning of a disaster, and it automatically actuates an alert receiver so that an alarm sound will be emitted from the loudspeaker to call attention to the program. Various systems and equipment have been proposed and developed since 1965. In 1980, systems were proposed by NHK (Japan Broadcasting Corp.), NTV (Nippon Television Co.), TBS (Tokyo Broadcasting System), and Kokusai Electric Co., and in 1981 the Basic Principles of Emergency Alert Broadcasting Signal were approved by the Radio Technical Council. Some of the principles are: (1) the signal should be used on every television broadcasting, standard radio broadcasting, short wave broadcasting, and FM broadcasting of VHF; (2) the signal should be composed of the digital code of FSK; (3) the signal should be audio transmission frequency.

Tentative technical standards for the alert broadcasting system were set in March 1981.

NHK and seven commercial broadcasters (TBS, Bunka Broadcasting Corp., Nippon Broadcasting Corp., Nippon Shortwave Broadcasting Co., Shizuoka Broadcasting Co., Chubu Nippon Broadcasting Co., and Sanyo Broadcasting Co.)

conducted field tests through TV and radio broadcasts August to October, 1981. The results of the tests showed almost perfect reception of the signal at any place in the service area with a 15-sec signal. The only problem was severe beat interference with MF wave from a foreign country.

High-Definition Television

Many people talk seriously about High-Definition Television (HD-TV). The question, "how much do we have to compromise the HD-TV system in order for it to be broadcastable?" reflects a concern that many broadcasters had. Considerable effort has been made towards the realization of the HD-TV System.

NHK developed HD-TV equipment with 1,125 scanning-lines in 1980 — experimental cameras, 70-mm telecine devices, color signal encoders, wide-bandwidth FM modulator and demodulator, wide-screen displays and portable receivers for receiving transmission test signals, and other equipment.

This equipment, except for the 70-mm laser telecine, was demonstrated for the first time in the United States at the SMPTE International Television Conference held at San Francisco in February, 1981. Many people who saw the demonstration showed great interest in the HD-TV system. Not only people in broadcasting but also people in cinema paid attention to this system, and they thought of the HD-TV system as the developmental results of modern television engineering and also as a kind of a new business in the near future. In August in 1981, this equipment was used for the first time in Japan, on a trial basis, for the origination of sports-events programs outside the studio (Fig. J-11). The system worked satisfactorily. The pictures were superior to conventional television especially and, with stereo sound, the sensation of reality was very impressive.

In addition to the equipment mentioned above, the experimental VTR and the experimental time base corrector (TBC) were developed by NHK and Sony during 1981.

NHK's system is as follows: the mechanical system is the modified 1-in type C machine. Rotating speed of the head drum is doubled and tape speed is increased to four times that of a standard 1-in type C machine, to record highband HD-TV signals.

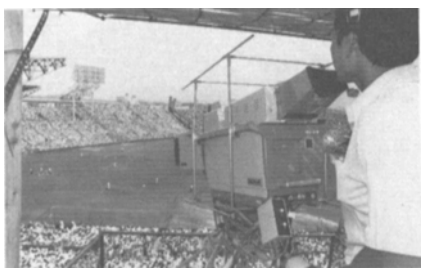

Figure J-11. View of field pickup by HD-TV camera (NHK).

If a chrominance signal is multiplexed with a luminance signal in the high-frequency region, the chrominance signal suffers from a triangular noise by FM recording. For this reason the NHK VTR adopts a Y/C separate recording system in which a luminance signal and a line-alternate chrominance signal are recorded into two individual channels.

The double rotating speed of the video head drum produces a head blanking interval in the center of a picture frame. Since the rotating speed of the drum is 120 r/sec and the field frequency of the HD-TV signal is 60 Hz, a half-field picture is recorded for one rotation of the drum. Thus, the head blanking interval is produced in the vertical blanking interval and in the center of a picture frame. To remove the head blanking interval from the center of a picture, it is necessary to shift the video signals in a vertical direction.

The vertical blanking interval of the HD-TV signal is 40 lines. In the recording process, the lower half of the picture is delayed 20 lines and the upper half is passed through. In the playback period, the upper half of the picture is delayed 20 lines and is added to the lower half. This measure for the head blanking is called "time base shift processing" and is done in TBC.

The playback signals from the VTR have a large time base error, called "skew," after the head blanking interval. For this time base error correction, the clock generator with a feed-back technique, such as a phase locked loop (PLL), has a disadvantage. So a new TBC with a feed-forward system without PLL has been developed. The clock can be nonlocked with the horizontal sync pulse, and a stable crystal oscillator can be used and a quick time base error correction is obtained as soon as video signals are received.

In recording input video signals are converted into 8 bits digital codes of 45.6 MHz sampling frequency and the video signals are processed so that the lower half of the picture is delayed 20 lines by the time base shift. The video signals are added with sync pulses, burst signals, and pedestal signals, and are converted into analog signals which are recorded by the VTR, reproducing high quality pictures.

Research for the HD-TV camera and improvement of picture quality has been going on at NHK.

In order to make the signal-to-noise ratio better, the newly developed 1-in Saticon® is used. It employs low-output capacitance with signal pin lead, newly developed low-lag Saticon layer of the second generation, and diode-operation impregnated-cathode. Signal take-out from pin lead on the faceplate halves the output capacitance of target to all other electrodes, enabling the camera to provide an improved SNR. Direct interelectrode capacitance between target and all other electrodes is only 1.8 pF, and SNR has been improved by 5 dB or more.

Figure J-12. Color camera, color monitor, projector, VTR and other equipment for HD-TV (Sony).

Fundamental research for high-definition picture quality has been carried on. For example, the simulation system for high-definition TV has been developed. This simulator employs a frame store for the still picture memory and the microcomputer system for signal processing.

Sony also developed the high-definition television camera and monitor in addition to the VTR (Fig. J-12). They follow NHK's provisional standards except for aspect ratio. Sony's aspect ratio is 4:3, which is an easier system then NHK's.

Digital Television Standards

Subjective tests have been carried out at NHK for establishing bandwidth and sampling parameters for digital television component coding.

The results obtained so far were as follows, and most of them were reported to CCIR[1]:

(1) A luminance-signal bandwidth of 5.6 MHz and a color-difference-signal bandwidth of 2.8 MHz were suitable for 525-line systems. The mean degradation in picture quality of band-limited signals to the quality of the camera output signals was less than 0.5 grade on a five grade impairment scale.

(2) A luminance-signal sampling frequency of 13.5 MHz or more, and 4:2:2 member of coding family were acceptable for digital coding standards for studio equipment. The tests covered luminance-signal sampling rates from 12 MHz to 14.3 MHz and family members of 4:4:4, 4:2:2, and 4:1:1. The difference in picture quality between the sampling frequencies of 14.3 and 13.5 MHz was 0.1 grade, and the difference between 13.5 and 12 MHz was 0.4 grade. With regard to the coding member, the difference between 4:4:4 and 4:2:2 was 0.1 grade, and the difference between 4:2:2 and 4:1:1 members was 0.5 grade. The tests also included digital chromakey (colormatte). The quality of the chromakey picture was 0.5 grade lower in average than that of the one analog-digital conversion. The major cause of the deterioration was an edge effect around the foreground picture.[2]

The test equipment for the subjective tests on the sampling frequency had functions such as switching, mixing, and chromakey necessary for a television studio. Features include:[3]

(1) The bandwidth of color-difference signals were limited by digital filters placed after A/D converters. The overshoot of unit-step response of the filters was limited to 2.5%, which was chosen from subjective tests.

(2) High-order digital filters having 83 taps were used for interpolation of color-difference signals.

(3) For a signal source, a facsimile-type film scanner was used together with a studio camera. The output signals from the 8 × 10-in color slide scanner were converted to real-time television signals with a frame store.

(4) Digital chromakey was performed by linear switching of the foreground and background signals. Further work is now being done to improve the chromakey picture quality.

Broadcasting and Production Equipment

Trends of Development in Video Equipment

Improvements were achieved in the picture quality and operation of studio, outside broadcast and handheld cameras. In addition, a new system incorporating functions of camera and VTR, a high latitude camera, and a good low noise FET for head amplifiers was developed.

For studio and outside broadcasting cameras, the usefulness of cameras equipped with auto-setup functions using a microcomputer has been recognized, and their use is tending to increase steadily. For example, there are HK-357B from Ikegami Tsushinki Co., Ltd., SK-100A from Hitachi Denshi Co., Ltd., and PK-40B from Toshiba Corp.

The performance of handheld cameras for ENG and EFP has been upgraded, and the limits of performance of 3-tube type cameras for SNR and resolution have been extended, and compactness and weight have been improved. For example, the specifications for the HL-83 of Ikegami Tsushinki Co., Ltd. are: weight 3.9 kg (lens and VF excluded), power consumption 16 W, SNR 56 dB.

A low noise FET called 2SK316, for head-amplifiers, was developed by Matsushita Industrial Co., Ltd.

Single Tube Camera

In the spring of 1981, NHK in collaboration with Sony Corp. developed a compact, lightweight single-tube camera for ENG, the Saticon Trinicon, with high picture quality and excellent color reproduction (Fig. J-13). In this tube color-stripe filters, electronic index-electrodes, and a photoconductive layer are arranged inside the face-plate. From the electronic index-electrodes applied with alternating voltage, an output current with index-signal multiplexed on RGB dots sequential signal is obtained. Then, the index signal is separated by using the vertical correlation, and the color difference signal is extracted from it by using the synchronous detection method. The pickup tube is a $\frac{2}{3}$-in MF (Mixed Field) Saticon. With this pickup tube the color shading performance is much better because of the improvement of peripheral resolution and geometric distortion. In the color-stripe filter the width of one group of RGB is 27 μm; 320 of these groups are arranged in the horizontal direction, and the color carrier frequency is 6 MHz. The weight of the camera, including view finder and lens with zoom ratio 10:1, is 4.5 kg; dimensions of the camera head are 290 mm (length) × 120 mm (height) × 90 mm (width); and power consumption is dc 12 W. The sensitivity is $f/4$ (2000 lux); horizontal resolution, 390 TV-lines; SNR of luminance signal, 50 dB.

Figure J-13. Single tube color camera (NHK).

High Latitude Camera

The dynamic range of conventional TV cameras is between 200 and 500% with 100% white and the signal components exceeding this range are clipped. For this reason, if a person were standing in front of open sky or a window, and the iris was adjusted to the person, the tone of the sky or background would be overexposed. Conversely, if the iris value was adjusted for the light background, the face of the person would become too dark.

In the high latitude camera, a signal-compressing circuit (knee slope circuit) is placed immediately after the preamplifier, and the compression rate (slope) will vary in accordance with the peak light input level to compress the high-light signal over a wide range in an effective manner. By use of such automatic variable compressing circuit and automatic beam optimizer (ABO) circuit together, a signal component up to about 1600 percent (16 times) can be dealt with effectively, and the high-contrast scene can have a natural appearance.

This signal processing circuit was developed by NHK, and it is already adopted in various TV cameras in Japan and the United States.

ENG Camera Incorporating VTR

In 1980 an experimental device for home use incorporating a camera and VTR in one unit was announced. In 1981 ENG cameras incorporating a VTR were announced by two companies. The unit uses a $\frac{1}{2}$-in cassette for home use VTRs.

The equipment (Fig. J-14) jointly developed by Matsushita Electric Industrial Co., Ltd. and RCA weighs 10 kg (with lens and battery), and the power consumption is 26 W. The camera portion contains three $\frac{2}{3}$-in Plumbicons. The VTR portion uses a VHS cassette, and the maximum recording time is 20 min at 20.45 cm/sec tape speed.

The equipment (Fig. J-15) developed by Sony Corp. in cooperation with NHK weighs about 7 kg (with lens and battery), and the power consumption is 15 W. The camera portion contains one $\frac{2}{3}$-in high-band Saticon Trinicon. The VTR portion employs a Beta-cassette, and the maximum recording time is 20 min.

General Purpose Compact Time Base Corrector

Diversification of VTRs for broadcast and production use is progressing. The 2-in quad VTR, the 1-in helical VTR, and the $\frac{3}{4}$-in U-format VTR are the most used formats. A time base corrector (TBC) is essential to compensate for the time base error of these VTRs for broadcast quality. As the methods of correction for each VTR mentioned above are slightly different, the

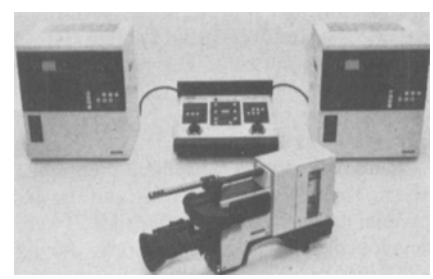

Figure J-14. ENG camera incorporating VTR and editing equipment. (Matsushita Electric and RCA).

