

# TV TECHNICAL REVIEW

*Special US-TV issue*

Two Shillings and Sixpence

## Marconi Band IV/V television transmitters

A universal drive transmitter and a range of amplifiers  
up to 50 kW power rating

### drive

Designed for colour with highly accurate independent adjustment of differential gain and phase.

Unique linear diode modulator operating on the absorption principle.

Sound and vision equipment integrated to ensure good sound to vision carrier stability. Designed for parallel operation.

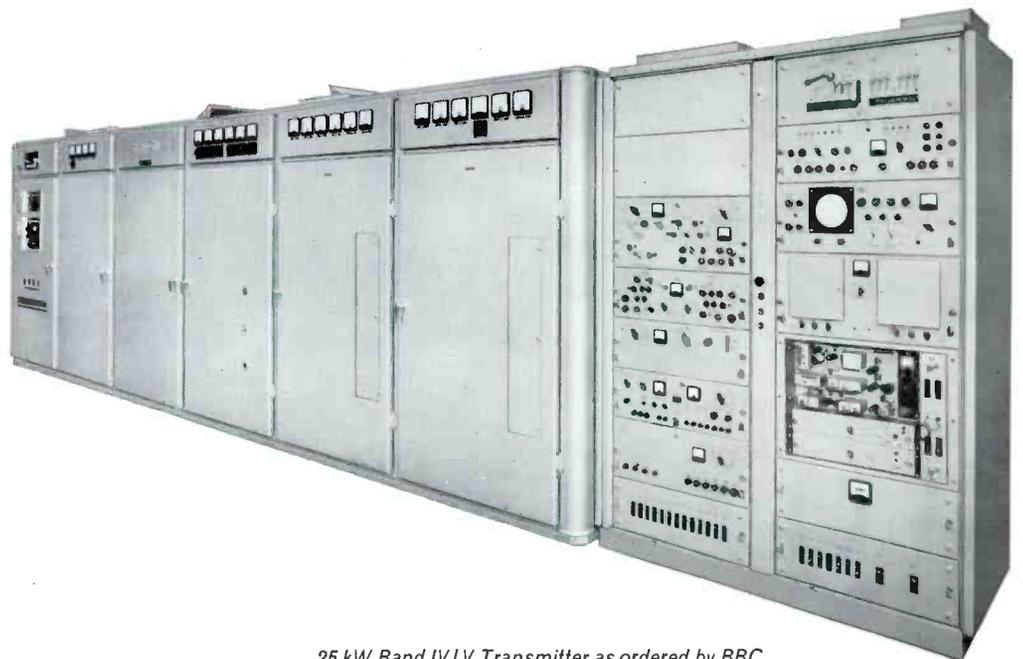
### amplifier

Similar klystrons used for vision and sound amplifiers.

Air cooling employed up to 10 kW. Water cooled klystrons used for higher powers.

No back access required.

Specially designed for parallel operation.



25 kW Band IV/V Transmitter as ordered by BBC

## Marconi television systems

# 3

## good reasons

Why radio & TV stations all over the world specify NEC equipment

### 1

NEC is Japan's leading manufacturer of telecommunications and electronics equipment, with total integrated capability across the entire range of modern electronics. (Example: 60% of Japan's 325 TV broadcasting and satellite stations and 26% of her 409 medium-wave radio broadcasting stations were supplied by NEC.)

### 2

NEC designs and produces complete, integrated systems of radio and TV broadcasting equipment to meet the international standards of FCC, CCIR, AIR, etc.

### 3

NEC equipment is designed for excellent signal quality, reliable as well as efficient operation, easy access, simple maintenance, minimum power consumption and minimum floor space requirements.

#### Recent major NEC exports

- Spain** . . . . A 200-kilowatt MW broadcasting equipment
- Iran** . . . . Two sets of 100-kilowatt MW broadcasting equipment
- India** . . . . One set of 100-kilowatt, two sets of 50-kilowatt and 32 sets of 10-kilowatt MW broadcasting equipment
- Cambodia** . . . . Complete TV broadcasting system including a 5-kilowatt transmitter, studio facilities, ST link equipment and remote pick-up unit
- Philippines** . . . . Complete TV broadcasting system including a 5-kilowatt transmitter, studio facilities, ST link equipment and remote pick-up unit
- Indonesia** . . . . Complete TV broadcasting system including a 10-kilowatt transmitter, studio facilities and remote pick-up unit
- Taiwan** . . . . A 5-kilowatt TV transmitter with its associated equipment
- Australia** . . . . 4 sets of 10-kilowatt and 2 sets of 6-kilowatt transmitters with their associated equipment
- Singapore** . . . . A 50-kilowatt SW transmitter and its associated equipment

P.O. Box 1, Takanawa, Tokyo, Japan

# NEC

*Nippon Electric Company Limited*

# international tv technical review MAY 1964

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MAJOR BREAK-THROUGH in colour film and slide transmission in RCA's new TK-27 vidicon colour film camera, first introduced at the NAB 42nd. Annual Convention and Exhibition, full details of which are given in this issue. Mary Lou Hattendorf adjusts a module in this camera which features a 1½-in. vidicon in the luminance channel.

## IN THIS ISSUE:

Technical Trend ... ..	158
I.E.R.E. Journal Digests ... ..	159
The U.S. Scene ... ..	162
This New Look Television ... ..	172
Technical Personality News ... ..	182
Standards Conversion and 625 ... ..	189
Photocells for Lasers ... ..	191
Industry New Developments ... ..	194
N.A.B. Report ... ..	199
What is N.A.B.? ... ..	200
United States Patents ... ..	201

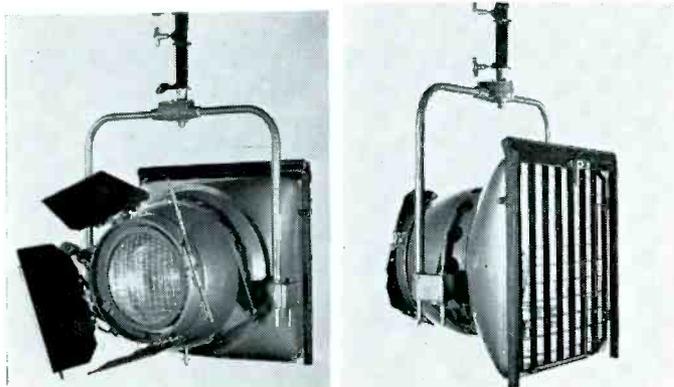
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# Mole-Richardson



## THE 'TENLITE'

The M.R. 'Tenlite' softlight fitting was developed some years ago to fulfil a particular television studio requirement, but the 1963 version of this design is proving so successful in application and in service that steps have been taken to introduce the obvious advantages of such a unit to photographic studios and salons. Ten separate light sources within an area of approximately six square feet provide a soft beam which can be varied by the type and density of the diffuser material employed in the frame fitted to the front of the unit. The holder is so designed that the changing of diffuser material takes only a few seconds.



## THE 'TWISTER'

The M.R. 'Twister' is an entirely new type of studio luminaire which has been devised by our engineers, initially to reduce the 'turn around' time in studios. It is an extremely efficient 2,000 watt unit which can be converted from a solar spot to a soft flood in a matter of 15 seconds, by pole operation from the studio floor. In the soft light setting there is no direct light emanating whatsoever and the loss in total lumens is negligible.

New



## THE DUTCH DOLLY

A collapsible and revolutionary T.V. or Film Camera Dolly, designed for O.B. and location work. It has a number of important features, not only does it collapse, but it can be used for very low level work in this position. The elevating screw can also be used in this collapsed position, so varying the panhead base level between 16" and 24 3/4". In the normal erected position, the minimum base height is 33 1/4" and the maximum 42". Cameras weighing up to 220 lbs.—100 K.G. may be accommodated, the dolly weighs approximately 132 lbs.—60 K.G.



## THE MOLEQUIL QUARTZ IODINE HAND LAMP AND CADMIUM NICKEL BATTERY

The compactness of the new quartz-incandescent lamp and its high efficiency in terms of lumens per watt are employed to the full advantage in this new fitting. When battery powered the MOLEQUIL is particularly suitable for newsreel and location work, but it can also be operated from studio supply or mains, when it is invaluable for interview work and also as a modelling light.

The MOLEPAK is, for its capacity, the smallest and lightest source of power for the operation of cameras and lights. A cadmium-nickel battery is contained in a fibreglass housing. The charger is a separate unit, but is designed to lock on top of the battery for easy transport. The MOLEPAK can be used in any position without risk of spilling and with normal use will not need any servicing for three years.



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NEW LINE . . . .

Serial No. TECH/MA 158A

# NEW LOOK IN EQUIPMENT

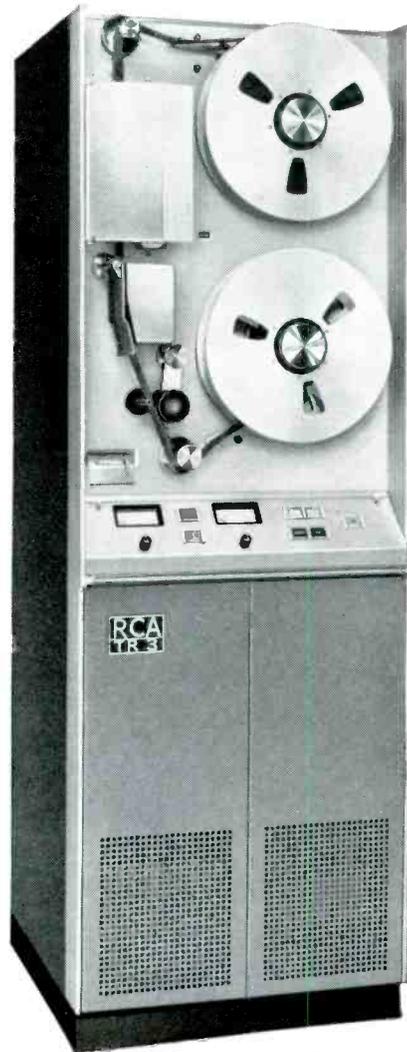


# Now there are four quadruplex

All completely transistorized...with interchangeable



NEW TR-4



NEW TR-3

## Want total performance in a compact ?

This new fully transistorized TR-4 does just about everything the deluxe model does. And it's compatible with all quadruplex recorders. Makes professional quality tapes. Uses standard modules like RCA's deluxe TR-22 Recorder. Has space for Pix Lock, ATC, Color ATC, and electronic splicer modules. Completely contained in one 83.8 cm x 55.9 cm x 167.6 cm unit.

## Want playback only ?

Here's the TR-3 tape player, a simple low-cost, high quality machine for playback of all standard tapes. Use it for "screening" commercials and programs or for putting them on air. Completely compatible with all standard quadruplex recorders. Fully transistorized for compactness and dependability. Standardized and modularized. Space for color modules.

See the entire RCA line before you buy any TV Tape Recorder

See your RCA Distributor or write: RCA International Division, 30 Rockefeller Plaza, New York 20, N. Y., U.S.A.

# RCA TV tape recorders!

modules...and switchable standards!



NEW TR-5



DELUXE TR-22

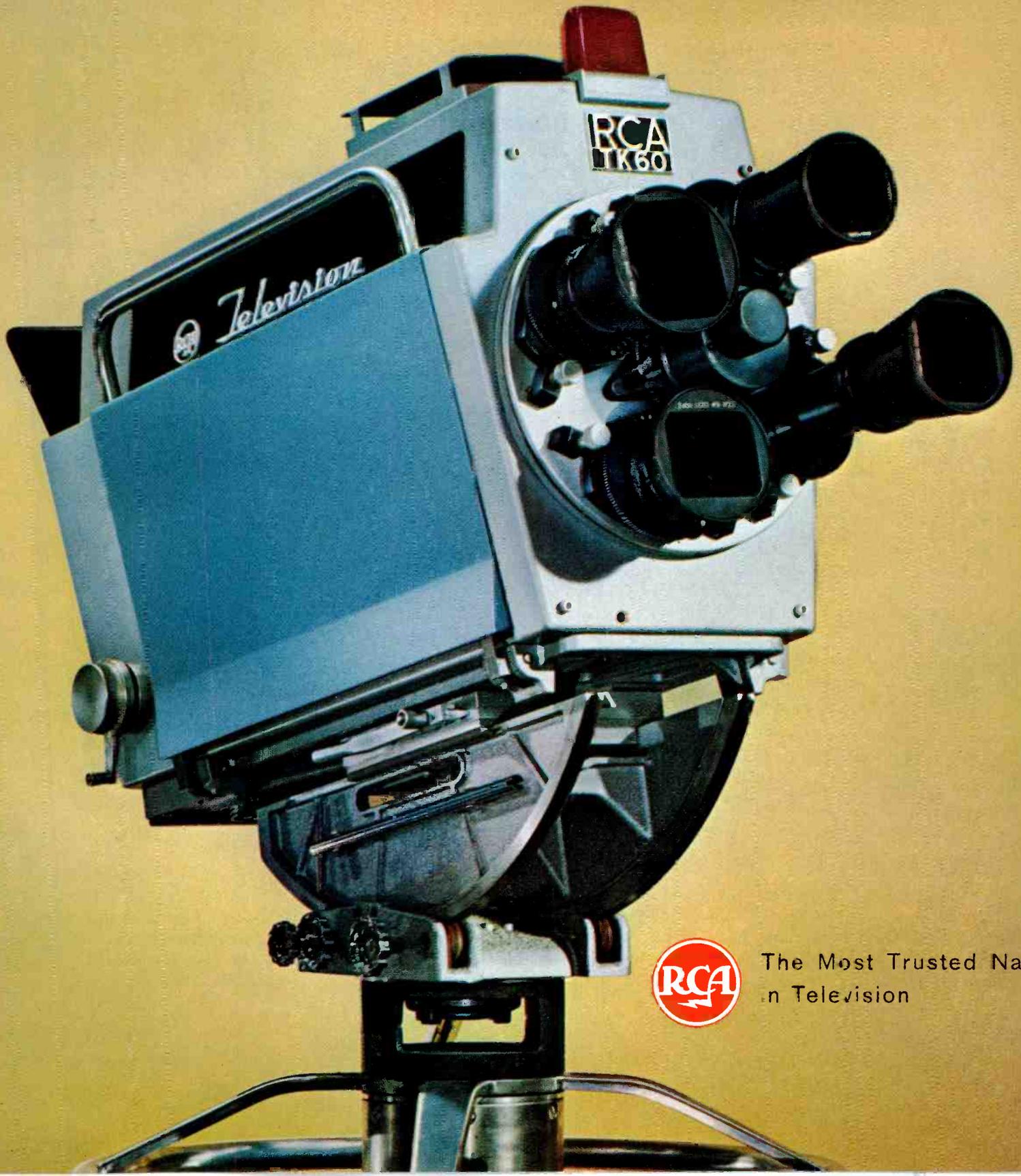
**Want mobility?** By putting this compatible, low-cost, all-transistor recording unit on wheels and lowering its height to only 81.3 cm we've solved a lot of taping problems. The TR-5 records tapes in the field that you can play back on all standard quadruplex recorders. Records in color as well as in black-and-white.

**Want the very finest?** It's not exaggeration to say the incomparable TR-22 is the most desirable of all TV Tape recorders. Its striking functional design is backed up by operating features that make quality tapes a simple certainty. Any studio can benefit from this symbol of the finest in compatible quadruplex TV Tape Recorders.



The Most Trusted Name in Television

# RCA TK-60 Mark of Deluxe Television



The Most Trusted Name  
in Television

# TREND TOWARDS TV ROBOTS

A LARGE section of this issue of International TV Technical Review is devoted to a survey of techniques and apparatus seen for the first time at the recent 42nd Annual Convention of the National Association of Broadcasters, held in Chicago, attended by a London, England, team from this journal.

The reason so much emphasis is centred on this Convention is because considerable technical changes are now taking place in the pattern of U.S. radio and television, and it is essential to study these trends.

One purpose of a Convention, naturally, is to convene; and under the NAB banner thousands of television and broadcast executives were able to meet to discuss coming technical changes. From my own personal point of view I found these discussions as invigorating as the new technical facilities to be seen in the demonstration areas. Although Europe is now making plans for 625-line colour, while the United States has had colour and even UHF networks for some ten years, the technical acceleration today in America is at a startling rate. Automatic TV programme controllers, pulse source timing, vertical Interval test signals (VITS) and many other developments—even the all-transistor camera channel—are actively on the technical schedule in the United States. Consider these contrasting but typical examples of advanced electronic trends which I noted while in the United States.

That important broadcasting group the National Broadcasting Company considers Audlock (a device which sends synchronising information over audio telephone circuits), superior in many respects to the more commonly used Genlock in telecasting from remote locations. In a paper presented at the Broadcast Engineering Conference, J. Lewis Hathaway, an NBC engineer, said that although Audlock is not completely automatic, it 'permits the ready alignment and locking of a remote sync generator so that pulses are properly timed at the central control location'.

This may be accomplished, he said, by watching the pulse-cross monitor while adjusting the phase shifter. When a remote has been properly aligned it remains so without readjustment unless a break or other discontinuity should occur on the audio sync feed line. He said the equipment needed for audlocking a single remote includes a transmitting unit at the central location and a receiving unit at the remote. The heart of the transmitting unit is a phase shifter which permits phase advance or retardation of sine wave signals derived from the master sync generator's horizontal drive pulses. The pulses are amplified and converted to double frequency sine waves through a double-tuned toroid transformer. The vertical pulses are brought into approximate alignment by motor drive and are eased into precise line adjustment manually. The complete process generally requires about 45 seconds.

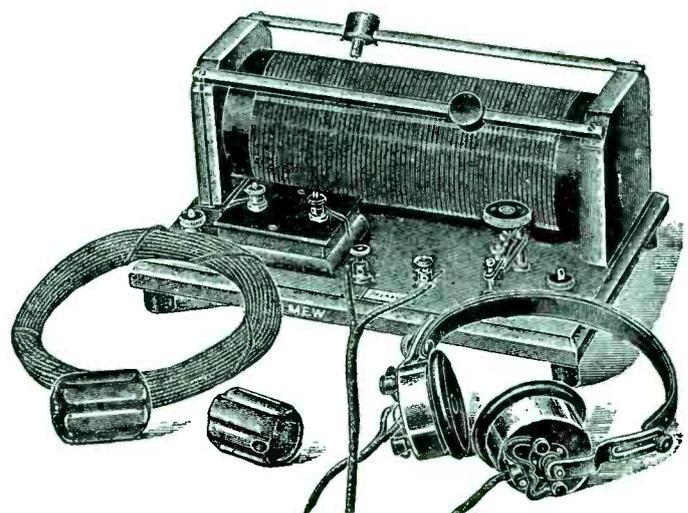
This Audlock receiver merely amplifies and multiplies frequency of the 3.94 kc signal from the audio telephone line. Transmission distance may be from a few yards to hundreds of miles. When a long telephone circuit is employed there are two main requirements: it must pass the signal frequency and it

must not be of the carrier type circuit as the carrier may be reinserted slightly off frequency. Mr Hathaway said the Audlock system enables proper co-ordination at a central location of any number of remotely located sync generators. It has become a 'must' in NBC's programme planning.

HIGHLIGHTS of what the Columbia Broadcasting System is doing to update its facilities was described in a paper presented by three executives of the CBS television network: Richard S. O'Brien, director of engineering; Joseph A. Flaherty, director of technical facilities planning and K. Blair Benson, director of A-V engineering.

Each studio in the new headquarters is an essentially self-sufficient production unit with its own control room. Three additional control rooms handle network and local continuity and originations from the newsroom. Operating adjustments for all sources, including assigned tape, telecine, and remote channels, as well as live cameras, are fed by remote to the control rooms, but set-up functions for all cameras are centralised. A camera control channel only two and a half inches wide, makes it possible for an operator to control a large number of sources. Interconnection of centralised sources with the studio or programme control points is fully mechanised, with the basic control of assignments handled by digital computer memory throughout the 24-hour broadcast day. The same dual-computer installation also controls station break switching and stores lighting-preset instructions for all studios. A video switching system, using wire-spring relays, requires composite signals only and includes a circuit which automatically prevents superimposition of non-synchronous sources. A compact, fully transistorised studio audio console is supplemented by combined audio-video switching in both studio and programme control rooms. Solid-state circuitry is used almost entirely throughout. . .