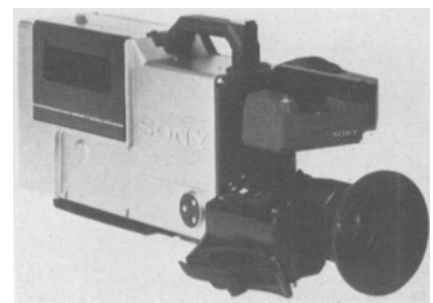

Figure J-15. ENG camera incorporating VTR (Sony).

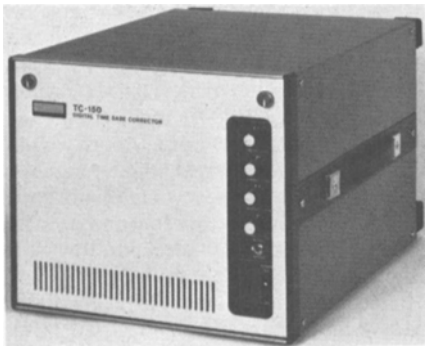

Figure J-16. Compact time base corrector.

conventional TBC is not always suitable for all.

Hitachi Denshi Co., Ltd. in cooperation with NHK, developed a TBC (Fig. J-16), having general purpose characteristics applicable to above VTRs. As the equipment is compact and lightweight (16 kg), it is useful outdoors. The sampling rate of signal is 14.3 MHz, the quantisizing level is 8 bits, and the correction window is 4-lines p-p.

Noise Reducer

The effect of the noise reducer now being used is minimal in pictures with movements. This is because, in pictures with movements, the correlation between frames is low. Therefore, if integration is performed in the time-axis direction to suppress the noise sufficiently, the picture becomes blurred. Accordingly, it has the disadvantage that sufficient noise reduction cannot be provided for the moving portion of pictures.

To eliminate this defect, a system with functions to compensate for movement was developed and demonstrated at the open-house of NHK Laboratories in June 1981. The features of this system are shown in Fig. J-17; feedback is applied to the input signal of frame memory after motion compensation. The compensation for movement is to detect the movement vector of the picture image and shift the position of the output picture image of frame memory to an amount equivalent to the motion vector, so that it becomes almost the same picture image as that of the input picture. Thus, a high noise-reduction effect can be exerted even for picture images with movement.

Transmitting and Receiving Equipment

Measures Against Ghost Interference

Ghost interference caused by waves reflecting from buildings is increasing because of the increase of tall buildings in cities, impairing television reception. To minimize or prevent ghost interference, CATV facilities are being built and techniques for measuring the degree of interference and for improving reception quality are being developed.

A ghost analyzer has been developed, and by use of this analyzer, the DU ratio (level ratio between desired wave and ghost wave), phase difference, delay-time, and number of ghost waves can be measured. In addition, there has been a proposal for a new amount of PDUR (Perceived DU Ratio), which can be calculated from the physical amounts measured by these instruments. It has become evident that this amount correlates well with the subjective evaluation of ghost interference.

In 1981, the consultative committee established by the Ministry of Posts and Telecommunications of Japan reported that the PDUR value for recognizing the range of ghost interference to be improved is less than 20 dB. The Ghost Meter, a measuring instrument that can directly measure the PDUR value, was developed by NHK Laboratories (Fig. J-18). This meter can measure the various amounts, calculate, and display the PDUR value. The range of measurable DU ratio is 10 to 40 dB, with an accuracy of 1.5 dB.

An instrument to detect the origin of the ghost was developed by NHK Laboratories. It can measure the DU ratio and delay time of the ghost wave from all directions by rotating the receiving antenna. It can display on a map where the ghost is generated, and it has the ability to measure the DU ratio up to 35 dB.

In 1979 and 1980 radio-wave-absorbing walls were used for a building constructed in Osaka and Aomori. These walls have greatly reduced the ghost interference caused by waves reflecting from building walls. Ferrite material is used for absorbing-walls. In 1981, a television relay station operating on the SHF band was established on a building constructed in the city of Okazaki. This is the second station in Japan built to reduce ghost interference. It operates in the 12 GHz band and retransmits six waves with 0.5 W of each visual transmitting power.

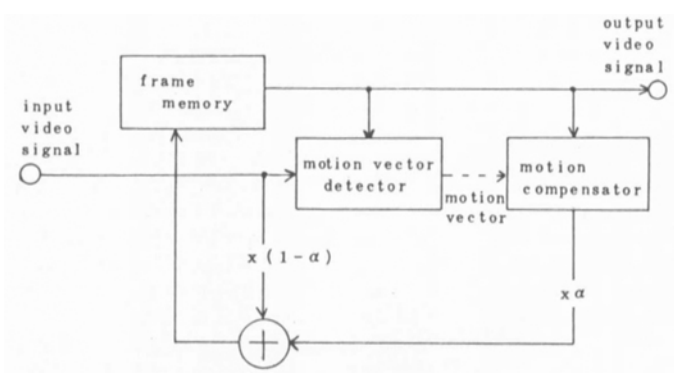

Figure J-17. Block diagram of noise reducer.

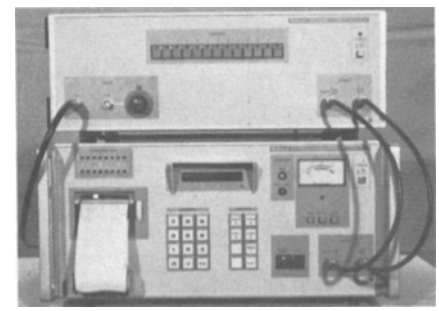

Figure J-18. Ghost Meter (NHK).

Figure J-19. Adapter for cancellation of TV ghost images.

NHK Laboratories and Toshiba Corp. have jointly developed an adapter for the TV receiver (Fig. J-19) which can automatically cancel the multipath ghost image at the base-band signal appearing on the television picture. This ghost-cancelling adapter consists of a transversal filter using CCD (Charge Coupled Device) and a synchronous detector type Hi Fi TV tuner. The ghost canceller is a system using the starting portion of the vertical synchronizing signal in the TV signal, to detect the ghost signal and subtract it from the original signal.

The adapter with this ghost canceller is mainly fabricated into a compact unit, using a large-scale integrated circuit and connected between the antenna and TV receiver input.

NHK Laboratories developed 38 GHz wideband FPU equipment to study the use of milimeter wave-band for transmitting high definition television signals. To obtain 400-mW output transmitting power, the output of a Gunn diode oscillator (direct frequency modulated by a varacter) is amplified through two stages of Impatt amplifiers. The video signal is a composite

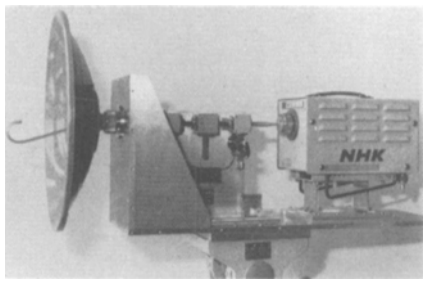

Figure J-20. Transmission equipment for HD-TV (NHK).

signal of 30 MHz bandwidth with a color subcarrier frequency of 24.3 MHz. The two channels of audio signals are time multiplexed onto the horizontal blanking intervals of video signal. Fig. J-20 shows the transmitter unit attached to a 40-cm parabolic antenna (gain 39.5 dB). The same type of parabolic antenna is attached to the receiver, and transmission tests are being conducted between NHK Laboratories and NHK Broadcasting Center (distance 8 km) to measure the attenuation of signal due to rainfall. When the weather was fine, the receiving power had a margin of 11 dB, giving a subjective evaluation of grade-4 picture quality, and signals could be transmitted with excellent quality until the rainfall rate-per-hour had increased to 5 mm.

In addition, relay equipment operating in the 37 GHz band was developed for two-hop relays. By attaching a 20 cm diameter parabolic antenna to this equipment, excellent results were obtained through transmission tests over a distance of 500 m.

Optical Communication Equipment for Relaying TV Signal

NHK developed optical communication equipment using semiconductor lasers for relaying TV signals over short distances where cables are difficult to lay. (Fig. J-21).

If many FPUs (radio equipment for relaying TV signals) should be established at the same location, they cannot be used efficiently because of mutual interference problems. For this reason, the target of development was compact, light-weight equipment that did not use radio waves that would be used to transmit signals over a long distance.

The dimension of the main body (without lens) of this equipment is 34 cm (depth) × 21 cm (width) × 11 cm (height), and the weight of transmitter and receiver, including lens, is respectively 6.5 kg and 7.7 kg.

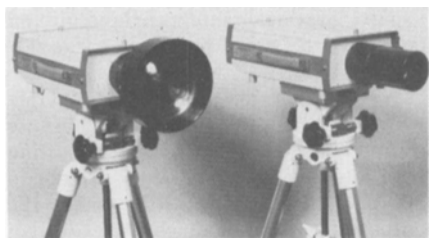

Figure J-21. Optical communication equipment for relaying TV signal (R. transmitter; L. receiver).

In this optical communication equipment, a laser-diode is used for the transmitter, to oscillate an infrared ray of 0.8 μm, and one channel of video and sound is transmitted by means of the pulse interval modulation system. The output power is about 1 mW, and a lens with a focal length of either 35 mm or 85 mm can be used. The optical element of the receiver is an avalanche photodiode, and a Fresnel lens of 15-cm or 40-cm diameter can be attached to the optical receiver. If a 40-cm diameter lens is used, transmission is available to a maximum distance of 7 km. A rifle scope is attached to the side panel of the transmitter and receiver unit to adjust the direction, and a fine-adjusting gear on the rotating portion of the tripod accurately adjusts the direction.

The power source is dc 12 V. As a battery can be used as power, it is useful for short distance TV relays such as across rivers or between buildings.

Equipment for Transmitting Two Video Channels Simultaneously

TBS (Tokyo Broadcasting System) developed a device that can transmit two video channels simultaneously, and it is being used for outdoor TV relays.

The two independent video signals at the transmitting site are compressed in half in the direction of the TV horizontal line, and both are laid side by side (right to left) to form a composite signal (NTSC signal). This signal is transmitted by using conventional single TV transmission lines, such as FPUs etc. The two channels are separated at the receiving side, and then doubled in the respective TV horizontal line directions to restore the original signal. With this equipment, time base correction is provided in each channel to use for a $\frac{1}{4}$-in VTR direct output signal as an input signal. Impairment of resolution is small because edge compensation is applied. This is an effective device for prompt transmission of ENG material and simultaneous transmission of a live camera signal.

Video Equipment for Home and Business Use

Home Use VTR

Portable equipment is being made more compact and light. New units weighing about four kg have been marketed by many companies. In the stationary types, a VTR eliminating noise bars at variable speed playback has been developed. In this type, the head only for playback is vibrated by a piezo-ceramic element, and it traces the recorded tracks.

With the popularization of home use VTRs, the demands for taped programs are expected to increase. To comply with this demand, a high-speed duplicator for VHS tape was put on the market by Matsushita Industrial Co., Ltd. In this system, the master tape and raw tape are both wound on the same take-up reel, and a magnetic field is applied to them. One reel of tape can be duplicated within four minutes.

Home use VTRs incorporating TV cameras was announced by Sony Corp. and Hitachi Co., Ltd. on an experimental basis. Matsushita Electric Industrial Co., Ltd. and Sanyo Electric Co., Ltd. have both developed this type of equipment.

Matsushita's experimental device uses a CPD (Charge Priming Device). The weight is 1.9 kg and power consumption is 4.9 W. A 7-mm wide metal-evaporated tape is used, and the dimension of the cassette is slightly smaller than that of an audio cassette. The maximum recording time is two hours.

Sanyo uses a $\frac{2}{3}$-in vidicon. The weight is 2.9 kg and power consumption is 11.4 W. With a $\frac{1}{2}$-in metal tape, a maximum video recording of 20 min is available.

High Density Video Tape

To meet requirements of compact VTRs or cameras incorporating VTRs, high density videotapes with excellent short-wave sensitivity are being developed. One of these is a metal tape coated with metallic powder such as iron, cobalt, or nickel, and another is a metal-evaporated tape consisting mainly of cobalt.

At present, for home use videotapes, the cobalt-added iron oxide (γ-Fe_2O_3) powder is in most common use. It is said that the metal tape can ensure a recording density more than twice that of the iron oxide tape, and an evaporated tape can ensure a recording density of more than four times that of the tape. The metal tape is already on the market as audio recording tape, and some companies are developing metal videotape also. The metal-evaporated tapes have been announced by Fuji Photo Film Co., Ltd. and Matsushita Electric Industrial Co., Ltd.

Still Picture Disc File

An optical disc on which the user can record is expected to be of interest in the future, and developments are being actively conducted. Matsushita Electric Industrial Co., Ltd. has developed a compact, light-weight still picture disc file (Fig. J-22) using a semiconductor laser which can record and reproduce signals. The disc is made of a polymethyl methacrylate base plate, evaporated with tellurium oxide film, having concentric grooves (0.8-mm width, 2.5-μm pitch), with an optical guide track. The semiconductor laser beam, which is modulated by the video signal, is irradiated, and its heat energy varies the reflection index of the thin film. The diameter of

Figure J-22. Still picture disc file (Matsushita).

the disc is 200 mm and it can record a maximum of 15,000 frames of still pictures. When reproducing, a low power laser beam is irradiated, and the reflecting power is detected. Address information is recorded on each groove in advance, and the average access time is as short as 0.5 sec.

Electronic Still Camera

While still picture cameras using 35-mm film are now popular, two kinds of electronic still cameras have been announced.

One of them is the experimental device developed by NHK using a magnetic bubble element, and the other one is the magnetic video camera "Mavica" announced by Sony Corp.

The former uses a frame transfer CCD of 1-in image size, and the video signal is digitized into 8 bits with a sampling rate of 8.8 MHz. After it is stored in the field memory, it is recorded on a bubble cassette (developed by Fujitsu Ltd.), having a capacity of 1 M/bit.

One frame of a picture can be recorded on one bubble cassette, and the time required for recording is about 20 sec.

The Mavica (Fig. J-23) was announced in August 1981. The video signal from the single-plate color camera, using a narrow-channel frame transfer from CCD (number of picture elements, 570H, 490V), is recorded on a small magnetic disc called Mavipack, and 50 pictures can be recorded on one Mavipack. The relative velocity of the fixed head and rotary disc is 5.6 m/sec.

The camera body (180 mm (width) × 89 mm (height) × 53 mm (depth)) is as light as 800 g with a zooming lens. The regular shutter speed is $\frac{1}{60}$ sec, but a mechanical or electronic shutter can be used, also, for shutter speeds between $\frac{1}{60}$ to $\frac{1}{2000}$ sec. The horizontal resolution is 350 TV lines and the bandwidth of color difference signal is 1 MHz. The camera is powered by three Ni-Cad batteries, and 200 pictures can be taken by one full battery charge. The recorded Mavipack is removed from the camera and reproduced by the Mavica viewer; the picture image can be viewed directly on a color TV receiver.

Liquid Crystal Video Display

A matrix video display using nematic guest-host liquid crystal with dichroic dye aligned on MOSFET array was developed by Suwa Seiko. The panel, acceptable for a portable unit, features a wide viewing angle and a bright blue-and-white image caused by pixel electrodes; the surface has controlled, diffused reflection characteristics. Liquid crystal is operated in ac mode, i.e., driven to positive polarity in odd field and negative in even field, and the panel is expected to have a long operating life. An effective display area consisted of 210 × 200 pixels in 110 (vertical) and 160 (horizontal); μm pitch is 23.1 × 32.0 mm on a 28.6 × 37.4 mm Si substrate. The panel showed response times of 80 ms rise and 110 ms decay, contrast ratio of 7:1, and a picture with about 10 gray levels without defect. Power consumptions of the panel including line drivers and video amplifier; synchronizing and control circuits are about 10 mW, respectively. The receiver (Fig. J-24) weighs about 200 g and has a power consumption of 300 mW. It can be operated more than ten hours using two UM-3 batteries.

Beam-Index Color CRT

A 32-visual-in, 114° deflection, beam-index color CRT was developed by Sony (Fig. J-25). The phosphor screen consists of 485 primary color triplets with a width of 1.3 mm. $Y_3Al_3Ga_2O_{12}$:Ce index phosphor was improved in its luminous efficiency, and PIN photodetector and amplifier were developed and specialized for color indexing. An index phosphor stripe is placed on every fourth black guard-band, and the CRT employs an electron gun with magnetic focusing. Circuits for the focus control, beam scanning rate control with digital techniques, and picture-size stabilization are provided to the receiver.

High Bright CRTs for Projection Color TV

A coolant-sealed CRT for bright color TV (Fig. J-26) was placed on the market by Sony. The 5.5-visual-inch rectangular, flat screen is composed of a front glass plate and faceplate of phosphor screen, between which a 4.5 mm layer of the aqueous solution of ethylene glycol is sealed. The coolant prevents the thermal quenching of the phosphor and destruction of the glass caused by a local rise in temperature; therefore the brightness of the tube is kept high at a higher current operation than with a conventional CRT. The solution has some electric conductivity and can remove the surface charge on the front glass plate and prevent some dust stains on it in operation. The phosphor screen was made dense by screen-printing of P43 phosphor for green and P22 for red and blue.

Toshiba also developed a rectangular, flat-screen CRT for high bright color video projection. The heat-sink-type screen has a fine mesh of 50-μm linewidth and 100-μm thickness stuck together faceplate. The mesh also has functions of effective ther-

Figure J-23. Mavica electronic still camera.

Figure J-24. Liquid crystal video receiver.

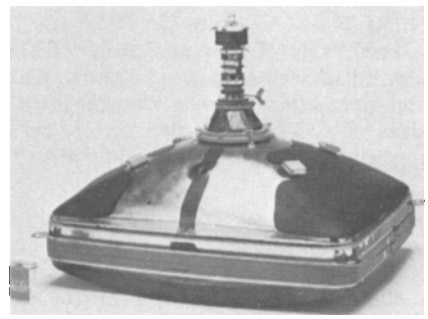

Figure J-25. Color CRT (Sony).

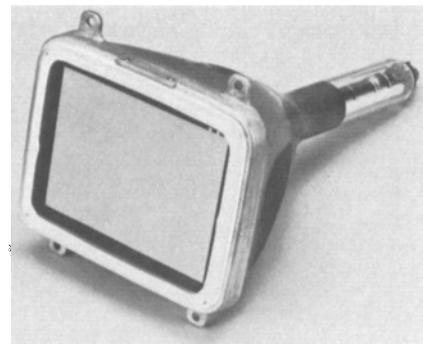

Figure J-26. Coolant-sealed CRT for color TV projection (Sony).

mal radiation and prevention of charge on the faceplate of the screen.

Giant Color TV System

A giant color TV system was developed by Matsushita. A typical picture size is 6.3 × 8.4 m. Display units consist of three colored, 10 × 30 incandescent lamps used in delta arrangement. R, G, and B lamps specify wattages of 18, 18, and 25 W, respectively. These are composed of a tungsten filament in a frosted hard glass bulb with an internal reflection mirror and dimensions of 28-mm diameter and 73-mm length. The system can display a bright picture in the open air and all weather.

Light-Emitting Diodes

Engineering samples of a GaN blue-color LED were developed by Matsushita. The diode has a MIS structure grown on sapphire substrate, and two electrodes are wired on one side of a 720 × 550 × 550 (thickness)-μm chip. Luminous intensity of the typical lamp is 2 mcd at the driving of 7.5 V and 10 mA. The diode shows radiant efficiency of 0.03% and spectral distribution of the peak at the wavelength of 490 nm.

Sanyo started production of the SiC PN-junction blue-color LED. Their full-color LED consisted of the combination of the SiC diode and GaP green-red multicolor LED, which had already been produced by the company. The characteristics of a blue diode shows the luminous intensity of 2 mcd at the driving of 3.5 V and 20 mA, and the luminescent peak wavelength of 480 nm for both the blue and full-color lamps.

Production of the super bright LED lamps had been started by Toshiba. Red and green lamps showed luminous intensities of 300-600 and 300 mcd, respectively, at the driving current of 20 mA.

Production Facilities for Display Device and Parts

Sharp is constructing a plant for the production of the thin-film EL display unit. The facility is expected to produce display units at the rate of 3,000 panels per month beginning in April 1983.

Dai Nippon Printing constructed a facility for the mass production of the shadow-mask, capable of a fine pitch (0.2 mm) (Fig. J-27). The production scheme is based on, and similar to, that of the past, but the automatic processing line of the 300-m length has been highly controlled, and holes of 0.08 mm diameter can be made on an iron sheet of 0.1 mm thickness. New lines can be matched to many types of hole shapes, including the round hole and slot-type shadow-mask and the aperture grill.

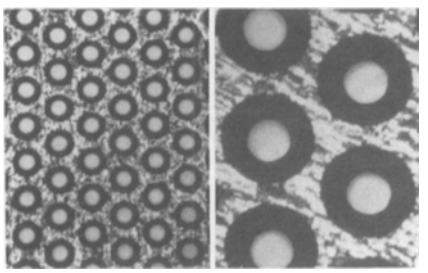

Figure J-27. Fine pitch (L) and ordinary-type shadow masks.

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2. CCIR Doc. 11/343, "Subjective Tests of the Effect of Sampling Frequency on Picture Quality of Component-Coding System."
3. T. Nishizawa et al., "Experimental Component-Coding System," NHK Laboratories note, No. 264, 1981.

Mexico

Sixty-three motion picture features were released during 1981; 32 in American Studios and 31 at Churubusco Studios.

Efforts of the Mexican authorities were directed toward promoting coproductions with various countries. A special mention should be made of the head of the industry, Mrs. Margarita López Portillo. She made many exhausting trips around the world in order to encourage the expansion of the Mexican motion picture industry.

During the last year an outstanding celebration took place in this country: 50 years of sound movies were celebrated. According to the Director of Cinematography, Mrs. López Portillo, the first film with sound made and produced by Mexican technicians was *Santa*. The leading actress in this film was Mrs. Lupita Tovar, and she came to Mexico to celebrate this outstanding event.

At the same time, the National Chamber of Cinematography conducted its second convention. Many people related to the motion picture industry were invited, from all over the world. The results of this celebration were very good and very encouraging for the three segments that make up Mexican industry; that is, production, distribution, and exhibition.

Netherlands

The new film center, with 53 editing suites, at NOS (Nederlandse Omroep Stichting) became fully operative in 1981. The building houses five audio copying machines, three audio mixing facilities where voiceovers can be produced and a broad range of sweetening facilities. The center also houses the film translation staff which produces per year on average some 800,000 lines of subtitling for foreign languages on Dutch television. This subtitling operation has been changed from cameras looking at punch cards with text, to a fully electronic title production and mixing system, based on custom-built character generating equipment. The handmade zero-series of this new system will, in 1982, be followed by some 25 input sets. They will produce into one network which can be switched to any number of control booths.

Teletext is growing. Plans to have 200 pages of information available throughout the day were stymied by software problems. The extension to 200 pages will be put into operation in February 1982. More pages may be expected and plans are far ahead for regional packets inside the main national information system. Each of an estimated 200,000 families has bought one of the decoder-equipped TV receivers now marketed in Holland. One feature of the teletext system used in Holland is the computer hookup with Schiphol Airport Authority. Several other hookups are scheduled to become operational in 1982. Teletext has made its "value to society" the number one priority, because no other system in broadcasting can handle large packets of information with "computer speed." Audience research in 1981 again underlined increasing acceptance and high usage during natural breaks in programs.

Subtitling for the deaf and hearing-impaired branched out during 1981, and teletext, on average, offers five to six programs with special subtitling each week, plus subtitling for deaf children when the *Newsreel for the Young* (targeted for 12 to 14 year-olds) is transmitted. Teletext is casting around for possible computer language in order to achieve minimal delays during live subtitling. Of course, England's *Wedding of the Year* was subtitled for the deaf through Teletext. Many of these viewers wrote in, saying that because of the subtitling they learned more about the wedding than hearing persons.

Pirates there were in thousands, but not in galleons. Regarded as a spin-off from Citizens Band enthusiasm, TV pirates created hot competition among themselves for the aerials that feed cable viewers. Some 70 percent of Dutch TV viewers presently acquire their signals through some sort of cable network. The pirates started out with stolen copies of feature films, hard porn, and advertising. Court orders were requested and given, obliging the pirates either to pay authors' fees or shut up. The pirates came back with recorded shows and advertising, even for a while, producing their own weekly program bulletins. Many viewers were attracted by the pirates' little wars, which always started the moment an official transmitter went off the air. More people have watched five minutes of porn and then turned away

than ever before since the introduction of video recording. Transmitting by pirates took many forms, from a video recorder with a transmitter module, to beam transmitters blasting out any other signal in an uncomfortably wide range of frequencies, conjuring up interferences never seen or heard before. Post Office detectives and police hunted down a few, but in many arrangements for camouflage of a transmitter new heights of ingenuity were reached. In 1982, cable systems and their receiving aerials are expected to be ordered shut down after the end of official TV transmissions each night. Thus the government is expected to step in and stop the pirates' clock.