So for this moment shall we turn from looking over the horizon towards the future trends, and try to remember the 'solid-state' device many of us used at the dawn of broadcasting. I wonder if you remember. . . .



# I. E. R. E. JOURNAL DIGESTS

★ An up-to-the-minute abstract of practical and instructive television papers by world experts, published in *The Journal of the British Institution of Radio Engineers*. This is a survey of abstracts covering nearly 900 papers in total, and which are felt to be of prime interest to *International TV Technical Review* readers. In many instances complete copies of these papers are available, and code details are given at the foot of this page.

AS a contribution to the ever-increasing problem of retrieval of scientific information, the Institution of Electronic and Radio Engineers (formerly The British Institution of Radio Engineers) has issued abstracts of papers which have appeared in its Journal between 1952 and 1963. Arranged according to the Universal Decimal Classification, the abstracts cover nearly 900 papers, articles and reports published during the twelve-year period and considerably simplify literature searches in the fields which have been dealt with in the Journal of the Brit. I.R.E.—now known as *The Radio and Electronic Engineer*.

The abstracts have been compiled in sufficient detail to enable the searcher to determine whether reference to the full paper will give him the information he requires. A complete list of these Abstracts is published at 10s. 6d. (including U.K. postage) by the Institution of Electronic and Radio Engineers, 8-9 Bedford Square, London, W.C.1. Abstracts have been classified by subject according to Universal Decimal Classification, and arranged in order of their U.D.C. numbers, which are printed at the head of each abstract.

590 621.397.12  
**Facsimile communication.** H. F. Woodman and P. H. J. Taylor.

The requirements for facsimile communication in public telegraph networks, commerce and industry are discussed and some of the factors concerned in the choice of suitable equipment for various applications are considered. The principles of operation of some types of equipment already in use are described and details are given of various methods of control. An outline is given of new equipment under development to simplify message-handling and to provide extended facilities. Vol. 16, page 129, March 1956. ‡

591 621.397.12:557.509  
**Facsimile transmission of weather charts and other material by landline and radio.** J. A. B. Davidson.

A rapid expansion in the facsimile broadcasting of meteorological information has taken place throughout the world during the past few years. An outline of the present situation is given in the paper, which also discusses the technical requirements of the service and examines special problems relating to radio transmission. Description of facsimile terminal apparatus developed for this service are given. Recorders feature the use of direct recording electrolytic paper and automatic operation. Reference is also made to facsimile equipments designed to handle other material including half-tone pictorial representations.

Vol. 16, page 115, March 1956. ‡

592 621.397.12  
**Cablefilm equipment.** S. N. Watson.

Cablefilm motion picture facsimile equipment has been developed for transmitting short lengths of 16 mm film over long distances as quickly as possible. A good quality music circuit for about 6 kc/s bandwidth is required. Techniques similar to those found in television circuits are employed. Although a considerable time is employed in transmission, the system is nevertheless many times faster than previously used facsimile systems. The reasons for the choice of the particular transmission standards employed are given.

Vol. 20, page 759, October 1960. ‡

593 621.397.13 (204.1)  
**The development and design of an underwater television camera.** D. R. Coleman, D. Allanson and B. A. Horlock.

The operational requirements influencing the design are considered. The camera and associated electronic equipment

follow standard television practice (625 lines 50 frames or 525 lines 60 frames). The mechanical problems of the camera casing are discussed and the handling arrangements for both diver-controlled and deep-sea cameras described. Some of the problems of underwater illumination are touched upon and a new type of remotely focused lamp referred to briefly.

Vol. 15, page 625, December 1955. ‡

Awarded the Louis Sterling Premium for 1955.

594 621.397.13:341.16  
**The technical consideration of television in the international field.** T. Kilvington.

International aspects of all classes of telecommunications are dealt with by the ITU (International Telecommunications Union) and its consultative committees, the CCIR (radio) and CCITT (telegraph and telephone). These bodies consider standards for television and the requirements for point-to-point transmission of television signals over long distances.

Vol. 20, page 293, April 1960. ‡

595 621.397.13  
**Industrial television: a survey of history, requirements and applications.** J. E. H. Brace.

The economic basis of industrial television is analysed and current and future trends in equipment design are briefly considered. A survey of some typical established applications is given, namely industry, commerce, science, and education; applications are classified under four headings, respectively control and surveillance, data transmission, instructional and experimental.

Vol. 20, page 441, June 1960. ‡

596 621.397.13:5/6(47)  
**Application of television in industry and science in the USSR.** V. I. Sardyko.

Television sets developed in the Soviet Union for the purpose of remote checking and control are briefly described. Examples of the application of television in medicine, metallurgy and railway transport are considered. Some practical results of the application of television in the automation of manufacturing processes and in scientific investigations are also discussed.

Vol. 20, page 449, June 1960.

597 621.397.13:535-1/3  
**A high-grade industrial television channel with reference to infra-red operation.** J. H. Taylor.

The range and scope of the uses of television for industrial purposes are indicated to give some of the design requirements and to show broadly how they have been met with reference to a particular television channel employing a vidicon camera tube. In addition, two special applications are described, namely the use of this channel with infra-red and ultra-violet light.

Vol. 20, page 77, January 1960. ‡

(continued on 197)

## KEY TO SYMBOLS

The majority of the papers abstracted are available in the issues indicated. Symbols after the bibliographical details denote the following:

\* These papers are completely out of print. Copies may be borrowed from the Institution's Library.

† These papers are only available in bound volumes.

‡ These papers are also obtainable in reprint form from the Institution (Price 3s. 6d. per copy).

§ These papers are included in the Institution publication "The Collected Clerk Maxwell Memorial Lectures."

# 'ENGLISH ELECTRIC'



**BBC 2  
WILL USE**

# EEV

**HIGH POWER  
KLYSTRONS**

EEV 25 kW klystrons are being supplied to the British Broadcasting Corporation for use in the new UHF transmitters.

*Full information on these and other high power klystrons manufactured by EEV is available on request.*



## ENGLISH ELECTRIC VALVE COMPANY LIMITED

AGENTS THROUGHOUT THE WORLD

Chelmsford, England. Telephone: Chelmsford 3491



# US SCENE

## N.A.B. REPORT

*FANTASTIC CHICAGO landmark which dominated skyline of NAB 42nd Annual Convention — Marina City, twin towers rising majestically 60 storeys on North Bank of Chicago River. First 20 floors of car parks, then 1,000 luxury flats and offices. Theatre with 1,500 seats, skating rink, 600-boat sea-park zone. Total cost £12-million. In Chicago they have the biggest of everything, even of television Conventions. . . .*

**I**NTERNATIONAL TV TECHNICAL REVIEW was the only professional television and electronic journal outside the United States to be officially represented at the 42nd. Annual Convention of the National Association of Broadcasters which has been held in Chicago, attended by some 4,000 heads and senior engineers of radio and television stations. A large section of this issue is devoted to an NAB technical report which in itself is a cross-sectional survey of electronic facilities displayed at this great United States centre. Here, at a mammoth Convention and technical exhibition held at Chicago's Conrad Hilton Hotel, were the pre-1965 TV equipment which American users will enjoy, and also the cream of British, Canadian, Swiss, German and Japanese television gear.

Why is this all so internationally important? Face the basic facts of world TV technical development.

Soviet Russia has yet to make up her mind which colour-TV system to adopt, while Britain, France and the rest of Europe are still arguing the relative merits of NTSC and SECAM. *The*



# DIRECT FROM CHICAGO

United States has had a public colour service for more than ten years. The BBC has only recently been given Government sanction to start a second channel on UHF, and UHF-TV is still new to large areas of Continental Europe. In the United States, many networked stations have had a UHF-TV of some sort for over ten years. Over vast areas of Europe and Asia there is still no adequate TV service, and a choice of two channels is usually considered a luxury. In New York City, one has a choice of no fewer than thirteen TV channels. The sheer vastness of the United States has no doubt contributed to the high accelerative pace of TV technical development. While it is true that Britain pioneered the modular format, and was a leader in transistorisation of video circuitry, and (as is perhaps only to be expected in a nation which invented radar) in the microwave realms achieved marvels with the first magnetrons and klystrons, the NAB Convention each year has seen the birth of some other vitally important technical facet . . . video taping, separate luminance colour cameras, and many more. So gradually NAB has come to be regarded as a Mecca for TV engineers wanting to keep abreast of development. NAB hold their Conventions each year

in different areas as a rule, moving from the Pacific Coast across to Washington, and again this year to Chicago. External laboratories and great manufacturing companies ship their latest lines, in some instances even prototypes. In addition to the 'greats' such as RCA and GE, Ampex and Collins, Gates and Raytheon, NAB attracts Evershed and Angenieux, Marconi, EMI, Pye, Sony, Northern Electric of Canada, EMT, Neumann and many more from outside the frontiers of the United States.

**Y**ET, surprisingly enough, at this vast Convention of FM, UHF-TV, colour-TV and all-transistor video taping, senior guest of honour and speaker at one of the cavalcade of NAB reception lunches, was the BBC's own Director of Engineering, Mr Francis C. McLean. In a sense he was following in the footsteps of his predecessor, Sir Harold Bishop, who spoke before NAB delegates two years ago. Mr McLean was refreshingly frank.

'We have followed with great interest over many years the fortunes of UHF in the United States,' he said, 'and have followed the arguments for and against inter-mixture. Our position is however different, and we cannot avoid inter-mixture and are going into it in quite

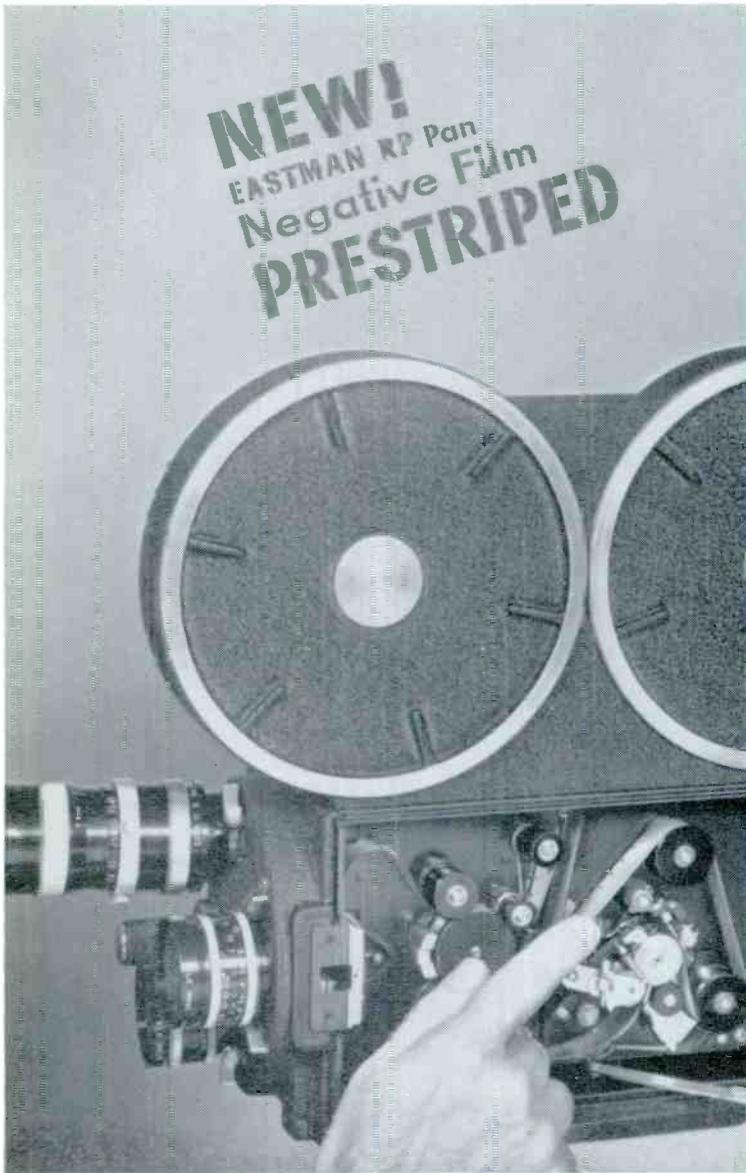
*NO LOST CUES can happen, as Jim Henderson of Q-TV proves at Chicago when he clocks out a yellow horizontal dispatcher strip on a specially-adapted IBM electric machine. In background is giant 3-in. lettered cue-sheet on a Q-typer.*

a big way. Moreover we have no option but to make it work, and somehow or other we have got to persuade the public to like UHF as well as they like VHF, and to like it well enough to pay the extra cost. How far we shall do this in the early years, I do not know. It is clear, however, that it will be difficult, and we are doing everything possible in the planning stages to ensure that we shall achieve our aim.

'Our plans cover that we shall eventually be radiating four transmissions from each site. From the work done, we think that in an area such as London the signal strength variations between the two channels will, for about 92% locations in the area, be not greater than about 6db, or not greater than about 10db for 99% of the locations. These figures we think are within the range of a normal receiver. We have experienced of course some very heavy shadow effects on UHF, but in general it has

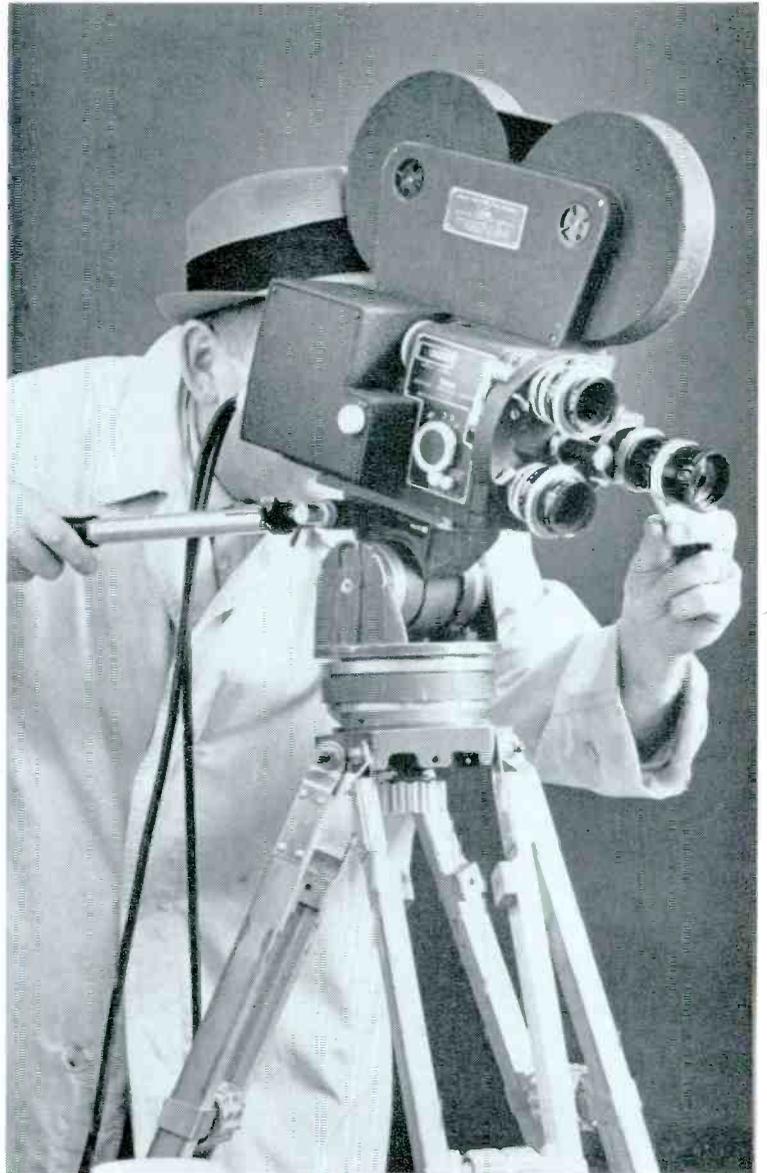
*(continued on page 166)*

# LOAD, SHOOT, SHOW...IN MINUTES.



## LOAD...

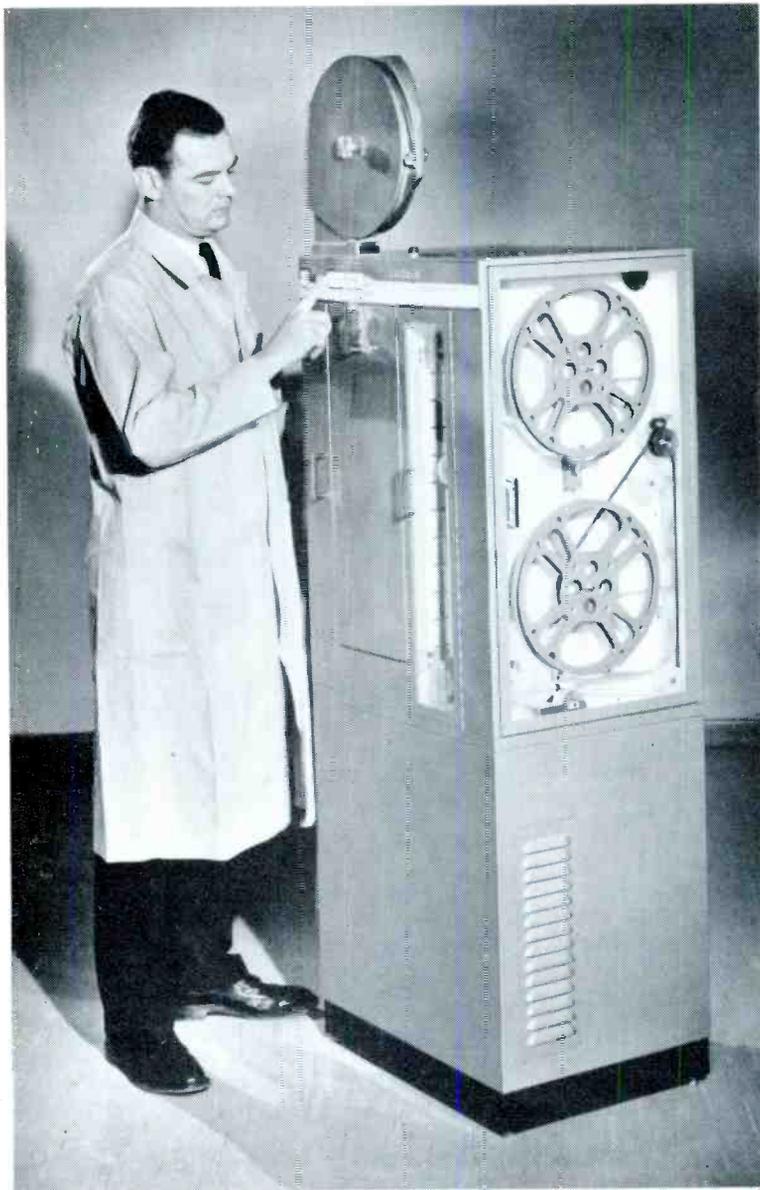
with new EASTMAN RP Panchromatic Negative Film, Type 7229! Here is a film designed for tight deadline shooting. It's magnetically pre-stripped for single system work. It has a high-quality, fine-grain emulsion that has the same speed-granularity ratio as Plus-X negative but it is really fast . . . ASA 250. It's designed specifically for the EASTMAN VISCOMAT Processor!