Norway

Sound broadcasting, and later television, has since the 1930's been restricted by law to one company only, Norwegian Broadcasting Corporation, NRK. By the time television was introduced the freelance market was relatively small, and as a consequence the NRK had, within a short period of time, built up the necessary film and video production capacity. This of course kept the production facilities outside NRK to more or less the same low level.

Since NRK produces only one TV channel, larger cable systems gradually grew up for distributing the TV channels of the neighboring countries. For practical reasons these cable networks are confined to the more densely populated border areas, and presently 30 to 40 percent of the total population is covered. The signals are picked up by antennas, and this distribution is not considered to be broadcasting. However, distribution of signals not originated from and simultaneously received by an antenna would conflict with the law covering broadcasting.

This law has been under revision for a long time, and in 1981 some important changes were adopted. The NRK monopoly is no longer as absolute as before. Organizations and groups of different kinds are, on certain conditions, allowed to run broadcasting stations. Further, more liberal modifications to the law are expected, since the non-socialist government we had after the general election last autumn has expressed the opinion that broadcasting should, in principle, be free and not confined to one or just a few companies. A number of organizations have been authorized to operate broadcasting stations, and the cable TV companies are ready for an extended program offering to their subscribers.

Another factor which has greatly affected our film and video market is videocassette distribution. Parts of the program material distributed are, of course, of foreign origin, and local companies do the dubbing from film or video tape to the domestic cassette formats and, at the same time, add subtitles.

Traditionally about 10 fulltime feature films have been produced each year, and there is a fairly constant market for commercials to be shown in cinemas. The new situation opens up for increased activity. The government has suggested that, to a larger extent, NRK base their productions on the freelance market and also in cooperation with the independent production companies. The possibility for free cable TV channels is looked upon with optimism by the film and video production companies, and new companies are established every day.

The high activity level in our new industrial field, oil drilling and production, has underlined the need for efficient training of personnel. Production of educational programs has become an important element throughout the industry. Some of the production companies are operating on a high professional level, producing films and tapes of the highest technical quality. Other firms have a different aim and equip accordingly. However, the tendency seems clear: less film and more video.

Spain

Spain's motion picture year has been described by some qualified commentators as one more year of transition.

At the beginning of the year, production was at a very low level, but by April and May there was a slight increase. The decline in motion picture production, however, reflects the economic situation in Spain and in other European countries. High production costs and diminishing attendance at motion picture theaters have resulted in a cautious approach to the production of new feature films.

The quality of Spanish film remained high. Among the features released in 1981, those worthy of mention include *Maravillas*, produced by Gutierrez Aragon, and *Deprisa—Deprisa*, produced by Carlos Saura. Both of these films received the Golden Bear Award at an International Film Festival in Berlin.

A new Education Ministry was established in 1921 and it is expected that it will have a beneficial effect on motion picture production in Spain.

Sweden

Motion Pictures

Motion pictures are being used and probably will continue to be used in the future for production and presentation in large auditoriums. For documentaries and instruction purposes, video is being used more extensively. The cinemas are continuously losing ground with less attendance and fewer theaters, and most of us blame television.

The Swedish Television is financed by license fees and is not commercial. There are only two channels and they do not invariably show entertainment programs. This is of some advantage for the cinemas.

Videocassettes and video discs represent a new threat to cinema owners. The videocassette boom is here. About 400,000 players have been sold, and the sale is rapidly increasing. About 1,000 programs are available for renting and buying. Most of the programs are feature films and the rental fee for one evening is less than the cost of two cinema tickets. To compensate for the drop in revenue from the cinemas, some film producers are making videocassettes from their feature films and are also buying the rights to foreign films for this purpose. Most of the film laboratories have facilities to transfer any type of film or tape to cassettes.

Videodiscs

One of the difficult problems in manufacturing videodiscs is the process of plating the matrix. The film and cinema company, Europa Film, in Stockholm, has been involved in solving this problem in cooperation with Teldec and Philips since the development of the videodisc.

During the years, the methods and processes have been perfected, with the result that most videodisc manufacturers are using Europa Film's plating equipment. Quality criteria for matrices include stress-free deposit, plano-parallelity better than 0.01 mm, homogenous fine-grained deposit, and a smoother flipside.

The complete plating plant (Fig. S-1) comprises units for (1) chemical precipitating of silver on the glass master; (2) galvanic plating of the glass masters with nickel; (3) galvanic building up of father matrices; (4) galvanic high speed plating of mothers and stampers. For processes 2, 3, and 4, the same type of deposit tanks are used. By processing the glass masters (2), however, a dust-free environment is essential. This is achieved by placing the preplating tanks in a separate room, isolated from the rest of the equipment. For processes 2, 3, and 4, the matrix and the

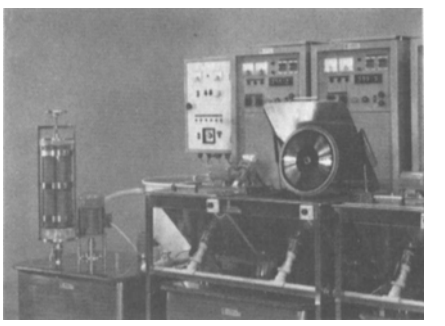

Figure S-1. Plating plant.

cathode are fastened to rotating discs placed in the deposit tank at an inclination to the horizontal plane of 45°. The nickel anodes are in form of pellets placed in a titanium basket parallel to the cathode. Due to the fact that the solution level is higher in the deposit tank than in the anode basket, the solution is forced to flow toward the anode basket through its filter diaphragm. This ensures that no anode sludge or other impurities reach the cathode. From the storage tank to the deposit tank, the solution passes the cooling system and filters, absorbing particles with sizes down to 0.2 micron. In the deposit tank, the solution is directed by a Perspex screen, giving an even distribution of the solution, and air is injected between the anode and cathode to give high turbulence. The automatic-controlled rectifiers can be programmed for start current, current rising time, and maximum current. A normal program is start current for 30 min, 10 A; rise time 10 min, 10 to 200 A; maximum current 200 A for 60 min.

In one of the storage tanks, called the dummying-out tank, there is a corrugated nickel cathode and titanium anode baskets for removal of metallic impurities. The process is continuous and simultaneous with the main plating activity in the plating tanks.

All tanks, frame work, pumps, and cooling coil are made of acid-proof stainless steel. The tanks are lined inside with chlorophene rubber in preference to plastic material, partly because of its long life and partly because it does not cause organic contamination.

This equipment is designed for the processing of all known types of matrices in the record industry. Over 200 plants are in operation today around the world.

Switzerland

By the end of August 1981, the AG für Werbefernsehen put into operation a new VTR studio for commercials. It is equipped with two BCN-100 Bosch cassettes, two 1-in Ampex VPR-2 VTRs and two BCN-51s, and a Bosch FDL-60 telecine. With this equipment, commercials can be electronically edited, assembled and transmitted to the SRG studios via PTT (Post and Telegraph).

Trial teletext programs started in October. The equipment was formerly used by ORF and conforms to the Ceefax standard with DIN characters. The teletext program is the result of cooperation with the national newspapers.

Near the end of 1981, TV Geneva began transmitting its own news program; formerly all Swiss TV news originated in Zurich. For this purpose, News Studio 3 has been equipped with a custom-built computer-controlled On-Air VTR system by Bosch. Decisions must be made to determine whether format "B" or format "C" will be chosen for 1-in VTRs; however, 1-in VTR editing centers are planned for the German- and Italian-speaking regions of Switzerland.

Figure SW-1. Tape deck with editing facilities (Studer).

Figure SW-2. Cassette deck with remote control.

Figure SW-3. T-Audio two-capstan tape transport (Kudelski-Nagra).

A 9-in rack-mounted tape deck (PR 99) offering editing facilities (Fig. SW-1) was introduced by Studer International AG. Also introduced was a cassette deck (B 710) with remote control (Fig. SW-2) and a mixing desk offering up to 32 line-in and any number of line-out configurations.

Kudelski-Nagra developed the T-Audio two-capstan tape transport (Fig. SW-3) following a decision to retain and improve analog systems because of advantages for film and video operations.

Kudelski also developed a quartz clock (using the micro-thermostatically controlled crystal technique) to receive or supply a time-code signal. Features include a generator with an internal battery (to keep its memories alive at all times) and a new master clock for time setting including a playback decoder to check the generators.

Sondor developed the Audio Electronics System which permits all operational modes of studio tape recorders to be used with magnetic film recorders (sprocketed tape recorders) including sync replay with normal replay quality.

United Kingdom

Motion Pictures

In common with most of British industry, the motion picture business has been affected by the general economic recession. The number of feature films fell from nearly 40 films in 1980 to about 25 in 1981, with the major studios being particularly hard hit. The 16-mm market, however, always an important sector in the UK, has remained relatively stable, due mainly to the continued use of film by television companies for serious program production.

One feature of the developments made in 1981 is the widespread use of microcomputers to handle the repetitive elements and to process data, leading to precise and predictable results with relatively little capital investment.

Film Laboratory Equipment

Rank Film Laboratories, one of the major European film labs, has developed new products for their Solvit range of laboratory equipment through its Research and Development Group.

A 4000-m/13,100-ft printing system (Fig. UK-1) has been developed to give a complete, commercially effective system for cleaning, printing, developing, and storing feature length negative rolls, typically, 4,000 meters, for both 35- and 16-mm gauges.

The state of the art has been advanced

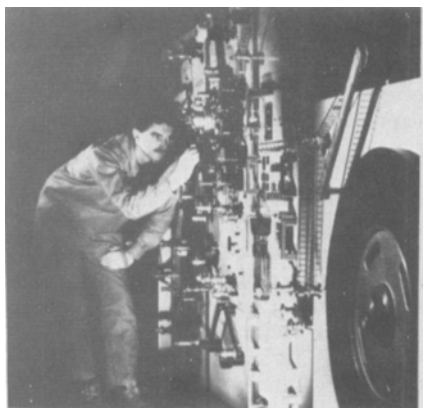

Figure UK-1. Printing system (Rank Film Laboratories).

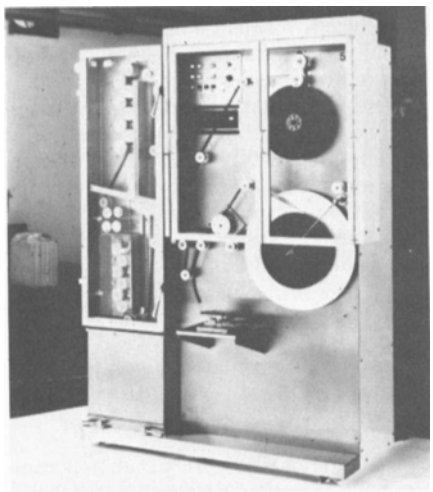

Figure UK-2. The Cleaner Rewind (Rank Film Laboratories).

by a system which now produces show-copy quality for every release print.

The benefits of the system include show-copy uniformity and improved cleanliness because dirt and wear are prevented, particularly at the head and foot of reels. It can be used on 35 mm and 16 mm and thus can satisfy different print orders at the same time. It is suitable for single and multiple copies since negatives in this longer-length format can be stored for several months at a time. The system operates with accurately controlled tensions and reduces physical contact with the negative surface. The choice of the 18-in center minimizes stress and provides handholds when transferring the roll, which can weigh up to 80 lb. All equipment is at the same height, obviating the need for lifting true hard rolls, which do not require side supports.

The Cleaner Rewind (Fig. UK-2) efficiently cleans 35-mm or 16-mm negative or positive rolls in sizes up to 1,220 (4000 ft) at speeds in excess of 100 m (328 ft/min), with the added protection of ramped starting and stopping.

The method employed on this equipment is extremely gentle to the film but removes minute particles, which other cleaning techniques do not remove at comparable high speeds. The equipment is sprocketless, and reel lengths are checked during the cleaning operation, using a counter incorporated within the cleaning machine. When an exact footage and frame count is required, use is then made of a free-running sprocket wheel.