## SHOOT...

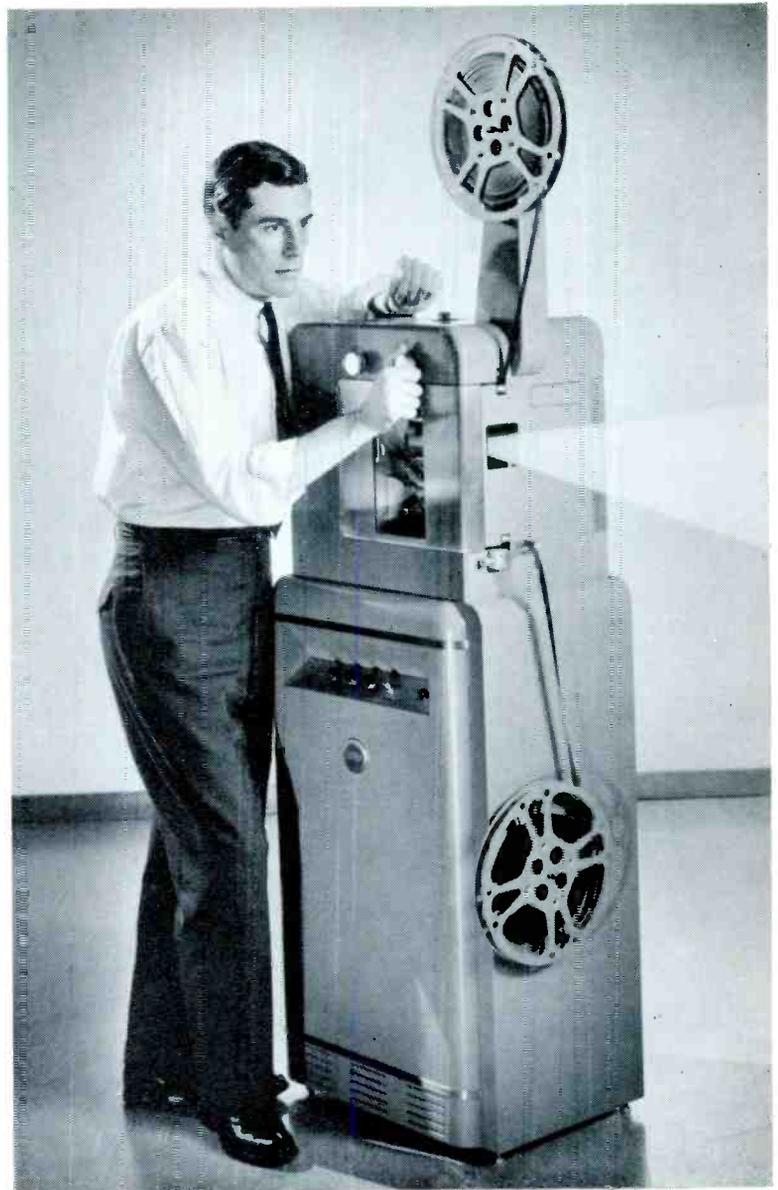
the event with a KODAK Reflex Special Camera. Adapted for single system magnetic sound recording, it's designed to meet the most critical professional needs. It has brilliant reflex through-the-lens viewing and astoundingly accurate frame positioning for rock-steady screened images plus a broad line of accessories that make this camera unexcelled in the world

# GET KODAK QUALITY ALL THE WAY.



## PROCESS...

the film in minutes with the new 16mm EASTMAN VISCOMAT Processor. Evenly—beautifully! It operates at a sizzling 36 ft/minute, delivering dry, ready-to-project footage. It has push-button simplicity, no chemicals to mix or replenish and a unique one-time-use chemical system that provides considerable savings in labor, time and consumable supplies.



## PROJECT

the film with the EASTMAN 16mm Television Projector, Model 275. It's built for critical accuracy, long, long life, and it's designed for use in both 50- and 60-field television. A unique heavy-duty film advance assures more power in the film drive. Accessory available for magnetic playback. KODAK EKTAR Television Projection Lenses assure maximum sharpness and brilliance.

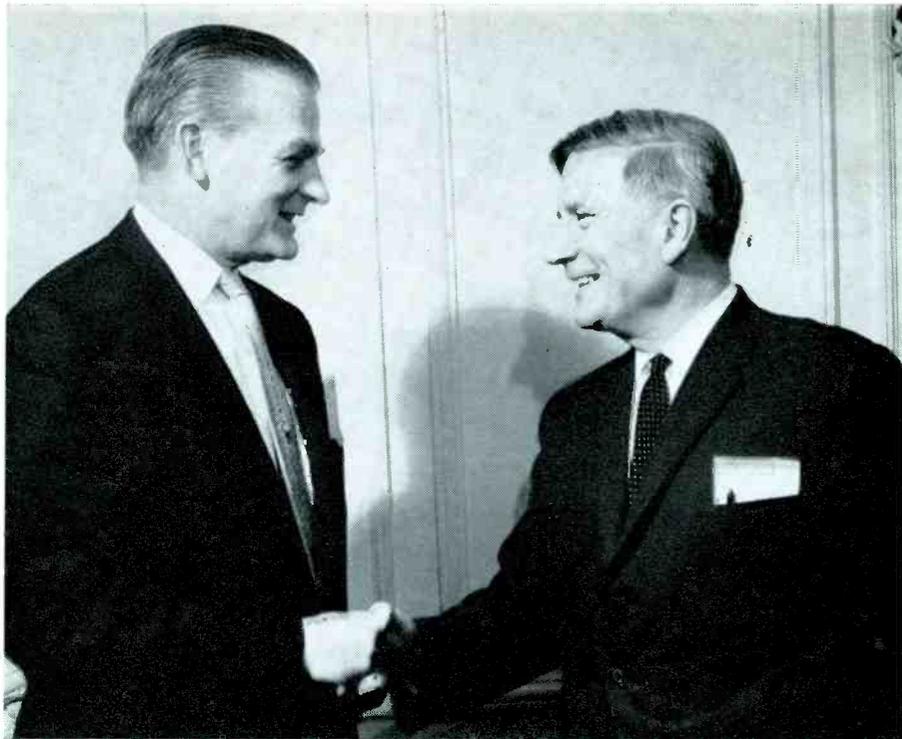
*Camera, processor and projector are available in both 50- and 60-cycle models. Write for detailed literature or see your local Kodak Representative. Motion Picture Products Sales Department,* **EASTMAN KODAK COMPANY, ROCHESTER, N. Y. 14650**

**Kodak**

turned out better than we feared in spite of the fact that the London skyline includes a fair number of buildings which, although not on the New York size, still in many areas give conditions approaching those in that city. We think that some 99% of the population within the +73db contour should receive a good service. These transmissions were carried out on black and white and on colour using all three of the proposed colour systems. In all this we followed with keen interest the findings of the FCC on their transmissions in New York as they became available, and in general we find ourselves in agreement. A full report on all our tests is due to be published shortly, although some of the information obtained has already been submitted to the CCIR. The results of work done in Europe, in particular in the Moselle Valley in Germany, in mountainous areas in Switzerland and in Italy, have not differed to any great extent from the results we have obtained in our tests in an area having only slight hills. The Moselle Valley results show a difference of 10 db for 95% of the locations.

It is fair to explain that in addition to being a Guest of Honour and a special delegate to NAB, Mr McLean was a senior member of the representatives of BBC TV Enterprises, whose office at 680 Fifth Avenue, New York City, was for the duration of the Convention largely transferred to the Conrad Hilton, staffed by Jack Aistrop, Peter Green, Sue Goldman and the rest of the BBC TV Enterprises team.

And what of the other exhibitors? Taking them as nearly as possible in alphabetical order, **Albion Optical Company**, of 1410 No. Van Ness Avenue, Los Angeles, 28, brought a nostalgic touch of home to every member of the British International TV Technical Review team, for Albion are sole US importers and distributors of Rank Taylor Hobson lenses. Gordon Cook, RTH's Chief of Lens Development, was with Albion's Vice-President Benjamin Berg, and John Barr, RTH's Development Engineer, Servo Systems, and the international throng at Chicago were eagerly noting details of the Varotal V zoom already described in these pages, and shown on Ampex camera-channel equipment. Ortol fixed-focus lenses and vidital lenses for vidicon cameras were also on show. A neighbouring space was taken by the **Alford Manufacturing Co**, of Boston, Mass, and with Richard Pouliot, Harold H. Leach and Fred Abel we discussed Alford's FM broadcast aerials, diplexers, coaxial switches, vestigial sideband filters and RF measuring instruments. Several German, Italian and British visitors will no doubt be corresponding with these Alford aerial—sorry, 'antenna'—experts, as the United States



can give the rest of the world a great deal of practical experience in TV and FM arrays, and Alford have built some of the biggest.

**EXPERTS** in speech input equipment, preamplifiers, audio power amplifiers, equalisers and studio audio controls, **Altec Lansing Corporation** from Anaheim, Calif, naturally attracted great attention at the Convention, and we discussed European TV and broadcast audio problems with Altec representatives including Arthur C. Davis, W. H. Hazlett and H. S. Morris. Altec condenser microphones are used at many US-TV stations, and at Capitol Recording Studios over 70 Altec Duplex speakers are used. In the equipment section we were particularly interested in the Altec 63A programme equaliser, a rack-mounted unit, giving 12db maximum boost and 16db maximum attenuation at any selected frequency.

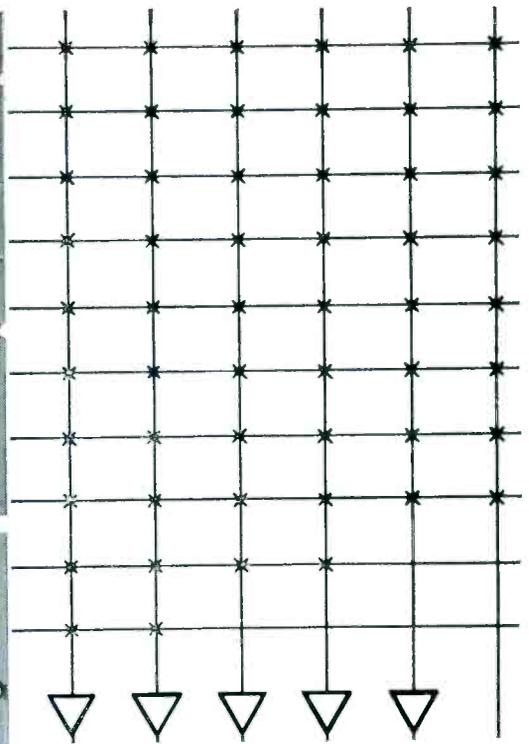
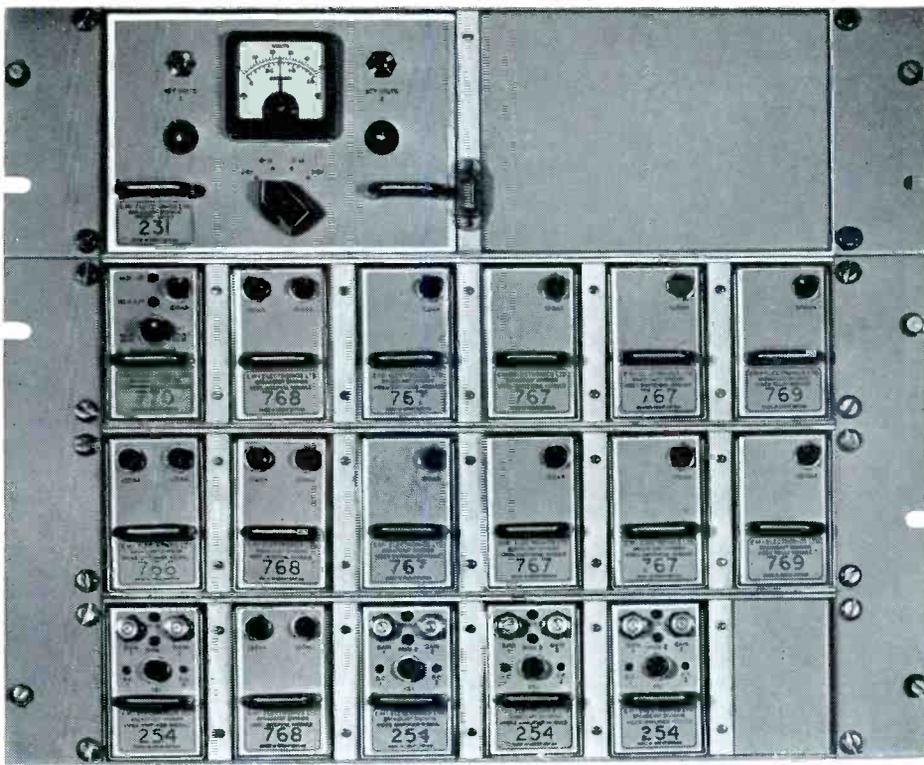
**Ampex Corporation** display included also a well-exhibited selection of British equipment of The Marconi Company, and following the NAB Convention most of this Marconi display was shipped to Ampex' own permanent exhibition centre at Redwood City. Among the most notable Ampex newcomers is the VR-200 colour-combatible recorder which they claim is capable of producing higher-quality recordings than any previous recorder. Our editorial team was shown this video tape machine by Mr. Robert J. Weismann, Ampex Vice-President and General Manager of the Video and Instrumentation Division.

A new high band record-reproduce standard is being introduced as an optional operating mode with the Ampex VR-2000, permitting substantial improvement in signal-to-noise ratio and corresponding improvement in picture quality. 'Conservatively, third generation tape

*GREETED AT NAB is BBC's Director of Engineering (right), Mr. F. C. McLean. "We have followed with great interest the fortunes of UHF in the United States," he told delegates. "and have followed arguments for and against inter-mixture. Our position is different. We cannot avoid inter-mixture, and are going into it in quite a big way..."*

copies equal in quality to present masters can be produced using the high band capability of the VR-2000,' Weismann said. High band signal-to-noise ratio is 46db, a 4db improvement over any previous recorder. A second low band standard is also incorporated, permitting tape interchangeability with present recorders. The low band standard has a signal-to-noise ratio of 45db, compared with 42db for previous recorders and provides correspondingly improved picture quality. By making use of the high band, signal-to-noise ratio for colour recording is 46db, the same as for monochrome recording. Signal-to-noise ratio for colour recording on the low band is 40db. On the high band, moiré is 40db maximum. The VR-2000 is available in a 525-line, 60-cycle version and a 625-line, 50-cycle version—with both high and low band standards. Optional electronic modules and a simplified version of the Ampex interswitch accessory makes it possible to record and playback tapes in both 625-line, 50-cycle and 525-line, 60-cycle standards. The VR-2000 features new Ampex Mark IV video heads with rotary transformers and integral nuvistor preamplifiers, which make substantial contributions to improved picture quality

*((continued on page 168))*



# EMI

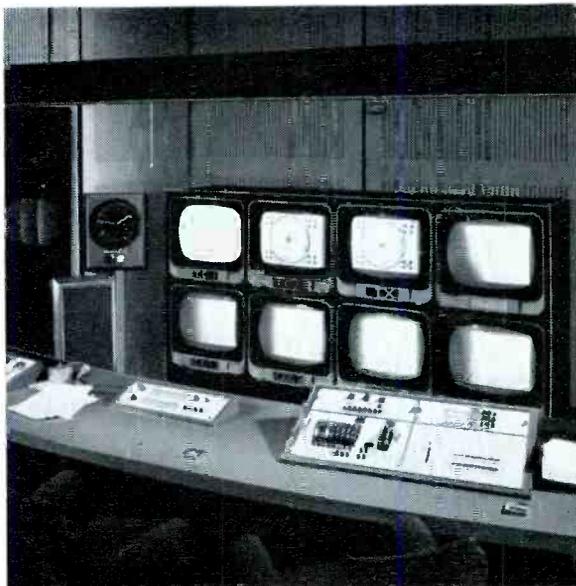
## SEMI-CONDUCTOR VIDEO SWITCHING EQUIPMENT

The new EMI semi-conductor system outdates relay and electro-mechanical switching equipment and provides increased flexibility in system design with very good reliability and performance.

The system comprises a series of plug-in modular units of standard size. Six units can be fitted in a mounting frame and accommodated in a 19-inch (480 mm) rack or an EMI standard case. Frames can be bolted together to form any required size of switching matrix.

### IMPORTANT FEATURES

- Modular construction provides complete flexibility in studio system engineering
- Greatly reduced rack space requirement due to new design techniques
- High performance specification suitable for use on all television system standards, both monochrome and colour
- Ability to switch during vertical blanking interval
- High degree of inter-channel cross-talk isolation
- Increased reliability resulting from exclusive use of semi-conductors



# EMI

*Further details will gladly be provided on request.*

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# NAB Report

in both master and duplicate tapes. Maximum K factor (transient response) for the VR-2000 is 2%. Bandwidth for the VR-2000 is  $\pm 1$ db (referenced to 100Kc) for the following: domestic low band—4.2 Mc-3db; domestic high band—4.5 Mc-3db; international low band—5.0-3db; and international high band—6.0-3db.

Another Ampex sensation is the MR-70 master audio tape recorder. This new recorder has improved dependability through use of industrial/military grade nuvistors, which have a failure rate of 10 to 20 times less than conventional vacuum tubes and about two times less than germanium transistors. The MR-70 has a signal-to-noise ratio of 70db (full track at 15ips), a full 10db better than previous Ampex master recorders. It thus takes full advantage of low-noise tapes and anticipates future tape improvements through improved electronics. Fast, positive starts, essential to master recording techniques, are provided by a power boost to the reel idler, motors and solenoids during the start function; stability of tape motion is assured by heavy ribbed casting, viscous damping of reel idler and a scrape flutter idler. Three new high precision heads

are machined and aligned to maintain absolute azimuth and zenith. No adjustment is required throughout the life of the heads. Head stacks are individually replaceable, and one head assembly can accommodate  $\frac{1}{4}$ ,  $\frac{1}{2}$  or 1-inch head stacks. Built-in Sel-Sync (yet another Ampex Corporation trade mark) permits conversion of any one of the recording heads to serve as a temporary playback head while the other are still recording.

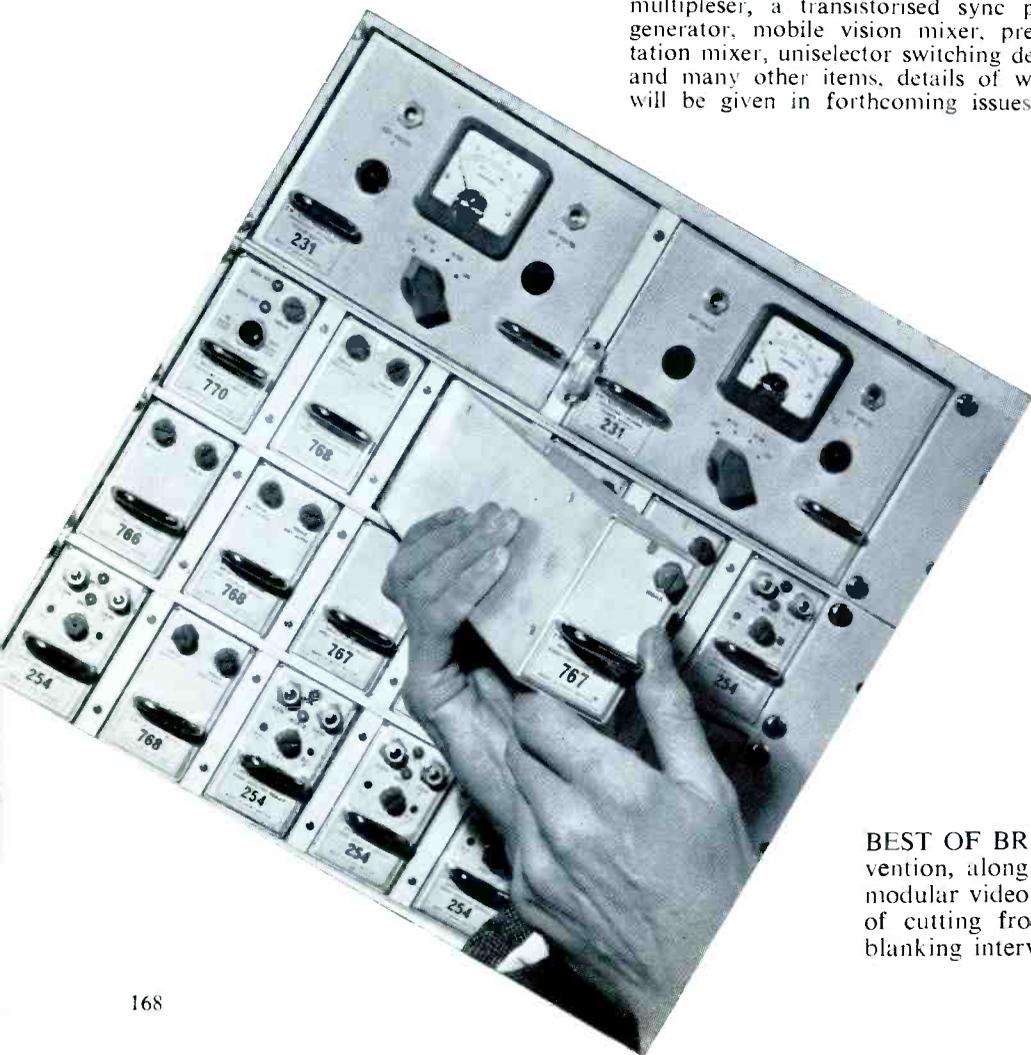
**S**TOP-MOTION is now a standard feature of the VR-1500 and VR-660 portable video recorders, we were told by Mr Weismann, and this stop-motion was demonstrated for the first time at NAB. Stop motion enables the operator to stop the tape during the reproduce mode at any instant for close inspection of any video field. It is useful in analysis of X-rays, detailed study of material for educational presentation, study of athletic form and minute inspection of materials in quality control applications. A push button disengages the capstan motor from the capstan shaft on the recorder and the tape stops. By manually rotating the pinch roller, the tape may be moved to any desired position or video frame for inspection on a monitor. When the button is released, normal reproduce mode is re-established. As this is such a valuable facility, we were interested to discover that a kit is available to enable older recorders to be updated to include stop-motion. The Marconi exhibits included  $4\frac{1}{2}$ in image-orthicon and vidicon cameras, the Type 923 multiplexer, a transistorised sync pulse generator, mobile vision mixer, presentation mixer, unselector switching device and many other items, details of which will be given in forthcoming issues.

Among leading US experts in microwave aerials, coaxial switches, rigid transmission lines and telescoping masts is the **Andrew Corporation**, of Chicago, and at NAB we talked with John Gyurko, Dr Victor J. Andrew and Robert C. Bickel about Andrew microwave aerials and in particular the Heliac flexible air-dielectric cables. And as the Arriflex camera is today an international TV-filming tool, we felt again a touch of nostalgia in meeting Victor James (Vice-President) and Lou Polonec, of **Arriflex Corporation** of America, fresh from their Park Avenue South, N.Y. office. To international NAB visitors they were showing not only Arriflex-16 and 16-M as well as the Arriflex-35, but also Siemens 2000 16/16 double system sound projectors. British television engineers are using the ATC tape cartridge system, and on the **Automatic Tape Control Inc** stand we talked to Vernon A. Nolte and Robert S. Johnson about the latest ATC 55, so named because it plays up to 55 taped spots, themes and audio production aids. The heart of all the playback units is the heavy-duty ATC tape transport with its hysteresis synchronous positive speed direct capstan drive motor. The Criterion tape transport offers speed accuracy to 99.8%, comparable to the finest reel-to-reel machines. Sealed precision instrument type ball bearings are used making transport wow and flutter less than .2% rms. The ten inch-ounces of driving torque developed by the Criterion transport virtually eliminates tape slippage and pinch wheel pressure problems on all cartridge sizes and tape lengths.

George Baker, Jack A. Rickel and Ron Jansen of **Ball Brothers Research Corporation**, Boulder, Colorado, introduced us to a number of new facilities and techniques presented not only by BBRC but by Tele-Measurements Inc of Livingston, N.J. Of outstanding interest in the TV field are the Mk VI BBRC special effects generator, ideal for keyed inserts and matting; and Ball's slow scan TV equipment. This latter provides a versatile, high performance source of narrow band video signals for scientific or industrial use. Major components of this system include: A  $1\frac{1}{2}$ in vidicon camera head, camera control units, synchronising generator, 'real-time' video monitor, and a slow scan video monitor for photographic recording of narrow band images.

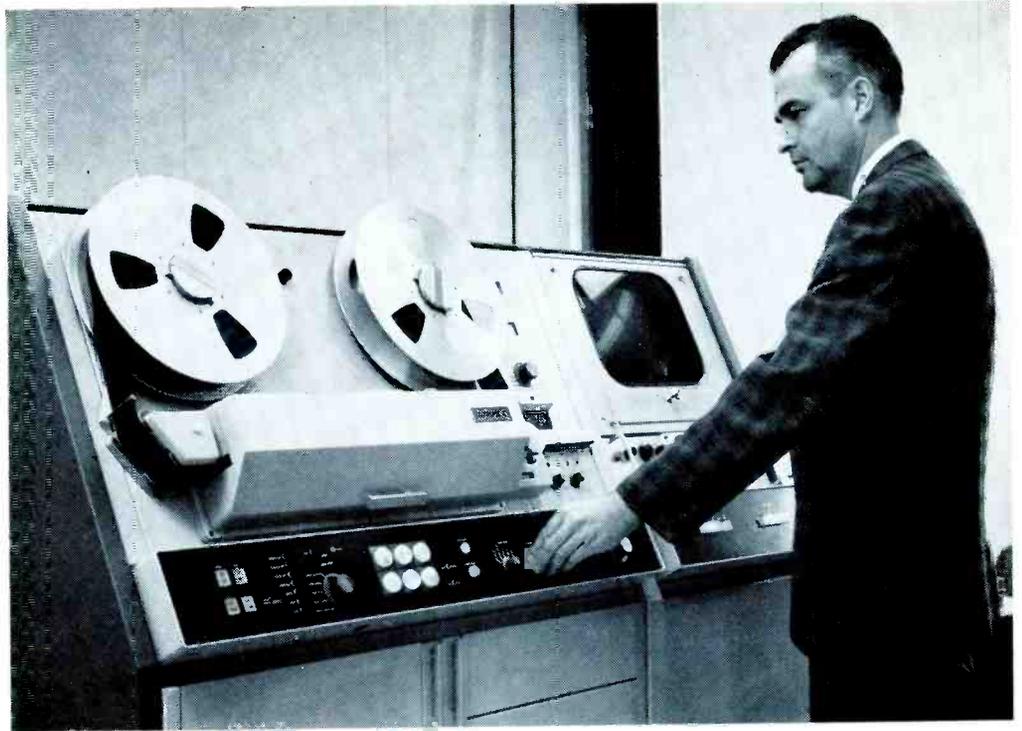
The basis of the system operation is the use of electronic sampling to convert a high resolution television signal to narrow band 'slow scan' video. As a consequence, all operations relating to system setup, change of input format, or variation of scanning parameters may

**BEST OF BRITISH** equipment was exhibited at NAB Convention, along with best of US-TV. Here is section of EMI modular video switching equipment, which gives vital facility of cutting from one shot to the next during the vertical blanking interval without flashing or streaking on the screen.

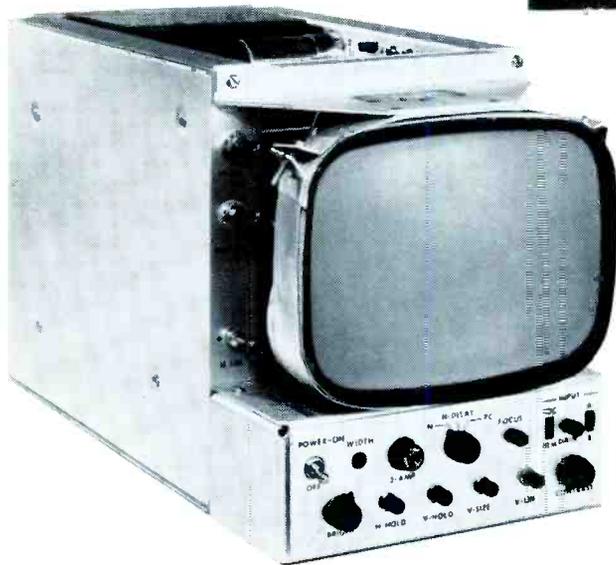


be rapidly and easily accomplished in real time, with very little operational complexity being added by the sampling type of bandwidth conversion used. The video output signal generated by the system is equivalent in all essential respects to that produced by conventional scanning methods, and has the additional advantages of excellent signal-to-noise ratio, digital control of resolution on both scanning axes, optional filtering or aperture correction on both scanning axes, and generation of synchronous or coherent video signals. The sampling conversion also allows a continuous, non-destructive, readout of a single line of slow scan information.

Particular attention has been paid to operational and performance characteristics in the system. Test signals for resolution and geometric and amplitude linearity analysis are included. System interfaces have been designed for synchronous digital encoding utilising either local or externally generated timing. Both camera and slow scan monitor parameters allow tape recording of slow scan data for future usage.



COLOUR COMPATIBLE top-quality video recorder was introduced at NAB Convention by Ampex, the VR-2000. Ampex Corporation's Vice-president Robert J. Weismann told our Editor: 'Third-generation tape copies equal in quality to present masters can be produced with the high-band qualities of the VR-2000 ...'



*NEW CONRAC MONITOR CZB8/N, an 8-in. fully-professional monitor combining advantages of tubes and transistors. The CZB series features dual matched inputs and a local/remote input switcher for picture comparison capability. Standard test signals can be piped to one input while the picture being monitored is distributed to the other input.*

**A** GAIN with European FM and UHF channels in mind, we found much of interest in the **Bauer Electronics Corporation** display, and Bauer experts from San Carlos, Calif, including Fritz Bauer, Charlie Sprague and Bob Zellner introduced us to a range of 50-watt to 10-kW AM transmitters, some 1-kW and 3-kW FM transmitters, remote control equipment and what Bauer call their 'Surrounding Sound special-effects gear. A great name in American television cables is **Boston Insulated Wire**, of Boston, Mass, and as a matter of interest Alden C. Davis, Hubert Goodwin and Ed G. McCusker of Boston Insulated Wire and Cable Co told me that their multi-cables are used on Marconi, EMI, RCA, General Electric, Philips, Pye and Dage cameras. Boston Insulated Wire manufacturers the widest variety of television camera cables in the world. Since manufacturing the first cables introducing television at the 1937 New York World's Fair, BIW has pioneered in the development of television cables

for studio, mobile, military and industrial applications, including colour. Standard Broadcast Cables are available from stock with or without demountable connectors. BIW manufactures cables for use with the camera chains, microwave relay equipment, and vidicon units of all the leading television equipment manufacturers in the Western World.

With complex TV schedules in American television, it is generally necessary to provide large numbers of copies of documents, such as programme schedules. The **Charles Brunning Company** of Illinois (Division of Addressograph Multigraph Corporation) specialise in TV work, and machines such as the Copyflex 110 are used by CBS, NBC, Canadian Broadcasting, Metropolitan, Colorado Broadcasting and other groups. Garwin R. Dawley and Bill Rassmussen showed us how Brunning Copytran Model 2000 electrostatic copiers and Copyflex diazo copiers are used in literally hundreds of US television stations and offices. Then we turned back

again to more-or-less conventional electronics, with Alec Autote, Arthur Kaiser and Carolyn McCormick of **CBS Laboratories**, Stamford, Con. CBS Labs have some very interesting new developments in all-transistor video distribution amplifiers, pulse amplifiers, video sync separating amplifiers, SMPTE test generators, peak controllers for audio limiting, together with some novelties such as digital displays for statistical reporting on TV channels. **Cleveland Electronics Inc** of Cleveland, 3, Ohio, are breaking new ground with deflection components for TV cameras, and we discussed camera trends with Cleveland Electronics' president P. J. George, and S. Z. Steven, director of the Deflector Components Division. Then conversation turned to an entirely fresh range of subjects—in fact from microwave transmitters to tape cartridge systems, because now we were with Ted Sorenson, A.

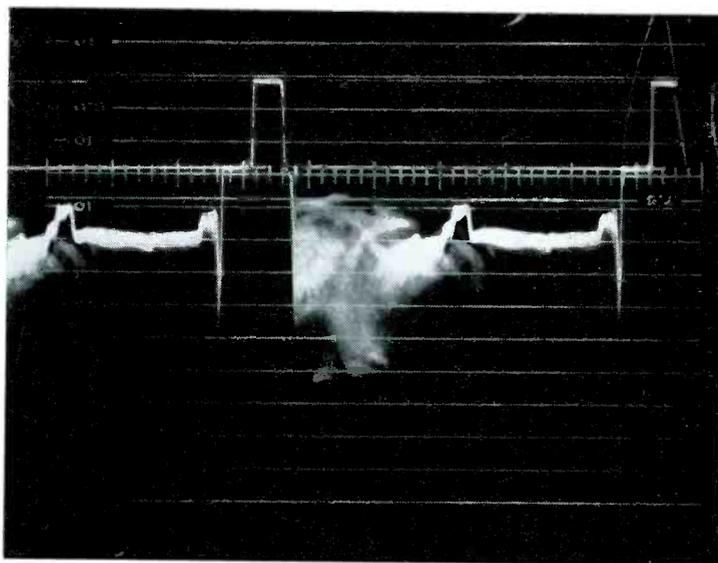
*(continued on next page)*

# NAB Report

Prose Walker, Gene Randolph and Jerrell Henry of **Collins Radio Company, of Dalas, Texas**. Perhaps because of the outstanding equipment produced by Collins Radio during the War (and today available to short-wave 'hams' the world over) Collins is an international label. The range today is so extensive—and we shortly hope to publish a section devoted to Collins transmitters—that here we may take just one example, the 830F-1A, a 10-kW FM transmitter which is widely used in and outside the United States. Like all Collins FM transmitters, the two-cabinet 10,000 watt model is carefully engineered and manufactured to a quality level that is a hallmark at Collins. Every component is housed within the two cabinets, including power transformers, harmonic filters and directional coupler. An optional feature is the Collins 786M-1 Stereo Generator which mounts in minutes in the 250 watt driver cabinet. Pushbutton operated, the transmitter starting sequences are fully automatic by the 'step-start' system. RF circuits are tuned and metered at the front panel. All adjustments can be made while the transmitter is on the air. No tuning or trimming of the harmonic filter is required. The PA stage is easily neutralised and is noncritical in adjustment. Grounded screen eliminates the bypass capacitors, doing away with a common source of failure. The driver power supply uses solid state silicon rectifiers which generate little heat and require a minimum of space. The final amplifier plate voltage supply uses mercury vapor tubes or optional silicon diode rectifiers. Efficient blowers force cooling air directly on the power tubes. In keeping with rigid Collins standards, the transmitter is tested under actual load

conditions on the broadcaster's channel before the unit is shipped. While the transmitter is designed for 60 cycle operation, only the blower motors and plate contactors need be changed for 50 cycle use. For the broadcaster who contemplates a power increase to 20 kilowatts, Collins also manufactures the 830F-2A transmitter. This unit uses an 830D-1A 1,000 watt driver, required when the additional PA is installed for 20,000 watt operation.

**I**N SO many TV stations Conrac monitors are used that, again, this US name has become an international label. 'Conrac' in fact is the **Conrac Division** of Giannini Controls Corporation, of Glendora, Calif, and at Chicago we discussed the international TV situation with W. J. Moreland (general manager), J. G. Jones (chief engineer) and sales manager R. N. Vendeland. For 1964/5, in addition to the famed range of monochrome monitors, Conrac have produced an entirely new line of performance-stabilised professional monitors, which are combination tube and solid-state. There are two fine colour monitors (17in screen), and a kinescope recording monitor. A most useful ancillary, also, is the AV12E television receiver. This audio-video set is particularly designed for monitoring, video recording or rebroadcasting applications. It supplies composite video and separate audio from 'off-the-air' signals. It is designed for use with either of two kinds of interchangeable plug-in units:



*WAVEFORM PIX IN TEN SECONDS, with the Polaroid Automatic 100 Land Camera, using a film pack instead of a roll, coupled to a special mounting on a Tektronix 'scope. The Tektronix, Inc group at Beaverton, Oregon, have built up a new series of techniques for taking oscilloscope and TV photographs direct off the tube face, using PolaScope and standard Polaroid Land film. Clarity of this waveform print is remarkable.*

Type CU Crystal Controlled for any single VHF channel; or Type SU-213, a 12-channel turret type tuner. The Type Cu single VHF channel plug-in unit employs a frame grid cascode RF amplifier, a crystal controlled local oscillator, frequency multiplier chain and pentode mixer. The aerial input network contains a bandpass filter which can be adjusted to match any given set of antenna and signal strength conditions and to provide a VSWR of better than 1.2 to one. The Type SU-213, 12-channel plug-in tuner employs a turret type VHF neutrode station selector. A high-gain keyed AGC system holds the video output constant within  $\pm 1$ db over a 60db change in input signal. It is especially suitable for the reception of NTSC colour signals. The video bandwidths is flat within  $\pm 1$ db to 4.1 megacycles. Bifilar-T traps are employed to reduce phase distortion. A combination of 'split-off-sound' and 'intercarrier sound' is employed. The sound is split-off ahead of the last video IF filter to permit over 60db of sound attenuation in the video channel while allowing the 4.5mc sound converter to operate at optimum ratio of sound carrier to picture carrier level. Both a fast time-constant limiter and a ratio detector are employed. The video output stage consists of two triodes with grids driven out of phase and connected so that the output is derived from the plate of one tube and the cathode of the other. It can

(continued on page 196)

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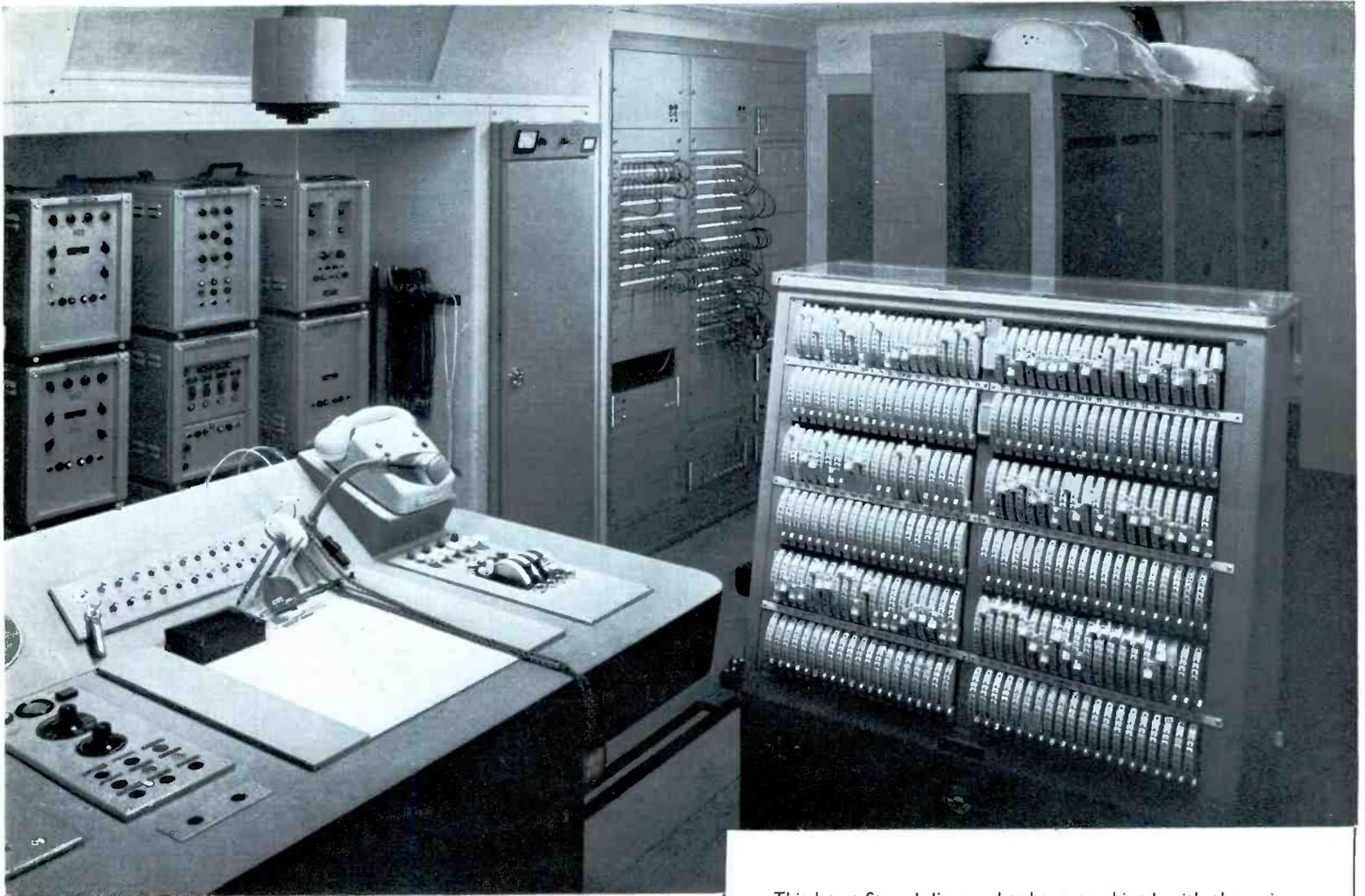
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F/1.9