The equipment was designed with health regulations and ventilation considerations in mind, so it is operated continuously in the laced condition. This prevents unnecessary exposure of the operator to solvent fumes. The operator does not need access to the chamber containing the cleaning action and solvent fumes to change each reel.

The Frame Line Winder (Fig. UK-3) is used in a darkroom or under safelight conditions to produce rolls of raw stock, which are subsequently used for printing. All the stock splices are positioned to fall on the frame line. This equipment has been designed to use the Solvit splicer to make the splices. The controlled acceleration and deceleration maintains an even and controlled tension throughout the winding operation, which runs at speeds of 2,000 ft/min (610 m/min).

The flexibility of the equipment allows short ends to be joined to existing rolls; exact roll sizes to be determined to match the negative length; the production of roll sizes of 4,000 ft (1220 m), or up to 13,100 ft (4,000 m) when used in conjunction with the modular winder; determination of the position of the splice relative to the Academy leader on the negative facilitating a no-join copy or qual reel; pull-back facilities allowing a predetermined length of leader to be measured off to thread to printing machine; and reduction of operator error.

The Microcomputer Control Unit (MCU) (Fig. UK-4) is an advanced printer control unit with a 64 K byte 16-bit microcomputer controlling the printing machine and assisting the operator with information for running the machine correctly. The MCU enables the printing machine to run frame count cued or RF patch cued negatives, when the RF information is converted to frame count on the first run, allowing a frame-count operation on subsequent runs. It handles counts/roll sizes in excess of 4,000 m (13,100 ft) and greatly simplifies section printing.

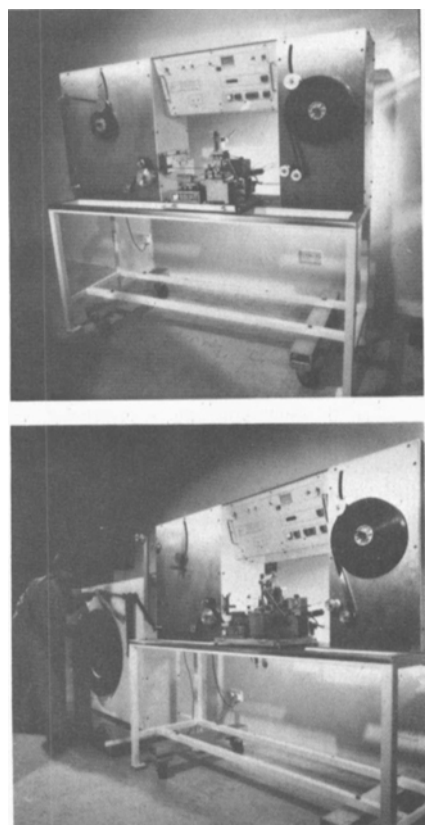

Figure UK-3. The Frame Line Winder (Rank Film Laboratories).

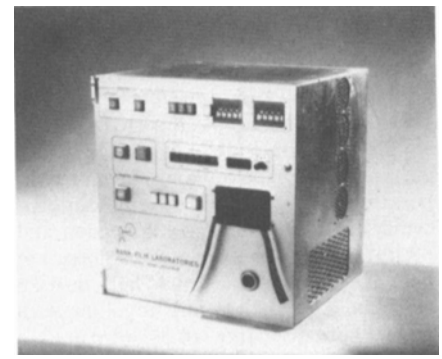

Figure UK-4. The Microcomputer Control unit (Rank Film Laboratories).

The inputs from the printing machine for checking tensions, lamps, and machine performance come directly from switches, so that the logic functions are under program control and readily changeable. The MCU contains its own diagnostic programs. It identifies and displays to the operator any electronic or mechanical problems and can be interrogated through special test gear or through a VDU. Using specially designed software enhances the flexibility of the equipment, allowing updating to suit conditions or coping with different types of printing machines.

Specialized Animation Equipment

Neilson Hordell Ltd. developed a special camera/rostrum system specifically for the production of filmstrips to be used in head-down map displays fitted in high-speed, low-level aircraft (Fig. UK-5). The system uses a 35-mm continuous motion camera, in which the exposure is made through a narrow slit aperture shutter. The mapping table, with a selected chart, is exposed in-camera by a moving illuminated slit, and the linear film transport and complex motion of the mapping table are computer-controlled. It also allows rapid updating of information. The resulting filmstrips are fitted into an aircraft and give the crew a continuous display of the aircraft's position with pinpoint accuracy.

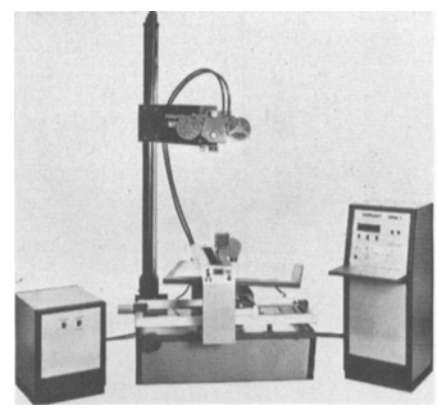

Figure UK-5. Camera and stand designed and manufactured by Neilson-Hordell Ltd.

Lighting

Thorn Lighting Ltd. now has a range of CID (compact iodide daylight) lamps (Fig. UK-6). The CID lamp is reported to be the smallest single-ended discharge lamp currently being made. It has a color temperature of 5,500 K with a luminous efficiency of 70 lm/W, in its 1 kW version, and 80 lm/W in its 2½ kW version. These are both available in "cold" and "hot" restrike versions. The CID lamps, together with other Thorn discharge lamps, were used to light the interior of St. Paul's Cathedral during the royal wedding.

Multi-Image Equipment

Electrosonic Ltd. introduced the System 4,000 computer-compatible multi-image control system, which uses a standard Apple II microcomputer with Esclamp, a specially developed software system.

The key item in the System 4,000 is the projector interface for Kodak projectors. There are two versions, a Sonic ES4103 for the Ektographic projector and the Eurosonic ES 4003 for the Carousel SAV 2,000 projectors. These interfaces can each control three projectors and eight interfaces can be used together, giving 24 separately controllable slide projectors, all controlled by the microcomputer.

The system is sophisticated in that, for any combination, each projector light source can be controlled accurately for timing, lamp brightness, and dimming speed (0.1 sec to 99.9 sec); also, a presentation can be developed and stored magnetically for playback. The system can also control cine projectors, videotape machines, and other equipment for multimedia presentations.

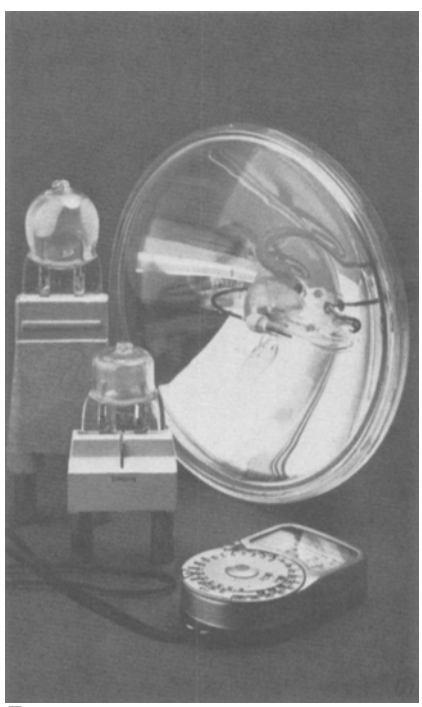

Figure UK-6. CID lamp (Thorn Lighting Ltd.).

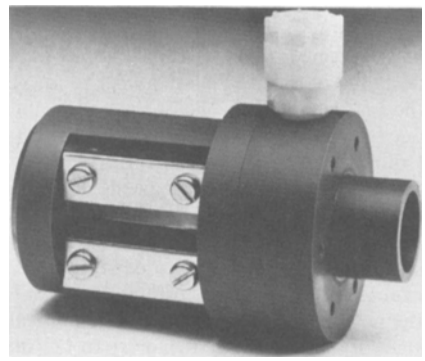

Figure UK-7. PVC Vacuum Inducer system (Calder Equipment).

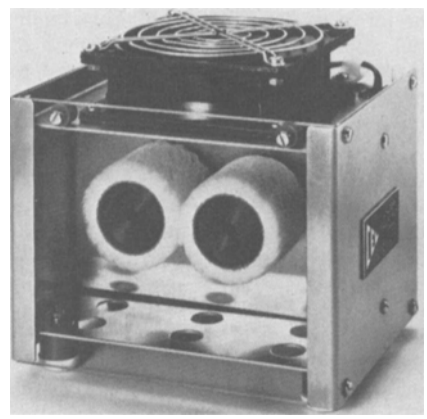

Figure UK-8. Buffer Fluffer (Calder Equipment).

Background Transparencies

An improved technique for producing large set-backings, using color transparencies, has been developed by Colour Processing Laboratories Ltd. Backgrounds are assembled from smaller color transparencies laminated onto a plastic backing, e.g. Plexiglas. In this way, backings up to 40-ft wide by 15-ft high can be constructed. In the past, the joins between individual transparencies were less than perfect and were most obvious in sky areas. CPL has developed new splicing equipment to eliminate this problem and has supplied backgrounds for several feature films, including one underwater background for a James Bond movie.

Calder Equipment introduced a PVC Vacuum Inducer System (Fig. UK-7) which can be used to remove surface liquid after fix or bleach solutions; the output from the vacuum heads can then be collected independently or, in fact, blown back into the machine tank. Experiments in the works have proved that even with a good wiper blade system, carryover of solutions in the perforations of 35-mm film can be as much as 650 cc per hour at 100 ft/min. The vacuum inducer requires an air supply of approximately 5 cu ft/min at 20 psi.

A Buffer Fluffer (Fig. UK-8) was also introduced. When new dacron buffers are initially fitted to a machine there are quite a lot of fine particles which are loosened by the speed of rotation and, in many cases, end up on the film surface. The buffer fluffer employs two small electric motors rotating in the same direction so that the dacron buffers wipe against each other loosening any suspect particles which, by means of a small fan, are blown clear.

Television

British Broadcasting Corporation

Constitutionally, 1981 was an important year for the BBC because a new Royal Charter came into force extending the corporation's tenure until the end of 1996. While, in most respects, the basic constitutional instruments remain unchanged, they have been developed in some important ways. From the engineering point of view they are broad enough to encompass the technological developments that the BBC may wish to adopt in the years ahead. Direct broadcasting by satellite is within the scope of the new Charter, naturally, as are some "non-broadcasting" services, such as the transmission of coded data along with the broadcast signal* in order to control the switching times of domestic electric storage heaters. The BBC and the Central Electricity Generating Board have already demonstrated the feasibility of this application, which would allow the country's overnight electricity demand to be adjusted to make the most efficient use of generating capacity.

In November the government announced that the annual receiving license fees were to be increased from £34 to £46 for a color television license and from £12 to £15 for a black-and-white license, both to remain unaltered for at least three years. The BBC derives virtually all its income from license payments (currently some 14 million color licenses and 4.5 million black-and-white licenses are in force), and in the face of inflation the previous fees were proving inadequate to finance the two national television services, four radio networks, and 22 local radio stations that the corporation provides. In fact, the BBC had campaigned for a £50 color television license, but in the light of the government's expressed determination to keep all forms of public expenditure in check, the figure of £46 was probably as much as could be expected. How adequate it will be over the next few years depends upon inflation, which at the end of the year was running at about 12 percent.

In May, the Home Office, which in the United Kingdom is the government department responsible for broadcasting,

* S. R. Ely, "VHF Radio-Data: Experimental BBC Transmissions," BBC Research Department Report RD 1981/4.

published a report on direct broadcasting by satellite that covers virtually every aspects of the subject as seen from a UK viewpoint. The report identifies five strategic options for direct broadcasting by satellite: a full and early start (for example, five new DBS services starting in, say, 1987); a full but later start (in, say, 1990); a modest but early start (one possibility would be two new DBS services, starting perhaps in 1986); a modest later start (in, say, 1990); and no DBS at all, at any rate for the foreseeable future.

The report does not recommend any particular option, but in a Foreword the Home Secretary (the government minister with responsibility for broadcasting) stated that the government believes that a positive approach is the right one, and is therefore prepared to give serious consideration to an early start as soon as possible, with perhaps one or two television channels and possibly other information services. He stressed that the new DBS services would need to be subject to the supervision of a broadcasting authority, and would have to meet the same program standards (concerning taste, decency, and impartiality for example) as apply to the United Kingdom's existing services.