2" f/1.9  
14° angle  
of view  
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Actual Size



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**Silicon Controlled Rectifier (Thyristor)**  
**DIMMER INSTALLATIONS**  
**for Television Studios**

**NTS Bussem Holland**

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**WDR Cologne**

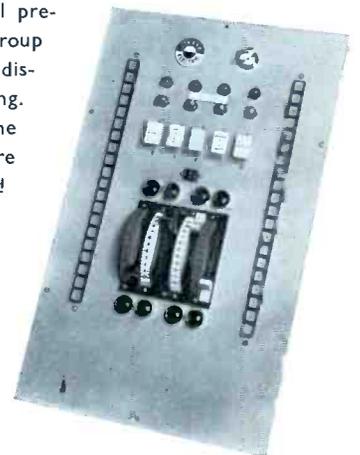
*Thyristor Dimmers also form part of the television installation recently completed for*

**BBC T/V Centre No. 1**  
**and LIME GROVE Studios E and G**

*They are also being installed in the*  
**GLYNDEBOURNE and COVENT GARDEN**

*Opera houses*

This latest Strand dimmer has been combined with the unique Strand Electric Control desk—the operator's switchboard—to form the most compact and versatile control system in the world. The above photograph of the installation at Cologne shows how the lighting control seen on the left can form part of a desk carrying the other television facilities. Shown right in the photograph is the 120 channel dimmer panel 53" x 30" (operational area 29" x 26") on which all pre-setting, switching and group selection takes place and is displayed by internal pilot lighting. The master panel seen on the right of the desk and inset here measures 20½" x 12½" and carries all the necessary master controls including 40 group memory push buttons.



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DRAMATIC NIGHT-FALL shot of Midtown Manhattan, from Robert Bagby colour original, in which the world-famed RCA Building dominates this scene which also includes two other internationally-known skyscrapers, the Chrysler Building and the Empire State (right). Atop the latter is a mast carrying New York City's 13 TV transmitting aerials.

## This New Look

# TELEVISION

**D**OMINATING that always familiar, always dramatic Manhattan skyline is the RCA Building . . . lofty giant among the sixteen other skyscrapers occupying a 14½-acre site collectively known as Rockefeller Center.

In this most fantastic zone of Lower Manhattan you can take your pick from the Time and Life Building, NBC Studios, the lofty Rainbow Room, and Radio City Music Hall, the world's largest indoor theatre.

The RCA building, rising to the sky from a flurry of United Nations flags, is the heart of Rockefeller Center which New York City's expert commentator Samuel Chamberlain has rightly called: 'Not only a prodigious and imaginative accomplishment in the world of business, architecture and entertainment, but also a thing of immense and moving beauty'.

What even many New Yorkers do not know is that RCA do not own the freehold of the land on which their super-magnificent skyscraper stands, any more than EAL, United States Rubber, General Dynamics, American Metal or the others own theirs. The moguls of Rockefeller Center pay an annual rent of four million dollars to Columbia University for this precious zone (nearly four mid-Manhattan blocks) on which they have helped to create a worthy twentieth-century rival to the Seven Wonders of the World. This odd and costly ground tenancy came about because in the 1800's, the days of gracious living, the Elgin Botanic Garden occupied the site now made world-famed by Rockefeller, and here a Columbia University doctor grew herbs for his medical experiments.

In time the herb garden gave way to a huge building plot darkened with a jumbled pattern of brownstone houses; and at length in the depression of the 1930's these, too, were swept

away, and in their place the Rockefeller millions helped to raise the 20-storey U.S. Rubber Building, the British Empire Building, the 33-storey Esso Building, the 48-storey Time & Life Building, the 6,200-seater Radio City Music Hall, and that giant amid giants, the 70-storey RCA Building, a veritable monument to American electronic endeavour.

And still, each year, the \$4,000,000 ground rent has to be paid for those golden 14½ acres.

**I** MENTION this little bit of multi-million gossip, not because RCA themselves are ever likely to slip behind with the rent, but because this year and for many years to come even such a colossal sum as \$4,000,000 is likely to be no more than a drop in the ocean to RCA. The Broadcast and Communications Products Division of the Radio Corporation of America have set a mammoth, world-wide target with their 'RCA New Look', which in itself is a multi-million completely new re-designing and re-tooling, a completely new-look programme for the entire range of RCA broadcast equipment.

What is this New Look likely to do for the TV and radio networks of the United States and the rest of the world? I put this question to a number of RCA top executives during my visit to the 42nd Annual Convention of the NAB in Chicago, first to **Mr Charles H. Colledge**, Division Vice-President and General Manager of RCA Broadcast and Communications Products Division.

'The New Look', he told me, 'is a programme for completely redoing our whole line of broadcast equipment. When I say "redoing" I do not mean just changing the colour, or the appearance, or the construction. Nor do we mean just transistorising, or modularising, *per se*. What we mean is that we have thrown everything out and started from scratch to design a

whole new line of completely new—and very different—equipment units’.

Charles H. Colledge is a blunt talker. He joined RCA in 1933 as an engineer, and has been active since in all fields of broadcasting, including supervision of RCA’s Field Colour Test operations in Washington from 1949 to 1951, being therefore one of the architects of NTSC-colour and the United States’ colour-TV service. During the War he served with the Electronics Division, Bureau of Ships, and was a Lieut-Commander on the staff of Admiral Blandy during the first atom bomb tests at Bikini. Today he applies the same straight-talking nuclear attitude to the New Look.

He explains: ‘This radical “changeover” in our equipment line is a sharp break with our past practice in three important respects: (1) in the past we have updated our designs by successive small changes—this time the changes are “revolutionary”; (2) formerly we updated equipment units individually—this time we are doing everything simultaneously; (3) before we redid our line over a five-to-ten-year period—now we are redoing the whole line in a two-year period.’

‘There have been many important—almost revolutionary—developments in electronics in the past few years. Transistors, silicon diodes and other solid-state devices, modularisation, printed-circuit boards, stabilisation and numerous advances in circuitry have appeared in a rapid succession. The overall effect of these developments has been to completely change our concepts of equipment design. Moreover, the physical changes have been so great (for example, some transistor equipments are only one-tenth the size of their tube predecessors) that there has been no choice but to break with past design and create a whole new generation of equipment.’

‘Actually we started on this programme about four years ago. And we showed our first new look product—our TR-22 Tape Recorder—at the NAB Convention in Washington in 1961!’

**W**HY did RCA select the TR-22 as the first step in this programme? Says Mr Colledge: ‘The TR-22 was a good place to start, because it encompassed almost every conceivable circuitry problem that could put this type of programme to the test. We learned a great deal about transistorising, took advantage of what we learned and, I think, have every right to be extremely proud of our TR-22. Much preliminary work and planning was required in designing the TR-22 because we wanted to standardise modules and components wherever practicable. As a result, many modules in our new family of TV Tape Recorders—the TR-22, TR-3, TR-4, and TR-5—are interchangeable. Similarly, many modules in our new camera family—TK-42, TK-27, and TK-22—will have the same type of module interchangeability’.

I suggested to Mr Colledge that in Britain, at least, the TR-22 had pioneered the way with all-solid-state video recording, and he agreed. Then he explained why the RCA organisation had moved cautiously and did not at the time announce the need for a major transistorising programme.

‘Like everyone else’, he told me, ‘we were enthralled from the start with the possibility of transistors. But poor quality, lack of standardisation and high prices harried those who transistorised too soon. Even a few years ago there were not transistor types for many circuit requirements where tubes (valves) had always been used. Until recently it was impossible completely to transistorise most equipment. Hybrids (part transistors, part tubes) could be built, but using even a few tubes negates most of the advantages of transistors—i.e., getting away from heat, high plate voltage, conventional panel construction, etc. Thus there were many good reasons why we moved into transistorisation very slowly.’

‘However, the situation gradually changed. Transistor quality improved, prices came down, many new types appeared. About four years ago we finally decided that the day when we could produce all-transistorised equipment of very high performance was within sight. As noted above, the TR-22 Tape Recorder was our first all-transistorised “new look” equipment. Based on our success with the TR-22 (as indicated by its overwhelming acceptance in the industry) we decided that the time had come to transistorise our whole line. So we made our plans and went to work. It was an enormous task. It has taken time.

## NAB Report

And it has required the expenditure, over the past several years, of very large sums of money. This expenditure will continue at an even greater rate during 1964. . . .’

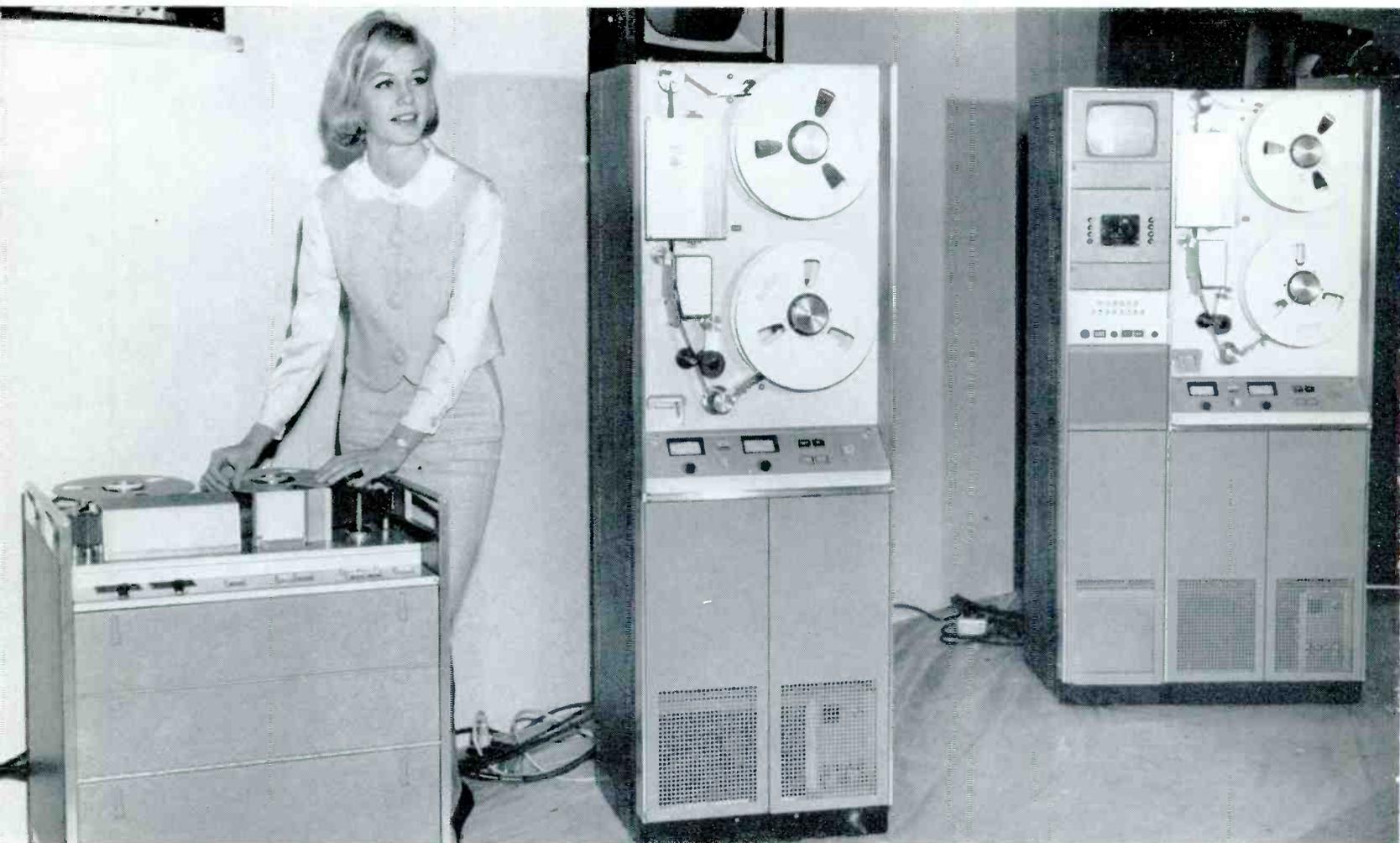
**H**OW comprehensive is this New Look programme? I asked Mr John P. Taylor, Manager, Marketing Services, RCA Broadcast and Communications Products Division, who has been closely associated with RCA for the past 33 years.

‘We have a whole new line of FM transmitters’, he explained. ‘We also have a complete new range of UHF television transmitters in the same styling—and they, too, are all-new inside. We have completely new, all-transistorised, 4-channel colour cameras—both live and film. We have a whole new line of tape recorders: new monochrome film equipment, new audio equipment, and the beginnings of a whole new line of video equipment. This, too, is the “RCA New Look”.’

‘These beautiful new equipments are largely transistorised, fully modularised, and they incorporate stabilised circuitry throughout. They are radically different from anything that has gone before—both in design and in appearance. And it is this



*HOW DOES THE TR-5 mobile recorder operate? Mr. H. H. Kler, Manager Electronic Recording Products Merchandising, RCA, explains to the Editor of International TV Technical Review at the Chicago Convention. The TR-5 is solid-state, uses standard modular construction, fully compatible with standard broadcast quadruplex recorders.*



THE NEW LOOK is a completely new RCA replanning, the programme including three entirely new all-transistor TV tape machines. (From left to right) TR-5, transportable recorder for remotes or studios, TR-3, television's first playback-only video tape machine; and the TR-4, complete record/playback machine at low initial cost. That's Mary Lou Hattendorf demonstrating the mobile job.

### ► New Look Television

complete newness—this feeling of starting from scratch, this throwing off of old shackles and shibboleths—that has so enthused our designers and engineers.

'With the TR-22 the "new look" idea began to grow. Transistorisation, obviously, was coming—for almost everything. But we still thought that we could change over gradually—one unit at a time—with no great disturbance to "the system".

'At the 1962 NAB we showed additional transistorised equipments—including the BC-7 Audio Console, the RT-21 Audio Tape Recorder, and the TFR-1 Film Recorder. All of these are "island units"—that is, they more or less sit by themselves and do not have auxiliary panels that must be mounted on racks or in consoles. Thus they could be mixed in with older installations with no obvious disparities—and with no great influence on the existing installation. Our gradual "changeover" seemed to be working.

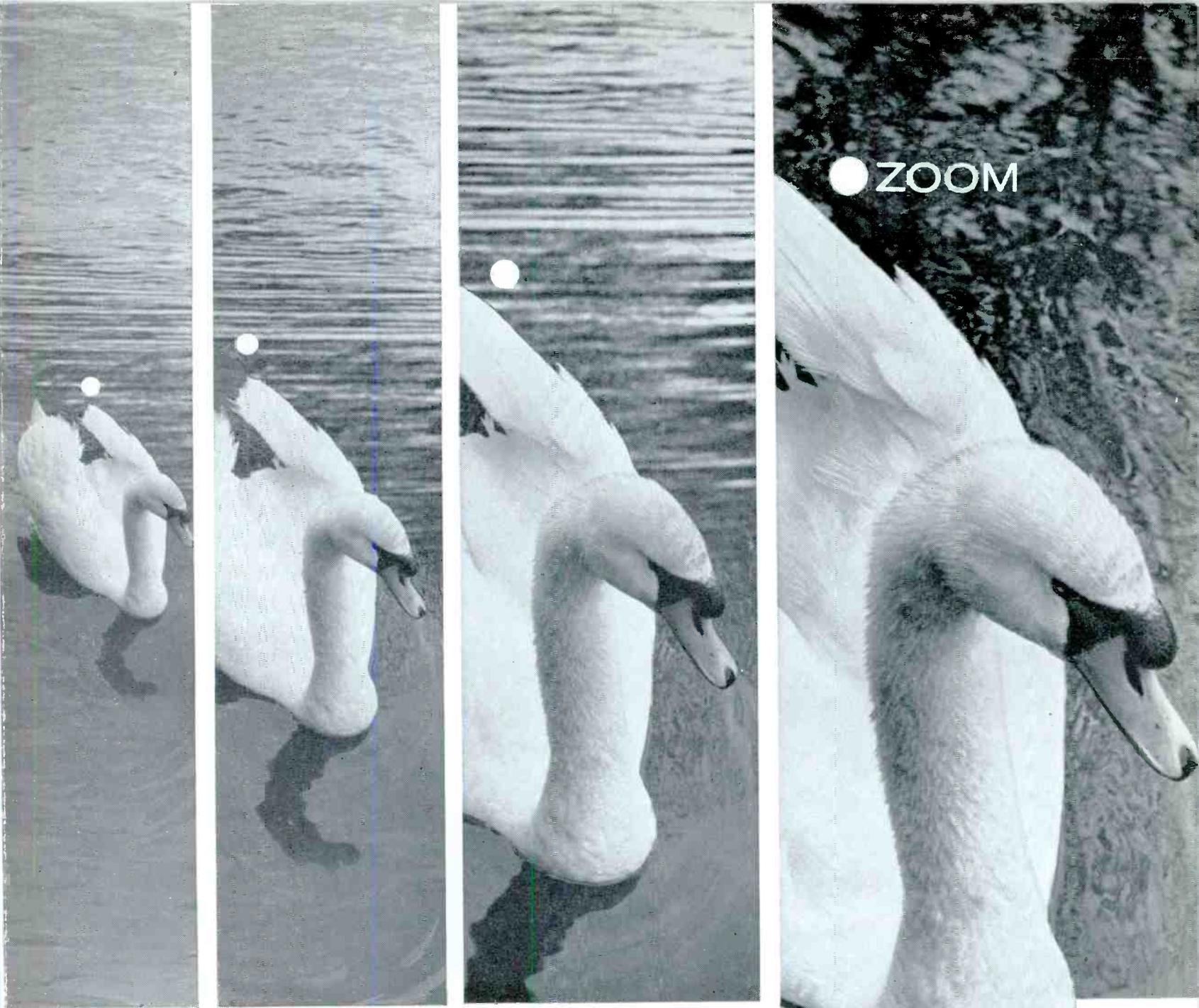
'But then came a new development. At the 1963 NAB we showed the prototype of our TK-22 Film Camera—and this time eyebrows shot up. Camera "chains" have notoriously taken up a lot of rack space. But with the new transistorised TK-22 all the parts of the chain are not located in the camera itself but fit in one-half of a 5½-inch high rack unit. The disparity between this and the 35 inches of rack space required by the TK-21 Camera is so great that one immediately has visions of ultimately getting rid of many, many racks in a typical station. In fact, the external modules of the TK-22 are so small that it

may well prove desirable to mount them in the camera pedestal—or perhaps in the control console.

'At this point it became obvious that to take full advantage of all the possibilities of transistorisation we ought to study all of the equipment units in the control room—and probably to redesign these equipments as a group rather than individually. This recognition of the need to redesign everything simultaneously was the next-to-final step in the development of the new look idea'.

**T**HIS brings us to the engineering design philosophy behind the RCA New Look, and here I sought inside information from Mr Wendell C. Morrison, Chief Engineer, RCA Broadcast and Communications Products Division. Mr Morrison joined RCA in Camden, N.J. in 1940 and two years later became a research engineer at the RCA Research laboratories in Princeton, N.J. where he worked on development projects for UHF-TV transmitters, aerial pattern calculators (polar diagrams) and later became assistant to the Chief Defence Engineer, RCA Defence Electronic Products.

Wendell C. Morrison is a visionary as well as an electronics expert, and he told me at once: 'In our engineering, as in other aspects of the new look, the keynote is newness. Thus, the goal of our programme has been to incorporate every new advance (concept, component, or circuit) which would enable us to build



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AT THE CONTROLS of the RCA transistorised consolette, the Editor of International TV Technical Review and his team are shown the functioning of this BC-7 for dual-channel AM/TV and FM stereo by RCA's Mr. C. D. Sullivan. This consolette uses interchangeable plug-in modules, and has colour-coded controls functionally arranged.

### ► New Look Television

a better product. And, to make sure that there would be no compromises in doing this, we purposely started each new design from performance specifications (rather than simply redoing the last previous design, as has been the custom). Thus, all of the new equipments have a complete newness—a newness that in some cases is startling.

'Lest there be some trepidation concerning the many new components we have utilised, let me point out that all of these components have been previously used, tested, and proved by our engineers in other equipment built by RCA. For example, the widespread use of transistors and the general principles of incorporating these into plug-in modules has been thoroughly tested in hundreds of large-scale electronic data processing equipments built and installed by RCA in the last five years'.

**M**ANAGER of the functional design group which has completely styled the New Look equipment is Stewart W. Pike, who joined the RCA design group just after the War, and has been its manager for ten years. He explained to me the distinctive appearance-characteristics which give a related product-line identity. They include:

*New Look Colours*, used in all equipments, are space-age blues—a light (horizon) blue in frontal areas, a dark (space) blue for side and rear of cabinets, as well as pedestals. Operating panels are aluminium or aluminium grey.

*New Look Finishes* on painted surfaces are heavy textured vinyl finishes which will stand heavy abuse, do not finger mark and do not collect dust. Where natural metal is left to show, it is ordinarily coated with transparent epoxy.

*New Look Trim* which gives character to the equipment is mostly brushed aluminium. Unusually heavy 'framing' is employed to give a feeling of ruggedness, as well as an identity that might be called the space-age look.

*New Look Shapes* are also important in imparting a certain distinctive feel to these equipments. Although their sizes and 'form factors' vary widely, all units have a similar look—a square, clean, businesslike look which unmistakably relates them to each other.

*New Look Controls*, also, have a family look—achieved through similar meters, control knobs, push buttons and panel treatments. In each instance controls are grouped as much as possible in the most convenient operating location.

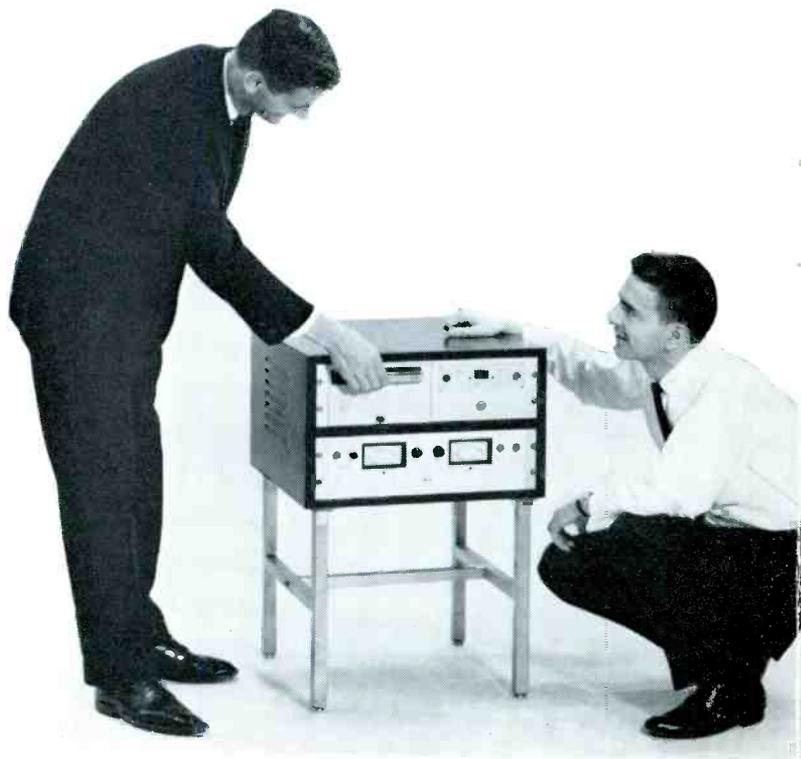
*New Look Emblem* is a final touch which distinguishes all these equipments. It is a cut-out aluminium rectangle within which are framed the letters RCA with the type number of the equipment just below.

Turning now to specific equipment, many of the new items of which are illustrated on the pages in this section of International TV Technical Review, attention must be drawn to the three entirely new TV tape machines mentioned by Mr Colledge. These are the TR-4 compact recorder, the TR-3 which is a 'playback special', and the TR-5 mobile recorder. And, of course, there is the New Look TR-22 known all over the television world.

First, the new TR-4 recorder is fully transistorised and budget priced, ideal in installations where economy and picture quality are both important considerations. The equipment comprises a complete recording and playback package with suitable monitoring facilities—built-in picture and waveform monitors and other provisions to meter key circuits for proper setup of the equipment. The TR-4 includes numerous features which have become standard in RCA TV tape equipment. Air lubricated tape guides, magnetic tone wheel, solid-state control system, built-in switchlock and two-speed operation are but a few.

The basic machine is complete in a 33 by 22 by 66-inch cabinet, in which space is provided for a number of plug-in modularised accessories. These include pixlock, automatic timing control, cue record and playback, and electronic splicing. Available also in a switchable standards model, the TR-4 is the only recorder of its kind adaptable to colour operation by the addition of transistorised plug-in modules.

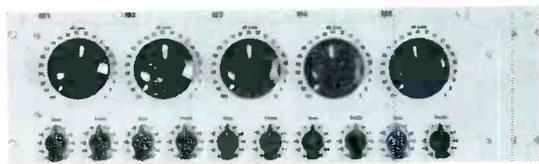
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CARTRIDGE TAPE recorder for stereo programming gets a checkout from RCA Broadcast and Communications Division's Bob Reynolds (left) and Miles Moon. This transistorised unit makes use of plug-in tape decks, power amplifiers and power supplies, which are interchangeable among all other RCA tape cartridge systems.

# MIXER EQUIPMENT UNITS

to form the basis of many alternative fixed or transportable mixer systems



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of modular construction, with any desired combination of line and microphone channels, with or without echo send facility. Separate bass and treble controls on each channel. 600 ohm line output.



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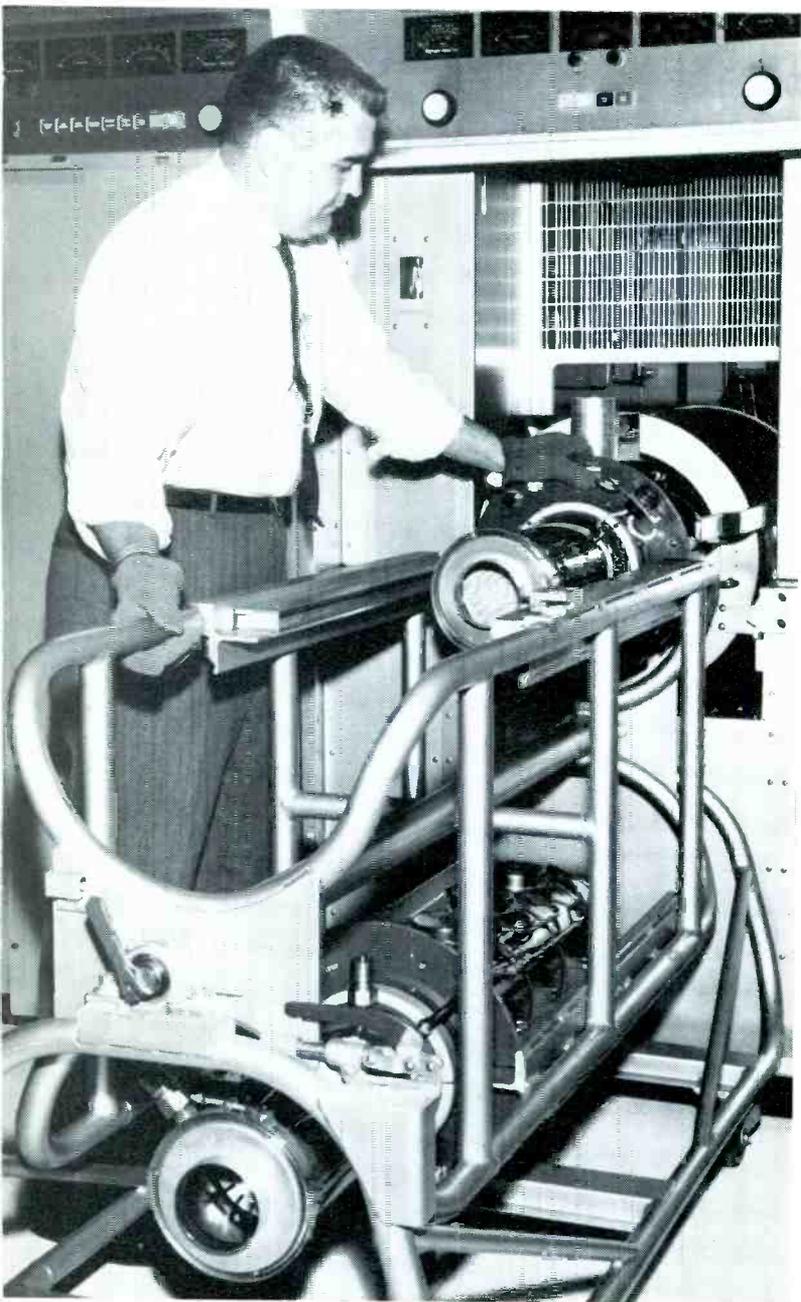
provides effective artificial reverberation of up to 3 seconds with good frequency response and signal/noise ratio. Peak level meter fitted, and inputs and outputs matched to mixer units.



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*KLYSTRON TUBE CHANGE is effected in only a few minutes with the unique rotating-cradle system on the latest RCA 30-kW UHF-TV transmitter. Cradle is swung over to bring replacement klystron in line for servicing, as is here being shown to the International TV Technical Review editorial team by RCA's Tom Muldowney. The 250-pound vapour-cooled klystrons are handled with finger-light ease.*

*TELEVISION FILM RECORDER with resolution capability of 800 lines is introduced this year by RCA, and here is International TV Technical Review's Editor (left) operating this TFR-1 under guidance of RCA's Press Relations Executive Edward J. Dudley.*

**'These new UHF transmitters are obviously so important in Europe, where so many countries are going over to UHF-TV for the first time.'**

### ► New Look Television

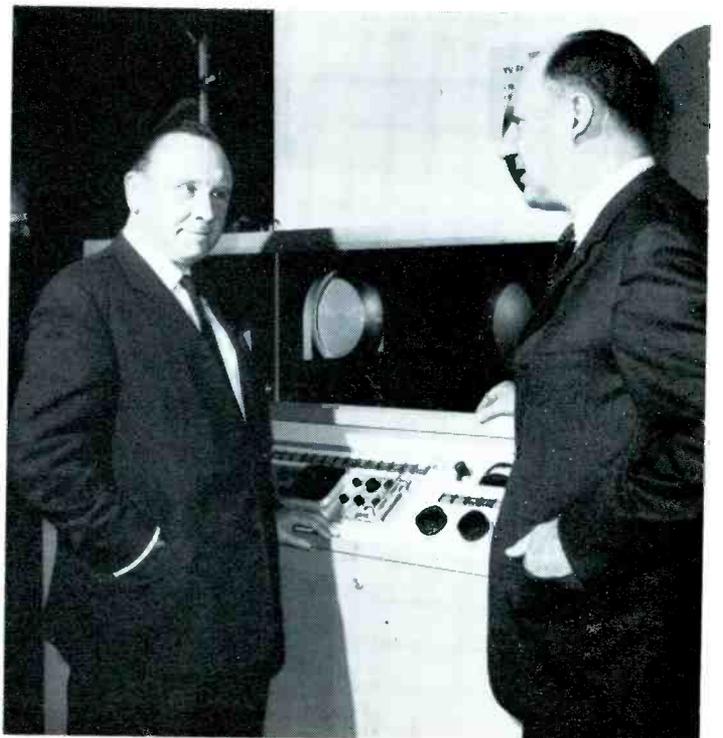
In the same way projectors are used to 'screen' film, the TR-3 low-cost tape playback equipment can be used for top quality screening of TV tapes. Previewing, editing, and on-air playback of taped programmes and commercials are handled with ease.

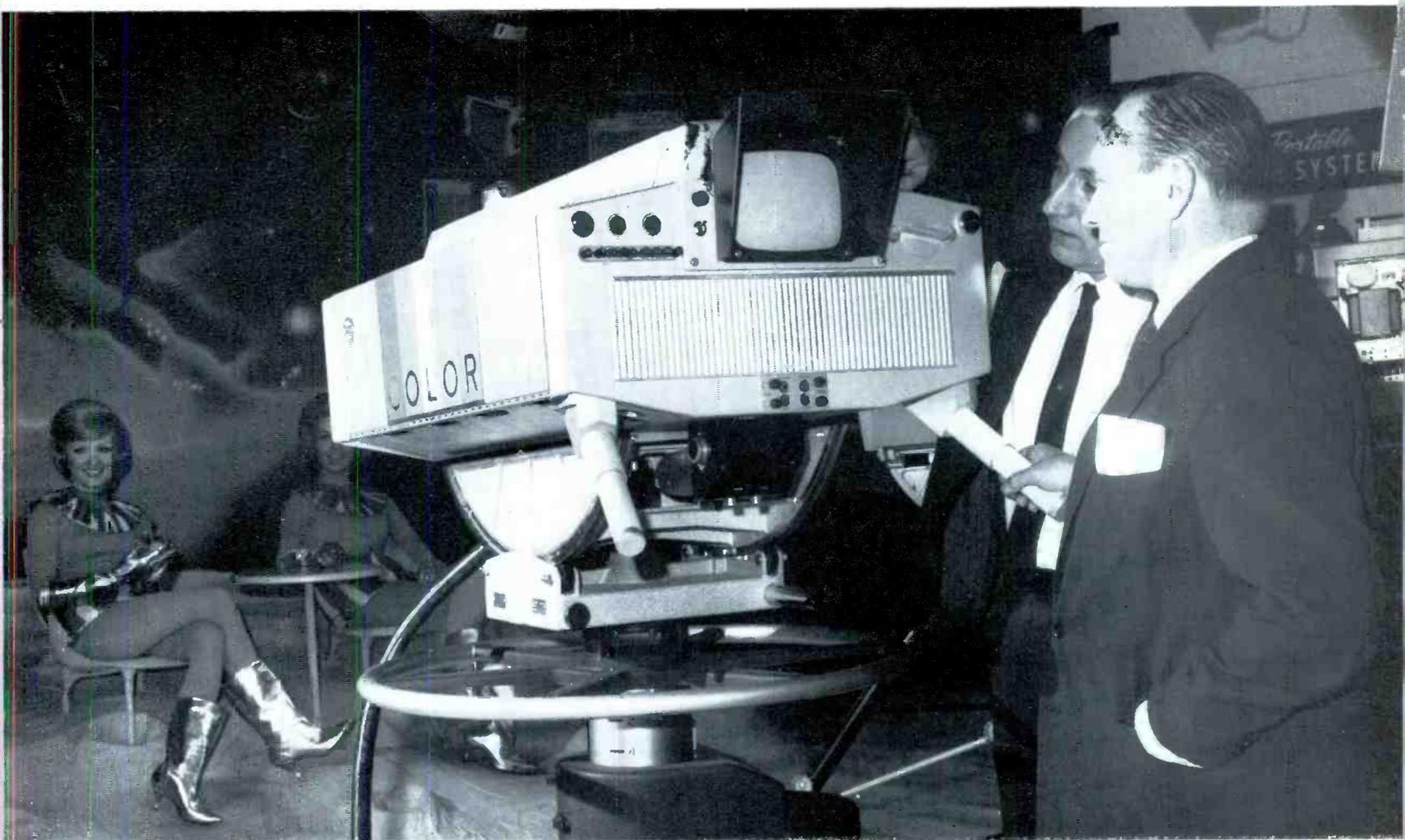
To the broadcaster, the TR-3 can serve as a valuable supplement to present TV taping facilities. In effect, it can provide an additional playback source—for on-air programmes, client preview, editing and splicing—relieving busily-scheduled recording equipment at a relatively small cost. To advertising agencies, and station representatives, the TR-3 provides a means by which the many tapes passing through their hands can be checked, previewed and presented for clients. It offers for the first time a low-cost, highly-effective TV tape selling tool.

**C**CAREFUL design has resulted in a self-contained player whose performance meets professional broadcast standards. It is compatible with any quadruplex television tape recorder in the world. Advanced-design transistorised circuits in module form are used throughout. It features built-in two-speed and switchlock operation. The player is completely flexible and can also accommodate a full complement of accessories including pixlock, automatic timing correction and colour operation. These accessories, when added to the TR-3, plug in as an integral part of the machine in the spaces provided in its basic design.

This compact player measures only 22 inches wide, 66 inches high and 24 inches deep and can be readily moved on its built-in casters to any location. Its vertical styled construction requires less than 4 square feet of floor space, making it easily installed in conference, projection, and clients' rooms.

For quality tape recording on location, the new TR-5 recorder is a valuable facility for special events, news and on-location commercials. The TR-5 is the first compact, transportable recorder capable of producing tape in the studio or in the field which may be played back on any quadruplex recorder





ZOOMING IN TO CLOSE-UP, with his hand on one of the two twist-grip controls for zoom and focus, is International TV Technical Review's Editor, here being given first-hand technical facts on the revolutionary new TK-42 separate luminance camera by RCA's Mr. R. C. Dennison. This is prototype camera, final versions having slightly different layout of plug-in side modules.

in the industry. It is the only such recorder capable of producing either colour or monochrome tapes.

The TR-5 is contained in a small portable cabinet on casters measuring only 28 inches high (34 inches with casters), 28 inches wide, and 22 inches deep. This permits easy movement from one studio to another, or transportation in a station van for use on remotes.