Prior to the publication of the report, the BBC had called for an early start to satellite broadcasting, and the corporation therefore welcomed the Home Secretary's approach. The BBC proposed that it should provide services on two DBS channels. One service would consist of a subscription service which would include feature films, first runs of special BBC productions, opera, drama, music and extended coverage of sporting events. The other would be used for a service consisting of retransmissions of the "best of BBC 1 and BBC 2" and the cost would be met from the license fee. This service could be attractive to many viewers (shift workers, for example) who cannot see programs at the times that they are normally broadcast, and to viewers on oil rigs and other remote sites, and coastal shipping. Other proposals have, of course, been made for the use of the United Kingdom's DBS channels when they become available, but by the end of the year no decision had been announced by the Government.

Cable television has, so far, made little headway in the United Kingdom, despite the fact that some trial subscription systems were installed as far back as the sixties. This is largely because the broadcasting authorities work in unison to provide excellent off-air reception throughout the country. Most cable systems exist either in towns where the off-air service was initially poor but where the population density was sufficient for a cable system to offer a reasonable return, or in areas where local authorities restrict the use of individual outside aerials for aesthetic reasons. The operators of these systems are normally restricted by law from distributing any services other than those provided by the broadcasting authorities, but developments in cable television in the United States have been observed with much interest in this country, and the cable television industry has lobbied for restrictions to be lifted. The government has responded by allowing the introduction of several pay cable systems for a two-year period (after which there will be a review) and the BBC is participating in one of these schemes now operating in London. The scheme, known as Showcable, is being jointly financed by the BBC and Visionhire, a television rental and cable company. The signals are transmitted over part of the existing Visionhire network, passing about 170,000 households. The charge to subscribers for Showcable is £7.95 a month, in addition to £25 connection fee for new subscribers to the cable system. The BBC's operating costs will be met from a share of the subscriptions, while its contribution to start-up costs is being provided not from the license fee income but from the profits made by BBC Enterprises, a company wholly owned by the BBC and charged with marketing BBC programs, records, tapes and associated merchandise world-wide. Visionhire is the authorized operating company and is ultimately responsible to the Home Office for the system, while the BBC is providing all the programming, presentation, and schedules. Video cassette playback facilities (high-band U-matics) and a 6-channel vision switcher have been installed at the BBC's television studio headquarters in West London for the system. The signals are normally "scrambled," but can be easily unscrambled by the operator so that all Visionhire customers can see program announcements and trials.

During the year agreements were reached with several manufacturers under which they are allowed to manufacture equipment incorporating BBC designs or patents. Sixty-six licenses are now held by British and overseas manufacturers, and 42 of these include royalty payments on sales.

Any review of the year would be incomplete that did not mention the agreement reached by the EBU and SMPTE on the sampling rate that they would recommend to the CCIR for a digital video standard, a recommendation since ratified by the CCIR (Recommendation AA/11). The BBC's Research Department has pursued the goal of digital video for several years; Howard Jones, Head of the Department's Transmission Group, is Chairman of the EBU Specialist Group VI/VID in which much of the technical discussion relating to standardization has taken place.† And Peter Rainger, the BBC's Deputy Director of Engineering, chaired the EBU/SMPTE meeting in Brussels at which agreement was reached on the 13.5/6.75/6.75 recommendation. International attention is now focused on further standards making use of the agreed parameters and covering studio equipment interfaces, the digital video recorder format, and the multiplex arrangements for international transmission. BBC engineers are actively involved in all these discussions.

The Royal Wedding

The program of the year was, of course, the Royal Wedding — the marriage of Prince Charles and Lady Diana Spencer. More than 100 broadcasting organizations from 74 countries transmitted the pictures to an audience of some 750 million people. The BBC was responsible for both lighting and sound in the Cathedral; the event was, in fact, the biggest single outside broadcast ever mounted by the BBC, involving no fewer than seventeen mobile television control rooms and 60 cameras.

The focal point for the outside broadcast was a new BBC mobile unit (Colour Mobile Central Control Room (CMCCR)), specifically designed to provide all the facilities required to control complex outside broadcasts, and located close to St. Paul's. Signals from the mobile television control rooms were fed to the CMCCR, where the producer controlled the whole operation through a bank of 42 video monitors. The CMCCR is described later in this report.

The Cathedral was lit to a level of at least 1700 lux, so that cameras could be used with aperture settings of around $f/5.6$ to $f/6.3$, achieving good depth of field and the best optical performance from their lenses. CSI (Compact Source Iodide) and CID (Compact Iodide, Daylight) lamps were used for most of the lighting because of their superior efficiency and color stability. Filters were fitted to several large windows to provide color "correction" for the incoming light. Fifty-seven microphones were used for the television and radio sound,‡ mainly capacitor types used in cardioid configuration.

The main coverage was based on 20 stereo microphones, mostly coincident pairs; ultimately, seven miles of microphone cable co-existed with the 10-mile long lighting network. A sound control room was set up in the crypt, where a 64-channel mixer produced a "clean feed" of stereo sound, and a second mixed-feed mixer was used to add the commentaries in order to produce the main feed for BBC Radio. BBC Television carried out their own sound mixing, and other broadcasting organizations took either direct microphone feeds or outputs from one of the mixers. In addition to analog sound recordings, two digital recordings were made,

† A. H. Jones, "Digital Video Coding Standards: Factors Influencing the Choice in Europe," *SMPTE*, March 1982.

‡ J. A. Flewitt, "The Royal Wedding a BBC Sound Spectacular," *Wireless World*, September 1981.

one of "clean feed" and the other including the radio commentary. A surround sound (analog) recording was also made, using a 24-track machine to record the 16 outputs provided by four "sound field" microphones.

Program feeds were made available to the EBU headquarters in Brussels via the Eurovision land-link for distribution around Europe, and to Asia and the Americas via three Intelsat satellites. A two-camera mobile television unit, located outside Buckingham Palace, was made available to foreign broadcasting organizations for in-vision shots of national commentators.

The hard-of-hearing comprise a significant proportion of any large television audience; in the case of the Royal Wedding the BBC determined to help them by broadcasting the major events on both national networks, BBC 1 and BBC 2, with a full subtitling service on the latter. Prerecorded subtitles were used where details were known in advance, but for the live commentary subtitles were originated using the Palantype mechanical shorthand system devised for Ceefax and described under *Teletext* in this report. Two electronic keyboards were used, operating into an interface so that one Palantypist could take over from another without interruption.

All at Sea

The use of lightweight 2-camera electronic field production units is well established in the BBC, and they have been used for making several television series, including Thomas Hardy's *The Mayor of Casterbridge* and Jane Austen's *Sense and Sensibility*. A somewhat different electronic approach was used for a drama series shown in 1981 called *Triangle*, which was shot on a working ship plying a regular triangular voyage between the ports of Felixstowe in England, Gothenburg in Sweden, and Amsterdam in the Netherlands. To meet the requirements of working within the confines of the ship, all the required apparatus, including mixers and 1-in VTR, were assembled on two portable racks, each not much larger than a tea trolley, that could be moved round the ship to any location (Fig. UK-9). The series was shot using ⅔-inch-tube cameras, the first time such cameras have been exclusively used for a drama series in the United Kingdom, and possibly the first time in Europe. The approach led to high productivity: four 25-minute episodes were completed on each 10-day cruise and the whole series of episodes was completed in three months. A follow-up series has since been shot on another working ferry between the United Kingdom and Denmark, using similar techniques.

Figure UK-9. Two portable equipment racks (and the team that constructed them) used in producing a drama series aboard a working ferry.

Studios

In 1981, as in every year, major improvements were made to the main network production studios in London (Television Centre and Lime Grove). At Television Centre, one of the eight large studios (TC2) was completely refitted with new vision, sound, and lighting equipment, as was one of the two presentation studios (Studio A) (Fig. UK-10). Similarly, one of the production studios at Lime Grove (Studio D) was largely re-equipped.

A second television studio (Studio B) was brought into operation at the BBC's regional production centre at Manchester. This 2,500 ft.^{3} studio is used mainly for the production of regional programs, but programs for the BBC 1 or BBC 2 national networks will also be produced occasionally. The new studio concludes a £12 million radio and television development at Manchester which began in 1975 with the opening of Television Studio A and a suite of radio studios.

At the headquarters of BBC Wales in Cardiff a second continuity suite has been installed. The equipment includes an audio/video mixer of the "knob-a-channel" type, with remote control of both video and audio. A feature of the mixer is that control signals are converted from analog voltages to multiplexed digital signals, processed in PROMS to modify fading laws, and then converted from digital to analog in the appropriate fading amplifiers, thereby controlling the levels of the audio or video signals. A similar mixer has been installed for BBC 1 continuity at Television Centre in London, and another is being installed for BBC 2.

Figure UK-10. The main production control desk in the newly-equipped Presentation Studio "A" at Television Centre.

Figure UK-11. Part of BBC's new "C" format editing suite.

New Multi-Machine Videotape Editing Suite

In common with most other broadcasters the BBC is gradually changing over from the 2-in quadruplex recording format to 1-in helical scan; in the case of the BBC, C-format (non-segmented) has been standardized.

The increasing use of these machines has led to a requirement for a C-format multi-machine editing facility, and the BBC's first suite of this type has been brought into service, using a BBC-designed system to control up to four machines (Fig. UK-11).

Most commercial editing systems are designed for one-man operation using a single dedicated control panel with keyboard entry. The BBC system, on the other hand, offers a separate control panel for each machine, with dedicated switches for each function. It was designed after much consultation and cooperation with the users, and provides a system which is easy to use, allows for dual manning (thereby shortening editing time) and also provides "hands-on" training for assistants. The equipment has proved so successful that another four systems are to be manufactured by the BBC's Equipment Department.

Conversion and Transcoding

All standards conversion is now performed by the BBC's two ACE (Advanced Conversion Equipment) 4-field digital field store convertors. The three original analog converters — the world's first electronic field standards converters — have now been removed, although one of the quartz delay lines (about the size of a dinner plate) has been preserved for posterity.

The BBC has also recently designed, built and installed its first digital SECAM to PAL transcoder; this uses the CCIR recommended digital sampling standard of 13.5 MHz for the luminance signal, and 6.75 MHz for the two color difference signals. This equipment can also be used as a synchronizer (by replacing the SECAM decoder by a high quality PAL decoder) and, since it has been designed to follow the rapid changes in line length associated with some helical-scan video recorders, as a time-base corrector.

Real Time Graphics

During 1981 four digital graphics units, designed and built by BBC engineers, were installed at Television Centre for operational use.

EAGLE (Electronic Announcements, Graphics, and Logo Equipment) is principally a replacement for remotely controlled monochrome cameras used for the standard range of apology or announcement captions. It stores, in digital form, data which can generate a wide range of static symbols ranging from text to complicated maps and logos (Fig. UK-12). Data for the symbols are prepared on the Television Service graphics computer and, after processing, are transferred to standard, eight-inch floppy discs. EAGLE has two disc drives, allowing rapid access ($\frac{1}{2}$ sec) to 32 different pictures, since each disc can hold up to 16 symbols. The information is stored in condensed form, known as run-length code, whereby each active line

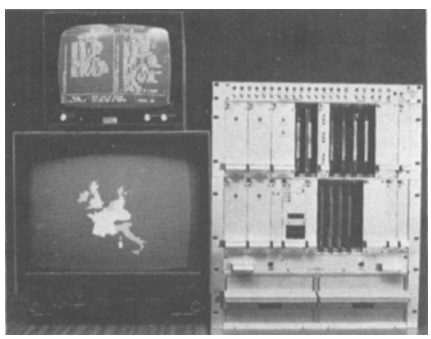

Figure UK-12. EAGLE stores in digital form data which can generate a wide range of static symbols.

Figure UK-13. Members of the BBC Engineering Design team shown with the ANT generator (R) and the BBC Zeus software development system.

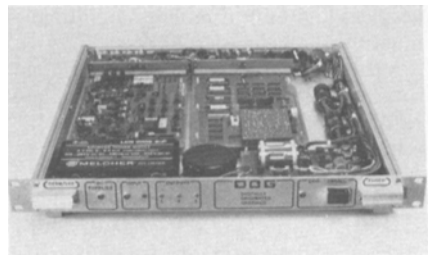

Figure UK-14. BBC's DOG (Digitally Originated Graphics) generator.

period is notionally divided into 1024 picture elements (pixels). The code describes, in 8-bit instructions, which color is to be used and how many pixels it should run. The use of run-length coding leads to economical storage without loss of resolution. EAGLE contains a microprocessor which is responsible for the overall control of the system, and for reading data from the discs into random access memories; these store two symbols, which are then available for immediate display. Using this feature it is possible to "cut" between two symbols, thus avoiding the $\frac{1}{2}$-second disc access time.