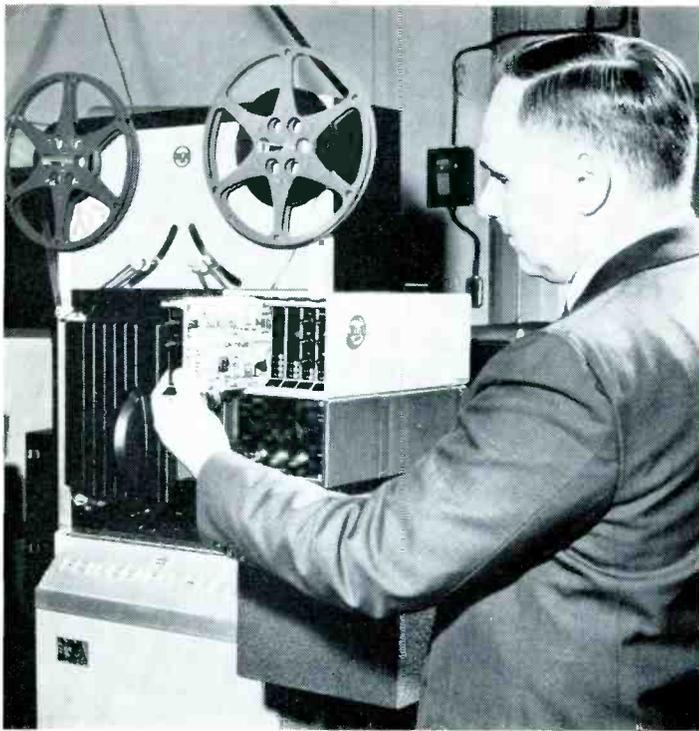
Limited playback facilities permit on-the-spot cueing and previewing of tapes to assure that a satisfactory recording has been made. Playback performance is not suitable for direct on-air broadcasts since the TR-5 has no provisions for head switching, signal processing, and playback quadrature delay. However, the tapes produced are immediately playable on any quadruplex equipment.

**A**DVANCED transistorised modular circuits are used throughout assuring low cost and maintenance. The equipment is designed with built-in audio playback for earphone level monitoring. The TR-5 is also equipped with a built-in master erase head. Models are available for operation on either international switchable or domestic standards. Tape speeds of  $7\frac{1}{2}$  to 15 ips are provided and recording time of up to 96 minutes at  $7\frac{1}{2}$  ips are possible with the  $10\frac{1}{2}$ -inch maximum tape reels.

Now let us look at another very interesting piece of New Look studio equipment, the New Generation TV film recorder,

which I saw and operated at Chicago, and which I discovered for myself consistently produces good quality 16mm films from TV picture sources—whether live, tape, network or film. It is the TFR-1. It uses two unique components: a new 'subscreen' picture tube, and a new clawless camera—plus programmed controls and self-adjusting circuits that actually define high quality pictures, and then provide the means to maintain them.

In my opinion this is the machine the industry has been waiting for. It replaces the old style, questionable quality 'Kine' recorder. It produces professional quality films and is the first film recorder that can truly be called automatic. Because of the new display tube characteristics, picture resolution is 800 lines at the centre of the raster (at least 600 lines at the corners), an increase of 35 to 40 per cent over previous tubes. There is also a 2 to 1 increase in sharpness of focus due to controlled kinescope spot size. The new, precision-registration camera achieves almost absolute vertical steadiness with complete absence of shutter bar effects. Defects usually found in kinescope recording equipment cameras, such as vibration and loss of interlace disappear. Improved display tube compensation results in excellent grey scale rendition. Two forms of compensation are used, gamma and exponential. The gamma circuit compensates for various pickup tubes, while the exponential corrects for gamma errors of the display tube. Grey scale, therefore, is linear under all conditions.



NEW MONOCHROME FILM system by RCA completely transistorised. A TP-66 16-mm. projector is coupled to the TK-22 film camera. This layout can be multiplexed, or multiplexed to serve two film projectors and a slide projector.

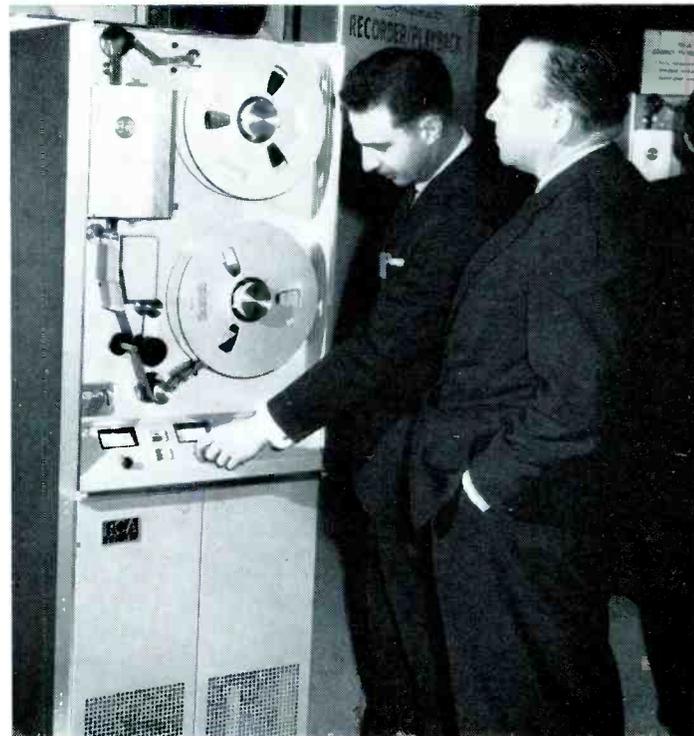
### ► New Look Television

In other machines the glass, which is necessarily thick, causes a secondary distribution of light, a halation, at the focus plane of the screen, resulting in loss of resolution and degradation of the picture. The TFR-1 display tube, however, employs a method of phosphor suspension on a substratum of glass (about the thickness of a postcard) mounted a short distance **behind** the face plate. This moves the image plane away from the thick glass face plate, eliminating light dispersion while increasing resolution capability.

**A**NOTHER significant change in the new tube is in the gun structure. A precision aligned electron gun produces a finite spot only 3 mils in diameter contributing further to image sharpness. Ample light output is assured by a highlight brightness of 160 foot lamberts. Of special interest is the new film pulldown mechanism. There are no claws, and only one reciprocating component weighing less than an ounce. The result is a vibration-free camera with a simplified film path—one that is simple to operate—easy to load and thread. A second feature lies in shutter design. In ordinary cameras, shutter closing and opening takes place within one or two video lines. Timing is very critical and even minor variations in film can cause shutter bar effects. In the TFR-1 camera, however, the shutter is located in the optical path in such a way that the image on film is made to fade in and fade out over some 40 video lines. Thus, shutter action in performing the picture splice is much less critical. In fact, because of the feathering of the picture splice, a bar does not develop.

Much emphasis has been placed on instrumentation in the TFR-1 to aid recording engineers in evaluating and establishing desirable picture parameters and then duplicating selected values. One of these features is a test signal that automatically produces a multi-step variable density strip for the film stock and processing being used. If not, an error signal corrects bias and gain of the system for the desired tube output. In setting the standards for white and for black, the photocell looks first at a half-black and then at half-white screen presentation on the

RCA's Mr. R. E. Abbenante demonstrates to International TV Technical Review's Editor the RCA 'playback-special' video tape machine which has enormous potential for producer and agency use. This machine, like others in the new trio, is fully compatible with the TR-22, and all standard broadcast quadruplex recorders.



tube (produced by a built-in generator). Use of a neutral density filter determines the contrast range. Another automatic circuit, **dynamic focus control**, provides sharper focus in all areas of the image from low light to high light. This circuit uses a third video waveform that counteracts the defocusing effect due to the movement of the virtual cathode. Variations in beam current are utilised to modulate a video signal on the focus electrode to eliminate blooming under highlight conditions. Mixture of the three focusing waveforms maintains the finite kinescope spot size constant from black to white and in all areas of the raster.

TFR-1 equipment is completely enclosed in an air-pressurised, dust-proof cabinet housing the image display tube, camera, control panels and associated electronic circuitry. All components and circuits are easily accessible through hinged doors, swing-out panels, plug-in modules and sliding shelves. Power interlocks provide utmost safety. Film processing no longer presents any problems. Eastmans Viscomat, a commercial quality processor that mates with the TFR-1, processes film to precisely controlled gamma at a speed of 36 feet per minute. In just 60 seconds after starting, processed and dry film begins to emerge. The Viscomat is fully automatic. I saw for myself there is no mixing of chemicals, no testing of solutions, no complex adjustments.

**T**URNING to the sensational new colour cameras, Mr Wendell Morrison, the engineer 'architect' of the new range, told me: 'Nearly all our New Look studio equipments are solid-state, and this is the predominating design consideration. Almost everything else follows from it. The most obvious corollary, of course, is the use of plug-in modules. We early found that traditional tube mounting arrangements (such as 'bath tub' chassis) were incongruous for transistorised units. The data processing people led the way to plug-in modules, and we have benefited by their experience. Plug-in modules have many advantages. They provide high 'packing density'—i.e., they get

(continued on page 184)

# ILFORD interviews ARTHUR PROVIS



Arthur Provis, Director of Photography of National Interest Pictures was interviewed by Ilford on the set of puppet series, "Space Patrol" (A-R, & WIPX, New York).

Asked why he chose Ilford, Arthur replied: "I use Ilford film first and foremost because I get excellent service from the Ilford people at Wardour Street, and that's important when you're working to our tight schedules. Having to put six minutes' screen time in the can every day, we can't afford delays.

And, since my subjects are one-third life size, I have to shoot much closer than I would with live-action. Ilford HP3 allows me to stop right down to get the extra depth of field I need. Graininess? Definitely not. We view our rushes on a full-size screen in a local cinema here, and the grain is hardly perceptible.

As far as I'm concerned, Ilford service, and HP3 quality, are exactly right for me."

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# Technical Personality News . . . .

**WE ARE GLAD** to hear that the Order of the British Empire has been awarded to Mr Francis L. Reed, government contracts manager of EMI Electronics Ltd.

When Mr Reed left school in 1916 he joined the accounts department of the Gramophone Company at Hayes, transferring after a few years to the sales administration department, where he handled gramophones, records and other domestic electrical equipment. Since 1935 he has been engaged in the administration of government contracts for radar systems, locators, telephones, defence equipment and maintenance of a wide range of instruments.

Mr Reed was concerned with the GL1 and GL2 radar systems, based on Watson Watt's early work, which were used for anti-aircraft defence, from 1938 until the middle of 1940. He was also involved with the early airborne radar equipment and homing devices. Since the war Mr Reed has handled contracts for EMI's activities in connection with GPO telephone equipment and more sophisticated radars such as Green Archer for Army use and aerial reconnaissance aids for the TSR2 aircraft.



Francis L. Reed, O.B.E.

**THE BBC ANNOUNCES** the retirement on July 31, 1964, of Mr W. Proctor Wilson, CBE, BSc(Eng), FCGI, MIEE, Head of Research Department, Engineering Division, and the appointment of Mr G. G. Gouriet, MIEE, to succeed him.

Mr Proctor Wilson has completed 34 years' service with the Research Department of the BBC which he first joined in 1927 having previously been with the Western Electric Company (later Standard Telephones and Cables Ltd). He left the BBC in 1930 to join the Marconi Wireless Telegraph Company and returned in 1933 to rejoin the Research Department where he remained until 1939. Throughout the war Mr Wilson served in the Signals Branch of the Royal Air Force, first in 1939 as an Assistant Air Attache, Paris, and later from 1941 to 1945 as Chief Engineer of No. 60 (Signals) Group with the rank of Group Captain. In 1943 he was appointed CBE (Military Division). He retired from the RAF Reserve in 1954 retaining the rank of Group Captain.

On his return to the BBC in 1945 he was appointed Assistant Head of Research Department. He became Head of Research Department in 1950.

Mr G. G. Gouriet returns to the BBC after having held the post of Technical Director of Wayne Kerr Laboratories Ltd, electronic equipment specialists, since 1958. He first joined the engineering staff of the BBC in 1937 and was appointed to the Operations and Maintenance Department. He moved to the Research Department in 1943 and in 1946 he was placed in charge of the television laboratory doing fundamental research. In 1950 he became Head of Television Section of Research Department, later called Television Group, and was principally concerned with colour television until he resigned to join Wayne Kerr. Mr Gouriet has been responsible for a number of patented inventions in the field of electronics. He takes up his new appointment as Head of Research Department on August 1.

\* \* \*

## New BICC Appointments

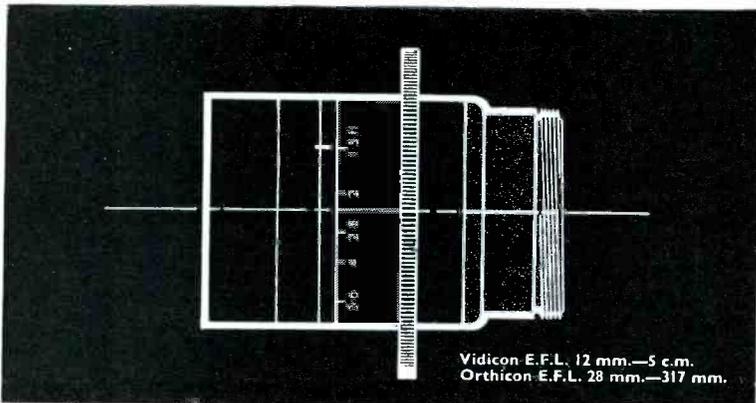
**BRITISH INSULATED** Callender's Cables Ltd announce that Mr G. A. Dodd, MIEE, and Mr N. S. Dean, BSc, Dip Electronics(Soton), AMIEE, AMIERE, have become Commercial Manager and Chief Engineer respectively of the Telephone Cables Division at Prescott. They have already taken up these appointments.

Mr Dodd joined British Telecommunications Research Ltd, a BICC Associated Company, in 1950 from the Engineer-in-Chief's Office of the Post Office. At BTR Ltd he was responsible for the development of line transmission equipment and systems until transferring to BICC in 1959 to become Chief Engineer, Telephone Cables Division. He was appointed a member of the Divisional Board in 1962.



# LENTAR LENSES

for Vidicon and Image Orthicon Cameras



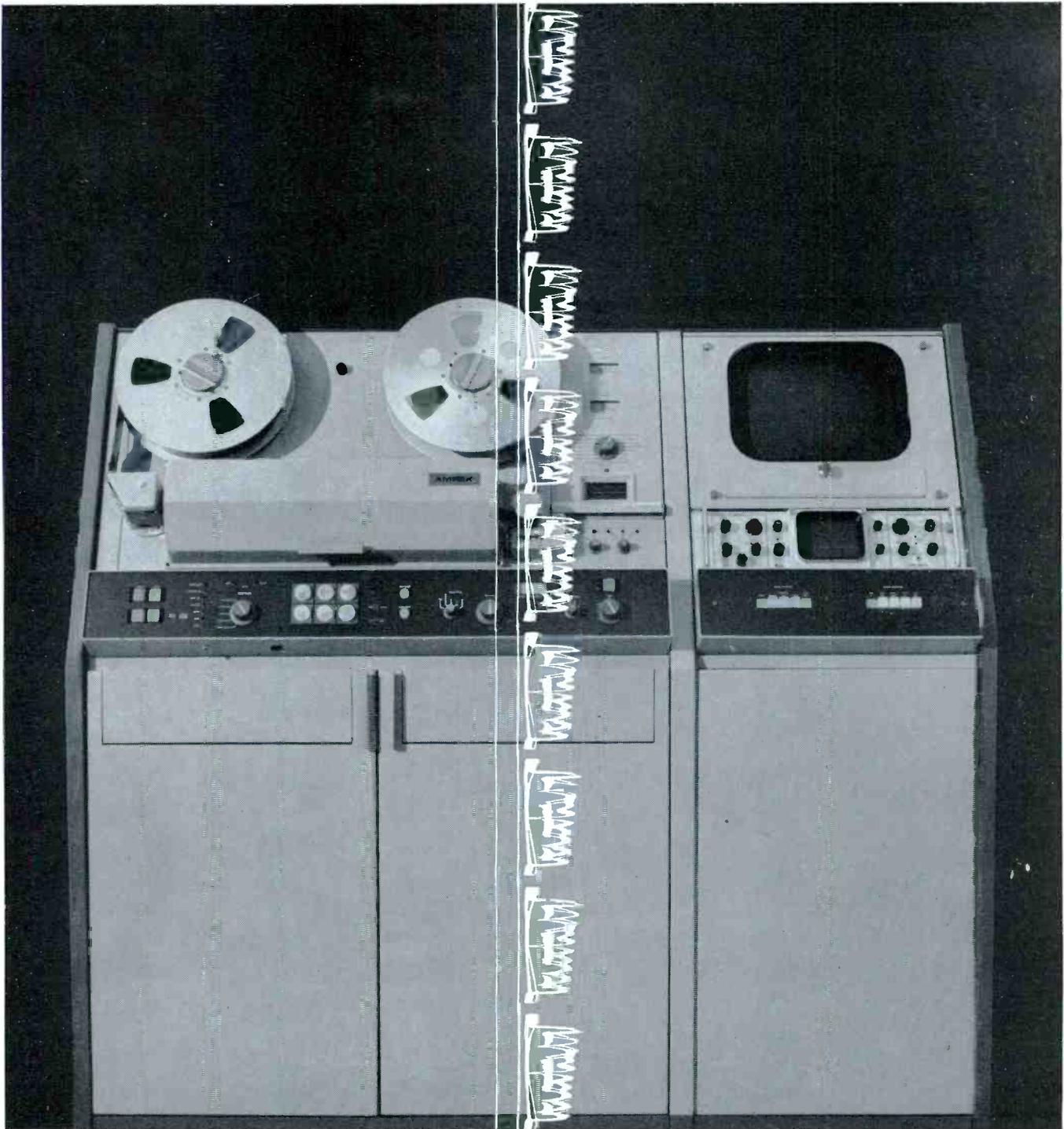
Lentor lenses are made to standards of quality equal to any in the world. But because Lentor is a comparatively small, quite new group of craftsmen\* you enjoy a very personal service plus the benefits of small organisation prices and delivery times.

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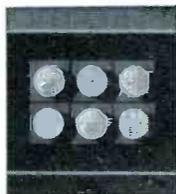
CSI A member of the Clarke & Smith Industries Group



## The video recorder that sets a new standard: The Ampex VR-2000

Ampex's newest Videotape\* Television Recorder, the VR-2000, is expressly designed to operate on new high band standards. It utilizes a new high band carrier/deviation frequency (7.16 to 9.3 mc), which permits a single standard for both colour and monochrome. The VR-2000's performance specifications are impressive: a S/N ratio up to 46 db; basic frequency response to six megacycles; excellent transient response and virtually non-existent moire. Performance is so good, in fact, that multiple generation copies made on the VR-2000 equal original tapes made on present equipment. Although it possesses all this upper range ability,

\*T. M. Ampex Corp.



the VR-2000 is instantly switchable to present low band standards in either 625 or 525 lines. And for all its sophistication, it is the most reliable and easy to operate recorder ever built. A complete line of VTR accessories is available now for the VR-2000: Intersync\* (standard on all VR-2000s); Amtec;\* Electronic Editor; Colortec;\* and Editec.\* The VR-2000 and its accessories are products, not promises. The VR-2000 is presently being installed at one major European network. Write today for complete information. Ampex Great Britain Limited, 72 Berkeley Avenue, Reading, Berkshire. Telephone Reading 55341. Sales and service throughout the world.

a lot of circuits in a small space. They can easily be replaced, and then repaired later on the bench (or returned to the factory for repair). They make it easy to add extras. And, perhaps most important of all, they lead naturally to standardisation and cost saving.

During the past five years we have considered and tested many forms of plug-ins. And we have produced equipments using three or four widely different types. There was an obvious need to standardise but we took our time doing it because we wanted to be sure we had the best answer.

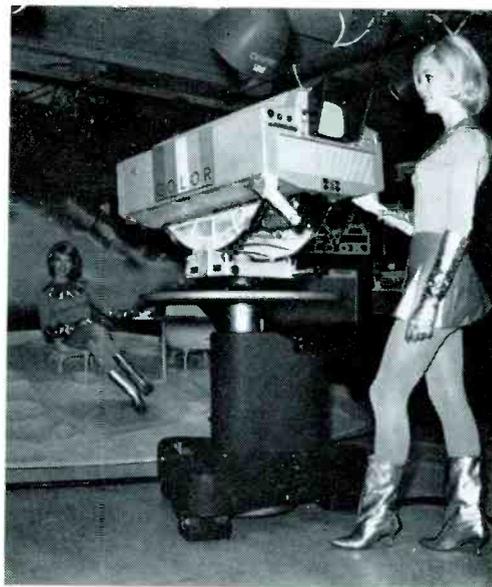
The New Look colour cameras—the new TK-27 colour film camera and the new TK-42 live colour camera—are both 4-channel designs in which the M-channel concept (i.e. separate luminance channel) has been brought to perfection by years of work. The concept itself, of course, is not new. In fact, a 4-channel camera was patented in 1944 by Dr A. N. Goldsmith. The first really practical live camera of this type was shown by our engineers at the 1962 NAB Convention and a prototype 4-channel film colour camera was shown in 1963.