The difficulty of manipulating run-length code in real time with only limited processing power means that EAGLE cannot easily change the shape of colored areas. A separate unit known as MOUSE (Microprocessor Open University Symbol Equipment) was therefore designed to generate the moving symbol for the Open University title sequences (the Open University is described elsewhere in this report). In MOUSE, a Z80 central processor unit is used with both read-only and random-access memories, and with a display store originally designed for an electronically generated clock display. A variation of run-length coding is employed, whereby numbers are placed in fast random-access memories by the processor, and these define the pixel counts at which foreground/background transitions occur on each television line.

A modified form of MOUSE, known as ANT (Animated News Titles) is now being used to provide opening sequences for news programs (Fig. UK-13). The generation of these title sequences by a dedicated unit has saved a considerable amount of frame-by-frame videotape editing and, perhaps more importantly, frees an expensive videotape recorder for general use during news transmissions.

In parallel with this work a low-cost, general purpose unit has been designed called DOG (Digitally Originated Graphics) (Fig. UK-14). This equipment uses ultraviolet erasible PROMs to provide internal storage for up to 16 Kbytes of run-length code. This is sufficient for a single reasonably complex picture or up to eight smaller symbols. Initial applications have included generation of action-replay symbols, especially for use with C-format 1-in videotape recorders; safe text area overlays with an optional alignment grill; and logos for inclusion in background scenes. A remote position control allows small symbols to be moved over the screen, and this has been used with a stored set of arrows to highlight points of interest.

Electronic News Gathering

The BBC conducted successful trials on electronic news gathering in 1977/78 but failed to reach agreement with the unions on the operating conditions necessary for its regular introduction into the television service. In November 1980 terms were agreed upon and during 1981 ENG got into full swing.

By the end of the year six ENG units were on the road, each comprising a saloon car with two-man crew equipped with camera and recorder. The cars do not carry radio-link equipment, but have provision for transmitting programs to Television Centre via a coaxial cable system permanently installed in Central London. Where a radio link is required a vehicle equipped with a 2.5 GHz transmitter and a roof-mounted circularly polarized antenna with dish reflector is used. Four receiving aerials installed on the roof of Millbank Tower, a high central-London office block, allow reception from most parts of the city. From Millbank Tower the signals are carried to the Television Centre in West London by cable. At the Centre there are editing suites for both 625-line and 525-line operation, as well as two more versatile transmission editing suites. The simpler suites can be easily de-rigged to form mobile editing units, so that tapes can be edited at the news point.

Outside Broadcasts

The Television Outside Broadcast Unit is a London-based engineering group within the BBC's Television Service. It provides engineering planning, operations, and maintenance for the BBC's television outside broadcast requirements, although each regional headquarters operates and maintains its own vehicles.

A program for the provision of new "full facilities" television outside broadcast (OB) vehicles for the Television Service has been under way for some years, and in 1981 the last of the six Type 5 vehicles designated for the London area was brought into service. The facilities provided by Type 5 include up to eight camera channels, 22 picture monitors, and a stereo sound desk. At 36 feet long, over 8 feet in width, and weighing 18 tons, the vehicles are only just inside the legal limits for both size and weight. Four more of the Type 5 vehicles are to be supplied for regional use, three based in Manchester and one in Birmingham.

These large OB vehicles meet most requirements, but every year there are some events for which even the largest is inadequate. The Lawn Tennis Championships at Wimbledon, for example, require a transportable control area large enough to house the staff and production and engineering facilities for the control of up to 30 picture sources. In 1970 the problem was solved through the introduction of a Colour Mobile Central Control Room (CMCCR 1) which operated in conjunction with one or more conventional outside broadcast vehicles to provide a production, sound, and communications center while the other vehicles provided camera control and other facilities. The need to keep the width of the vehicle within legal limits imposed certain restrictions on the design, but nevertheless CMCCR 1 was used successfully for ten years.

In 1981 a replacement vehicle (CMCCR 2) was brought into service. This was designed by BBC engineers to overcome the width restrictions by incorporating a control room which can be enlarged when the vehicle is stationary — the walls of the central part of the vehicle are electrically driven outwards to create a room almost 15 feet wide. One of the expanded sides contains a bank of 34 monitors, 30 black-and-white and four color; the other side accommodates the production staff and allows free movement around the production control desk.

At the rear of the vehicle is the sound control area, having a 44-channel stereo mixer, and a communication system based on a 50 × 100 pinboard matrix that enables the communications to be tailored to meet the needs of each outside broadcast. The front of the vehicle houses an engineering and vision control area where the vision signals are processed and monitored.

The CMCCR 2 was used for the first time in April to cover the Oxford/Cambridge University Boat Race, rowed over 4½ miles of the Thames, and always a big television event for the BBC. In 1981 twelve cameras were used to cover the race, three connected by landline, the other by radio link.

The CMCCR 2 is tailor-made, of course, for events like the Royal Wedding. For this event it was based close to St. Paul's and was fitted with an additional eight monitors. This gave the producer, who spent a long day in the vehicle, a bank of 42 screens from which to select the transmitted pictures.

Mobile Satellite Terminal

The 1980 Report mentioned the BBC's interest in using satellite circuits to relay pictures back to the studios from outside-broadcast locations, and described the trial conducted using a commercial transportable up-link terminal. The trial was very successful, and BBC engineers have now designed and built a mobile satellite terminal for the Television Service.

A particular feature of the new terminal is its compactness, such that the complete transmitter is accommodated on a lightweight trailer which can be coupled to any standard BBC radio-links vehicle. The trailer houses the 3-meter dish aerial, 14 GHz transmitters, check receivers, FM modems, and other associated equipment special to the satellite link. The transmitter, which uses a 600-W traveling wave tube in the output stage, can operate through the Orbital Test Satellite (OTS) or future European Communications Satellite (ECS).

The baseband video and audio interfaces and all the transmitter remote control and monitoring equipment are housed in three equipment boxes which fit into shelving bays in the link van. Thus, once the transmitter has been set up and the satellite initially accessed, the operation is completely controlled from the link van, which can be positioned up to 400 ft from the trailer.

The new terminal was brought into program use on Sunday, November 22, when it was used to transmit a church service through OTS from Guernsey for "Morning Service," a BBC 1 program. Guernsey is one of the Channel Islands, which although politically included in the British Isles are geographically part of France (they remained loyal to King John when he lost his other French lands) and lie close to the Cherbourg peninsula. The oversea path from Guernsey to the English mainland is about 80 miles, which precludes the use of direct SHF links for television outside broadcasts from the island.

Teletext

The United Kingdom teletext standard has now been adopted by all countries in Europe with the exception of France and Italy. This standardization has already been used to advantage — the first live exchange of teletext between broadcasters began in June, over a telephone circuit linking the BBC to the ORF in Vienna. Every day the BBC transmits some news pages to Vienna, where they are broadcast for the benefit of the large international community that resides there. In exchange, Ceefax is receiving and broadcasting pages of international weather reports and a page about the weather in Austria itself, as well as a few pages of general interest material in German.

Ceefax also broke new ground at the beginning of the year when, for the first time, it was used for the simultaneous subtitling of a live program — the inauguration of Ronald Reagan as 40th President of the United States. The subtitling system, developed in collaboration with Leicester University, uses a modified Palantype shorthand keyboard connected to a microcomputer; the latter compares the phonetic shorthand output with a 70,000 word dictionary in order to produce captions in everyday English. To ensure maximum accuracy the words held in the dictionary are tailored to the particular program but as with any form of machine translation, errors obviously occur, for example, "rain" instead of "reign." These are amusing to viewers with normal hearing, but deaf viewers have expressed unqualified appreciation of the system.

In the United Kingdom a significant improvement to the teletext services — BBC's Ceefax and ITV's Oracle — has been made by increasing the number of data lines transmitted in each field from two to four. In the case of Ceefax, this has reduced the average waiting time for a page from 14 to 7 seconds.

A major deterrent to sales of teletext receivers has been the public's lack of awareness of what the service has to offer. To overcome this the government (as part of its commitment to information technology), the industry, and the broadcasters cooperated to make October National Teletext Month. The industry and government spent £5 million on a variety of activities, which included organizing seminars for dealers, printing 3 million leaflets for the public and 8,000 sales promotion kits for dealers, and providing a travelling roadshow that visited seven cities. The broadcasters promoted teletext on-air, and the BBC has been exposing a larger audience to teletext by transmitting, at certain times, a selection of Ceefax pages instead of a test card. Despite the recession in the United Kingdom, National Teletext Month was successful in giving a significant fillip to sales at the year's end: the total number of units sold was estimated at 200,000 compared with 60,000 in the previous year.

Enhanced Teletext

The BBC is cooperating with other broadcasters and industry in developing enhancements to the United Kingdom teletext system. Some of this work is being done under the auspices of the Department of Industry, and close ties are maintained with British Telecom (the United Kingdom telephone administration, recently separated from the mail service) so as to maintain compatibility with the Prestel videotex service. In specifying enhancements, it is obviously important to use the teletext data channel as efficiently as possible, while maintaining, wherever possible, compatibility with earlier decoders.

Among the enhancements envisaged are:

Dynamically Redefinable Character Sets in which sets of high resolution graphics characters are transmitted to the receiver and can be associated with any

page or group of pages. This will allow higher definition pictures to be produced (realistic portraits, for example) than is possible with the present system; and the use of non-Roman character sets, including Cyrillic, Greek, Japanese, and Chinese. It will be possible to mix the different character fonts in the same display.

Alpha-geometric Coding extra "intelligence" in the receiver interprets transmitted codes to produce points, lines and surfaces on the television screen. This can be useful for certain specialized markets.

Telesoftware in which computer programs are transmitted using a series of linked teletext pages which, instead of being displayed, are fed to a computer. To investigate the educational potential of telesoftware the BBC and ITV are taking part in a joint project, coordinated by Brighton Polytechnic, in which some schools will be provided with teletext receivers enhanced so that they can function as small computers. Programs for the computers are being broadcast on Ceefax and Oracle, using a dialect of BASIC.

Alpha-photographic transmission will allow color pictures of photographic quality to be transmitted and displayed. As part of the enhancement development program, BBC engineers have constructed two identical units each comprising a microcomputer, a high quality digital picture store with video input and output ports, and interfaces to generate and decode data in the United Kingdom teletext format on 525/60 or 625/50 television standards. A complete color picture sampled at 13.5 MHz for each of the red, green, and blue components can be stored and retrieved using a double-sided double-density floppy disc. This apparatus, shown schematically in Fig. UK-1, will allow all aspects of advanced teletext to be investigated, including the development of a logical coding structure for the planned series of enhancements.

In June 1981 the equipment (converted to 525/60 working), was transported to Chicago for the IEEE Conference on Consumer Electronics, where it was used to demonstrate high quality still picture transmission via teletext. The demonstrations attracted many enquiries from cable television operators who saw a picture-teletext or picture-videotex system as a long-awaited and viable realization of their idea of providing customers with an illustrated electronic mail-order catalogue or real estate directory.

625-Line UHF Transmitter Network

Seventy-one new 4-channel relay stations were commissioned during the year, bringing the total number of UHF transmitting stations in service up to 578, and the proportion of the population served up to 98.9 percent. On average, each new station served about 2,000 people, a far cry from the Crystal Palace transmitting station which, radiating 1 mW effective radiated power on each channel, serves some 14 million people in the London area. In the eighteen years since Crystal Palace opened, the UHF network has been extended to cover the length and breadth of the country, a major engineering achievement.

Much effort is expended on reducing the cost of relay stations while maintaining technical standards, so as the populations served get smaller the average cost per additional viewer does not get disproportionately high. In this connection the BBC has designed a new transposer (used to change a received channel at a relay station to a new frequency without demodulation to baseband) which compared with earlier equipment is smaller in size, cheaper to manufacture and easier to install, and enjoys high reliability and simple maintenance. The heart of the transposer is a broadband active module which has no integral controls, but whose working frequencies are set when it is plugged into a passive "personality" module. Thus the transposer modules are all identical at all the stations fitted with the new equipment, which minimizes the number of spares required. A particular feature of the transposer is that its two synthesized local oscillators use a novel design that gives a transposer output frequency which is independent of input frequency drift. Thus where signals are relayed through several stations en route to their final destination, there is no accumulated frequency error. The compactness of the new transposer allows four channel units to be housed in a simple casing fixed to the aerial support pole. The heaviest spares unit weighs less than 20 pounds, so pedestrian access will be suitable for many stations, considerably reducing site costs. The new transposer equipment is now being manufactured by Continental Microwave Ltd. (Dunstable, England) under license from the BBC.

Occasionally it is not possible to find a site for a relay station from which it is possible both to serve the required area and receive incoming signals from a neighboring station. In some such cases, however, good reception of the required signals may be obtained at a second site one or two miles from a suitable relay site and the signals passed to the relay by means of a link station known as an active deflector. If the link site is a long way from the public electricity supply it becomes necessary to find alternative sources of power, and the BBC has been experimenting with solar and wind-powered generators. The first link station relying on these sources went into operation at Dychliemore in the west of Scotland in September. A wind generator and a solar panel assembly have been installed at the site, charging separate batteries; either battery can, when fully charged, supply the equipment for three weeks without recharging. The wind generator, mounted at the top of the 55-ft aerial support pole, has blades about 6 ft in diameter and provides a maximum output of 500 W (at a wind speed of 30 miles per hour). Four solar panels, also fitted to the pole, provide a maximum combined output of 225 W. Automatic changeover equipment selects the solar-powered battery if the battery supplied by the wind generator should fail, although there is no inherent reason to prefer either source. Monitoring apparatus is being used to record the performance of each supply system, and the data will be used in developing equipment for further wind and/or solar-powered stations.

Open University

In 1966 the government of the day announced that it was to introduce a revolutionary step in adult education through the establishment of an Open University, whose students would work at home to obtain degrees through correspondence courses. The significance of the Open University was that unlike other educational establishments, it would offer university-level education for all those who wanted it and were capable of following their desired course, regardless of their age, status, or existing academic qualifications. An essential feature of the plan was that lectures should be broadcast on radio and television, and the BBC undertook to make and transmit the programs, with the costs being met by the Open University. A self-contained production center was established at the BBC's Alexandra Palace studios in North London, and transmissions began in 1971 (Alexandra Palace occupies a place in television history because it was from there that the first regular high-definition-405-line-television service began in 1936). The Open University's success has exceeded most people's expectations: by the end of 1981 45,000 students had graduated, and currently 63,000 students are taking courses.

The Alexandra Palace studios were intended as a temporary arrangement pending the government's making available the funds necessary to build a dedicated production centre at the Open University's headquarters at Milton Keynes, about 50 miles from London. In September 1981 this plan came to fruition when the new production center came into operation; it is equipped to make 400 radio and television programs a year, and is the biggest purpose-built educational broadcasting production center in Europe.

The center consists of an administration block, which provides design offices and listening rooms, and a technical block. The technical block contains two television studios (6,000 ft^2 and 1,800 ft^2), two sound studios, a central technical area, film dubbing/review/editing areas, and the usual support areas: these include wardrobe, make-up, scenery, and visual effects

Figure UK-15. BBC/OU production center. General purpose desk in the radio control room.

areas, as well as mechanical, electrical, and electronic maintenance workshops and stores. The studios and control rooms (Fig. UK-15) are constructed as separate structures within a protective envelope, to ensure good acoustic isolation.

The large television studio has four color cameras, and its production control suite is at ground floor level to allow easy access to the studio for production staff. This arrangement is considered preferable to the usual high-level gallery with observation windows.

The smaller studio has been equipped initially for operation on a "drive-in" basis using the Open University's outside broadcast vehicle — a 3-camera unit. The installation has been confined to production lighting, plus cabling to a point in the nearby outside broadcast base where the vehicle will be parked when used in this mode.

The 1-in helical scan C-format has been specified for recording, and four new machines have been installed. Two existing 2-in quadruplex machines have also been transferred from Alexandra Palace to replay existing recordings.

An essential element in making Open University programs is the video rostrum, comprising a color camera mounted vertically above a graphics table. Pre-programmed servo-controls enable the camera to traverse laterally in two directions while the lens can be simultaneously zoomed; a series of movements can be stored in a memory. The unit has a color synthesizer, and a 4-channel mixer unit can be used in conjunction with the studio or VTR for animation work.

The Open University's success in Britain has created international interest in its teachers, techniques and systems, and its experience is helping in the creation of similar institutions elsewhere, including Everyman's University in Israel, and the People's University in Pakistan. A company has been formed, owned by the University, to distribute correspondence courses, films, tapes and experimental kits throughout the world. The Open University's American office is at 110 East 59th Street, New York City, 10022.

In 1981, Rank Cintel telecine equipment won an Emmy engineering award; the company added to its MKIII flying spot scanner a number of new features. Designated the MKIIIC, the new machine embodies variable-speed shuttle control, saturation control, servo brake release foot switch, on-air indicator, more convenient inch-mode operation and an improved servo enabling the machine to stop as quickly as it starts (Fig. UK-16).

Figure UK-16. The MKIIIC flying-spot telecine (Rank Cintel).

Independent Television

Due to circumstances beyond anyone's control, the Independent Television portion of the United Kingdom Television Report arrived too late for publication in the May JOURNAL. The following brief excerpt was fitted in at the last minute to provide some idea of the contents of the entire report. The report was contributed by Pat Hawker, Independent Broadcasting Authority, 70 Brompton Road, London SW3 1EY, England.

For Independent Television, 1981 was primarily a year of preparation, for fulfilment in 1982. All program company contracts terminated on December 31, 1981, with new contracts starting on January 1, 1982. Among other changes these involved two entirely new companies (Television South and Television South West); two new "dual regions" (South and South-East England, East and West Midlands); a change of name (ATV Network changing to Central Independent Television); and a number of transmitters being re-attributed to different regions, most of which required preparatory engineering work. The year saw also major engineering preparations for the new national Channel Four network and (in Wales) Sianel 4 Cymru (the programs for which will be the responsibility of the Welsh Fourth Channel Authority but with the IBA responsible for the transmission) both of which are due to open in November 1982, but with a number of transmitter installations completed during 1981.

Independent Broadcasting Authority (IBA)

The year saw notable progress in the IBA scheme for its entire transmitter network to be controlled from just four Regional Operations Centers; all four ROCs are now operational although further work is needed to extend them to Channel Four/Sianel 4 Cymru. Also the Croydon ROC for the whole of London and South-east England has still to be virtually rebuilt to take full advantage of stored program control based on the Ferranti Argus computers.

None of this work has been permitted to delay the continued expansion of the UHF transmitter network with 70 more relays opened during the year, most of them now small gap-filling installations serving fewer than 1000 viewers.

Preparation has also been the dominant theme of Engineering Research and Development which has again been much concerned with international standardization, particularly the search for digital standards and future use of direct broadcast satellites.

IBA engineers have also been concerned with the continued rapid expansion of the Independent Local Radio system with seven new services — involving 17 transmitters — opened during 1981, bringing the total number of ILR services to 33, and with up to 36 more now authorized.

Although much thought has gone into the question of remote supervision of unattended transmitters and computer-based

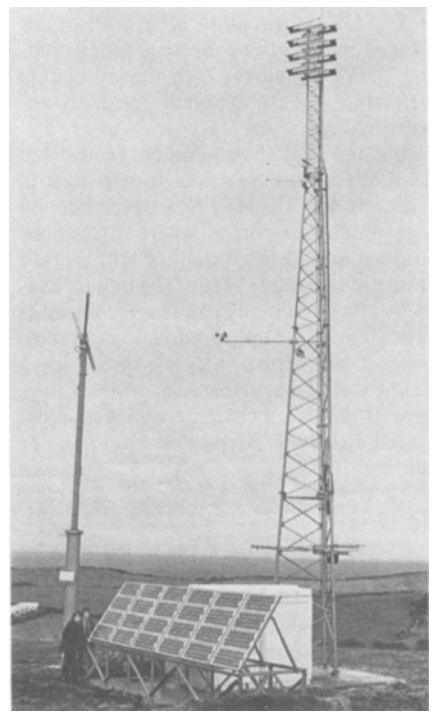

Figure UK-17. Four-channel UHF sun-and-wind-powered television low power relay station.

Figure UK-18. First of a new generation of Regional Operations Centers opened at Emley Moor. More than 550 unattended transmitters are now controlled from four ROCs.

automatic swtiching and information retrieval, the severe winter of 1981-82 continued to underline the vitally important human factors in field engineering. Mast climbing may still be necessary in sub-zero temperatures; long and uncomfortable journeys have to be made to remote sites; sites where building work is in progress may still resemble mud-baths; it can still be necessary to use blow torches to gain entry through frozen-up doors; connectors still deteriorate and moisture can still sometimes seep into co-axial cables; installation and maintenance can still involve painful hours of work in elbow-crushing containers. Field engineers, and their practical skills, remain an essential part of television broadcast operations.

In September 1981 the IBA completed Britain's first sun-and-wind-powered low-power relay to serve some 300 people in an around Bossiney, near Tintagel on the north Cornish coast (Fig. UK-17.).

ROC: With the bringing into operation of three Regional Operations Centers at Emley Moor, West Yorkshire, St. Hilary, near Cardiff and Black Hill, and central Scotland, the entire IBA television network is now controlled from just four ROCs (Fig. UK-18).

During 1981, IBA engineers began a detailed investigation of a novel transmission system which, it is believed, could overcome prolems involved in the future use of direct broadcast satellites in areas such as Europe where broadcasting across frontiers is rendered more difficult by the number of different signal formats and color encoding techniques.

Thames Television: The Thames News Program now has four ENG mobile units and two ENG booths in full operation. The remaining parts of its film operation are being replaced and Thames News will become the first all-ENG news program to be broadcast in the United Kingdom.

London Weekend Television (LWT): 1981 was a busy year for LWT because of the program of studio equipment replacement. By the end of February a new VTR area was opened to replace the old area which had become increasingly crowded.

Anglia Television: Anglia Television has also been expanding and re-equipping technical areas and studios.

Border Television: Viewers living in the area where England joins Scotland and in the Isle of Man are served with ITV programs by Border Television. This company has new studios in its Carlisle television center, and the build-up of facilities and equipment continues.

Harlech Television (HTV): HTV which provides a mixture of Welsh and English programs has been involved in considerable engineering expansion and re-equipping in preparation for the fourth Welsh channel which will begin service in November 1982.

Tyne Tees Television: Tyne Tees TV is continuing to reorganize technical areas at its Newcastle headquarters.

Yorkshire Television (YTV): YTV installed a number of new items of equipment including a computerized Datatron Super Tempo (ST5) CMX Edit Controller, called the Edge.

Scottish Television (STV): During 1981 STV concentrated on adding to its facilities, particularly in the videotape area. A completely new videotape time-code edit suite was commissioned (Fig. UK-19).

Brief Reports From Other Countries

Indonesia

A new laboratory owned by PFN (State Film Laboratory) is being built. Situated in a big building, the laboratory is complete with all modern equipment including two black-and-white processors, two ECN processors, four ECPII processors with a capacity of 56 ft/min and one CRI processor. Interchangeable for 16 mm or 35 mm, Other equipment for the laboratory which, it is believed, will soon be running at full capacity, will include a Hazeltine Colour Analyzer and Bell & Howell printers.

The Indonesian Government is tentatively planning to build, somewhere in Jakarta, a film center that will contain sound recording space, a film library and storage, a distribution office and special effects facilities.

Malaysia

Filum Negara, the government film studio in Kuala Lumpur, has obtained from Filmlab/Australia an ECP2 16/35 mm (100 ft/min capacity) and an ECN2 16/35 mm 60 ft/min capacity processor, but they are not operating because the building of the laboratory has not started. Filmlab/Australia also supplied Gevachrome II 16-mm processors with capacities of 60 ft/min and 28 ft/min to RTM TV/Kuala Lumpur and TV Sabah/Kota Kinabalu.

Taiwan

The International Film Laboratory was taken over by the Central Motion Picture Corporation, a government film unit. A new laboratory, the China Motion Picture Studio, was set up in Taipei, complete with all negative processing, contact printing and reduction. Another government-owned laboratory, Taiwan Film Studio in Taichung, situated in the center of Taiwan Island has begun limited operations. The five laboratories in Taiwan are sufficient to serve the film production activities in the country.

Thailand

There are five film laboratories in Bangkok. Only a few Thai productions were sent outside the country for processing as the local facilities were quite sufficient. It was even ordered by the government that all foreign pictures for screening in Thailand must be printed in Bangkok.

Hong Kong

Mandarin Colour Printing & Developing Ltd. was taken over by a big finance company and its name was changed to Mandarin Film Lab because of a decline in film production and too many laboratories. The laboratories are, none of them, planning to add new equipment, but they do plan to maintain the present level of services offered until the situation improves.

Figure UK-19. Videotape control desk for Scottish Television.