Before and since these dates our engineers have been working to further perfect the idea and to integrate it with our other New Look equipments. This meant complete transistorisation, use of standard type plug-ins, and as far as possible, standardisation of plug-ins between cameras. The six plug-in modules in the TK-22 monochrome film camera are all used in the TK-27 colour film camera. Of course, the latter uses four sets of 'Proc' and 'Video' modules—one for each channel.

**I**N a forthcoming issue of International TV Technical Review I shall be giving a detailed account of the TK-27 and TK-42 cameras, and also of the TK-60  $4\frac{1}{2}$ -in image-orthicon camera for monochrome broadcasting. So far as the TK-60 is concerned, it may here be noted that on examining the equipment at Chicago I found extensive use is made of stabilised circuitry in every part of the camera chain, beginning with the voltages applied to the image orthicon and extending through all of the video amplifiers, deflection circuits and processing circuits. As a result, a great improvement has been achieved in stability of operation. This permits a major reduction in the number of operating controls and the amount of effort required for operation. Further, the frequency with which re-adjustment of set-up controls must be made and the amount of servicing required are also reduced significantly.

In the TK-60 camera chain there are actually only two operating controls. This simplification makes it possible for one video operator to handle as many as six cameras at one time. I found that by virtue of the stable circuitry in the TK-60 camera most of the controls usually found at the console are no longer considered operating controls. They have been removed from the operating panel, leaving only two controls for normal operation—CONTRAST and IRIS (exposure). This actually results in more uniform picture quality as well as simpler control. The fundamental basis of the TK-60's performance lies in the new space-age developments of circuit techniques and components that provide either built-in immunity to, or compensate for, normal drift in performance.

Common variations attributable to changes in temperature, line voltage, and ageing of components have been eliminated almost completely by use of the new techniques. Therefore, performance is maintained over long periods of time without re-adjustment of controls. To achieve this uniformly high performance precise regulating techniques are employed for: (1) Focus current and Voltage. (2) Photo Cathode Voltage. (3) Image Section Voltage G-6. (4) Dynode Voltages. (5) Beam Voltages. (6) Target Voltage. Some of the new devices used for combating drift include Zener diodes, Zener diodes in ovens, corona regulators, and corona regulators in ovens. Use is made of feedback techniques in video output stages, deflection systems and clamp circuits. These are further aids in maintaining stable signal levels, linearity, and low differential gain. Additional automatic compensation employed in the TK-60 includes: (1) Self-regulating power transformer—for variations in line voltage from 95 to 130 volts. (2) Thorough magnetic shielding—for



*SPACE-AGE SETTING for display of the revolutionary new RCA separate-luminance colour camera at Chicago featured live 'Moon Maids' out of the internationally-famed Dick Tracy comic strip. Chester Gould, creator of Tracy, appeared with the Moon Maids before this camera, his appearance being colour-video-recorded.*

protection to 10 gauss. (3) Temperature control—through thermostatically controlled heater. (4) Parameter tracking. As a result, the TK-60 produces no noticeable variation with normal temperature from the high standards of performance and does not exceed maximum variation with temperature extremes. This means the TK-60 will give unvarying quality in pictures—hour after hour, day after day—by merely turning the camera on and off. No longer is it necessary to wait for long periods of warm-up, or to re-adjust at frequent intervals.

**A**LL these RCA New Look cameras must be regarded as a 'team', as part of group design. This was stressed to me by Wendell C. Morrison, who further explained: 'By group design we mean the simultaneous design of closely related groups of equipment items. Cameras are a typical group. By considering all of our camera designs simultaneously we have been able to standardise many of the modules, yokes, camera mountings, and other items. We could also relate arrangement, performance, operational set-up, and maintenance to obtain many obvious benefits for the user. Similarly grouped for design have been tape recorders, FM transmitters, and UHF transmitters. In the latter an extra advantage of this programme to the user is the ease with which power can be increased subsequent to the original installation.'

'The New Look FM Transmitters not only look different, they are different—very different. They make use of an entirely new exciter unit, and a completely different tube line-up. The only thing retained from our old design is the use of "direct FM". This system—developed by RCA engineers, and used in all of our FM broadcast transmitters from the very first—has proved to be better than any of the numerous systems tried by others. In our new FM Exciter frequency modulation of the oscillator is accomplished in a new way that has been brought

(continued on page 186)



## Who raised the standard of Video Tape?

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to suitable performance standards by engineers of our transmitter group. In this new method the oscillator is directly modulated by capacitive diodes. There are no series or cascaded modulators—and there are only four r-f tubes (oscillator, buffer, doubler, and 10-watt output tube). Frequency stability is maintained by a counter-detector circuit which drives a magnetic amplifier supplying d-c voltage to a capacitive diode controlling the frequency of the FM oscillator. The overall exciter arrangement is far simpler than any devised previously. It is also more stable and it eliminates the problems of spurious frequencies in multiplex transmission.

The intermediate amplifier and output stages which follow the exciter are also much simpler than in previous designs. All circuits—both in exciter and amplifier are single-tuned. The overall effect of these design features is to make these new transmitters much simpler, far easier to tune, and more certain of providing high-fidelity performance even under the most difficult stereo and multiplex conditions.

In the new UHF transmitters, which are obviously so important in areas of Europe where a UHF-TV service is going on the air for the first time, the Camden experts employ high-gain tubes (valves) to reduce the total number of stages. One example is the use of travelling-wave tubes in the first RF amplifier. These tubes produce a gain from 1 watt to 250 watts in a single stage! They are driven directly by the mixer stage in which grid modulation is accomplished by low-level video. For 2-kE output the TWT drives an amplifier stage using an A-2571, and for 10-kW they provide an additional stage with two A-2571's in parallel. Thus for 2-kW there are just two RF stages following the mixer, and for 10-kW only three. The A-2571's, of course, are air-cooled, coaxial tetrodes. Klystrons RCA now use, I observed at Chicago, are the integral-cavity variety, and this in itself reduces several of the troubles others have encountered with klystron transmitters for TV. Reason? Why, simply that since the cavities are part of the tube itself, the number of ceramic windows and ceramic-metal seals is cut almost by half.

Because of all-metal body construction, I find these klystrons to be extremely rugged, and from test-reports it is obvious that RF fields are confined within the self-shielding structure of the TWT, so eliminating unwanted coupling, and simplifying screening. These things are of vital importance on UHF-TV. Moreover, I noted that these integral-cavity klystrons are pre-tuned at the Camden laboratory to the TV-station's operating frequency. So there are no cavities to assemble and adjust out at the station itself.

**T**URNING for a moment again to the FM transmitters, the new RCA range—for which I predict world-wide sale—are designed since the advent of FM-stereo, so naturally they give good performance in stereo, with or without an SCA sub-carrier, since they are not conversions for stereo but actually designed for stereo duty. The 5 and 10-kW systems (BTF-5E and -10E respectively) are field expendable to a full 20-kilowatt power capability at virtually no increase in floor space. Thus, the lower powered station can provide for future expansion without increasing floor area requirements. Further, the five-kilowatt system is expendable to 10 kilowatts as well as to the 20-kW level. This ability is particularly valuable when adding vertically-polarised antenna systems. Experience has shown that the less complicated a transmitter is the better its operating dependability. In line with this, these three new transmitters were designed for utmost simplicity without sacrifice of performance. For example, the exciter portion—often called the 'heart' of the transmitter—uses only **nine** electron tubes to perform all of the functions that required 18 tubes previously. Of these nine, four serve in the RF portion, an additional four in the automatic-frequency-control (AFC) section and the ninth is a voltage-regulator type. Although the exciter is a true frequency modulated device, it avoids the use of reactance tubes as modulators. Capacitive diodes—an innovation of solid state electronics—frequency modulate the ultra-stable oscillator in the exciter. Additionally, the oscillator operates at one-half the



*DIRECT-FM DESIGN is feature of this entirely new 10-kW UHF transmitter, salient points of which are here being explained to International TV Technical Review's Editor by RCA's Ralph Lopez, Manager Advertising, Communications, Broadcasting and TV Products.*

transmitter frequency—thus avoiding the tuning tedium of multiple frequency multiplier stages. Further, **direct-FM** modulation eliminates the critical modulation level adjustments that other modulation systems demand.

The AFC system of the exciter employs a magnetic amplifier system. Should the modulated oscillator drift from its centre frequency, a counter-detector circuit senses the drifts and develops a so-called 'error' signal. Before this error signal can be used for oscillator control, it must be amplified. This is where the magnetic amplifier comes into play—a transformer-like device, the magnetic amplifier boosts the magnitude of the error signal some 40dB (100 times). This amplified signal then corrects the centre frequency of the oscillator. The power amplifier in the exciter delivers 10 watts of modulated r-f to the driver stage.

Many station operators prefer that the bulky high-voltage power supply be external to the transmitter, in a separate enclosure, to permit installation in the basement, closet, attic or other unused area of appropriate volume away from the transmitter room. This, of course, reduces the floor area dedicated to the transmitter and removes the dead weight of the plate transformer from the floor loading consideration. The new series of transmitters improve this concept by locating the silicon rectifiers with the power transformer instead of within the transmitter cabinet. This results in increased accessibility in the transmitter and the rectifier cabinet for cleaning and other maintenance. Silicon rectifiers are ideally suited for this type of duty because they can't be 'frozen' out as can mercury-vapour-tube types. Thus, the place where the transmitter is installed need not be a heated area.

*(Continued on page 188)*

Vinten camera mountings, tripods, cranes and pedestals are used in television studios all over the world. This photograph by courtesy of JODX-TV Japan illustrates the Vinten 'Heron' mechanically operated, hydraulic traction Television camera crane at the KTV Studios, Osaka.

# Vinten

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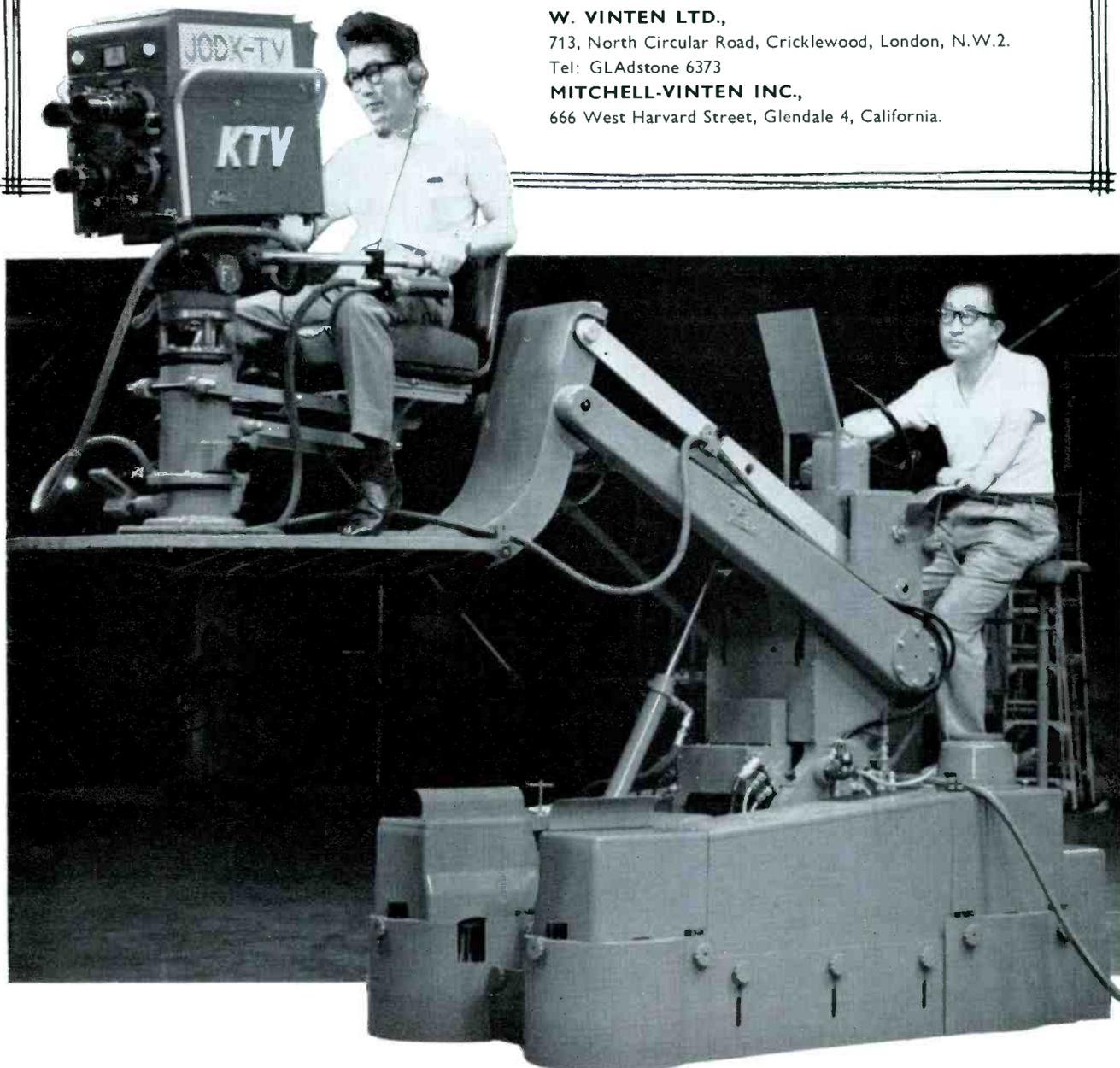
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In summary, the 5E/10E/20E transmitters are claimed by RCA to be the finest FM equipments developed to date: An exciter without peer; outstanding operational simplicity; modern cabinet styling; separate high-voltage power supply; readiness for remote control and automatic logging; self-correcting functions; true frequency modulation; power upgrading of the 5 and 10-kW systems. These are but some of the features of the new line of FM transmitters.

**QUOTE** has already been given from Wendell C. Morrison on the TWT's used in the UHF transmitters, and the biggest Tx in the range uses vapour-cooled klystrons. The TTU-30A in fact employs klystrons engineered and manufactured by Varian Associates, and these help to reduce Tx space since steam is the heat-transfer medium, and steam condensers are smaller than water coolers of equal heat-exchanging capacity. In addition, the TTU-30A uses a much smaller circulating pump than conventional water-cooling systems and this results in a primary-power saving of some 10 kilowatts. Since this saving is cumulative, it grows with every hour of transmitter operation and, over the years, can amount to thousands in reduced operating costs. It has been my experience until now—and doubtless yours as well—that klystron-powered transmitters were notorious for their demands on headroom in the room which housed them. The TTU-30A, through an ingenious tube-change system, permits installation of the entire transmitter in a room with the average 8-foot ceiling height. A tilt-down klystron-change system eliminates the gantry-crane dolly system, which, in turn, eliminates the unusual ceiling-height requirement of gantry systems.

Because of the fact that International TV Technical Review goes all around the world, including many areas where broadcast services are just being planned, I want to draw particular attention to RCA's entirely new TTU-2A. This is primarily for the 'just-starting' UHF station where they must keep Tx investment and operating costs to a minimum, but where one looks forward to future expansion. This transmitter is the answer to both requirements: it is a high-quality, low-cost transmitter that offers future expansion to a 10-kW power capability. The increased power is an add-on feature so that the original transmitter remains substantially intact. The TTU-10A and TTU-2A are unique in the industry in that they are the first commercial television-broadcast transmitters to employ travelling-wave tubes (TWT's) as the driver amplifiers. TWT's have a long history of excellent reliability and long life in microwave-communications gear. At UHF frequencies, TWT's serve as high-gain (26 db), broadband amplifiers that operate **without tuning devices**. Thus, TWT amplifiers are the simplest power amplifiers. The power amplifiers in the TTU-2A and -10A use air-cooled power tetrodes designed for long life with a minimum of maintenance. These tubes are ceramic-seal units engineered to deliver the highest possible efficiency at all points in their service life. In addition, the amplifier design provides for quick tube change so as to minimise lost air-time in the event of tube failure during air hours.

The three transmitters in this new line all employ a new visual exciter/modulator that applies the video modulation to the carrier at a level prior to driver input. This greatly simplifies the modulator and, as a result, sets a new standard of reliability. Aural modulation is applied via the **direct-FM** method using the new Type BTE-10C FM exciter which I have described in connection with the FM transmitters.

**I**N future issues of this journal I shall be giving more detailed information on the video equipment so far outlined, and in October another International TV Technical Review team will be visiting Camden, N.J. However, to conclude this section of the New Look survey, reference must be made to RCA's latest programme of transistorised audio equipment. This includes cartridge and reel types, a monaural cartridge system for tape, the Type RT-17, a stereo cartridge tape system, RT-37; a cartridge playback system, RT-8 and a professional audio recorder, RT-21. New studio consolettes, the BC-7 for stereo and the BC-8

for monaural operations, offer a custom-like flexibility, highly adaptable to radio and TV operations. These two new transistorised equipments provide facilities for recording programmes and commercials—making them available for instant selection and playback. The RT-17 monaural system—with its silent automatic operation, compact modern styling, and high quality sound reproduction—adds new realism to broadcast material, from 'quickie' spot announcements to complete programmes. The stereo version, RT-37, adds still another dimension to the sparkling sound of this excellent performer. Use of tape cartridges make cueing and threading of tape unnecessary. The desired cartridge is selected, placed in the playback unit, and instantly switched 'on-air' at the touch of the start button. Remote control permits recording or playback from any desired location. By means of a trip-cue tone—which can be placed anywhere on the tape—either of the cartridge tape systems can automatically trigger slide projectors or other equipment capable of being remotely started. An end-of-message cue can be used to activate additional playback units, reel-type recorders, etc. in a simplified form of automation. A third cue tone (automatically recorded each time the tape is started) re-cues each tape announcement so that it is ready for re-use.

**DESIGNED** for playback of a number of pre-recorded tape cartridges, the RT-8 system can be operated manually, sequentially or by pulses supplied from an automation system. Each unit houses four plug-in cartridge decks, however, a number of units may be interconnected to provide 4, 8, 12, 16 or more playback decks in an operating system. Three RT-8 models are available; one each for use with cartridges recorded on RT-7, RT-17, and RT-37 (stereo) systems. Plug-in cartridge decks, playback amplifiers and power supply modules are identical to those used in RT-17 and RT-37 equipments. An optional feature of the RT-8 is provision for recording a random trip cue to automatically activate slide projectors and other such devices.

Continuously variable speed control is provided for quick and precise cueing of tapes. An optional fourth head (in addition to normal record, erase and playback heads) can be added for playback of dual quarter-track tapes, or for time delay broadcasts, or for special applications as desired. Rugged construction for smooth reeling and braking is also featured. The RT-21 is available for stereo or monaural recording—the stereo version includes two identical transistorised record/playback modules. The modules are directly interchangeable.

The BC-10 includes a ten-mixer position to handle 30 programme sources, while the BC-8 includes eight positions for 24 sources. Ganged, step-type attenuators are included in the BC-7 for use in stereo programming, while the BC-8 is designed for monaural operation only.

**I**N this brief review of the RCA New Look equipment, we have endeavoured to show the behind-the-scenes of the design philosophy, and to show how the equipment has been engineered. We have dealt at random with UHF and FM transmitters, with four-channel live-colour and vidicon cameras, the new monochrome film system, the completely new transistorised video tape machines, and with an important section of the audio equipment. In future International TV Technical Review exclusive articles we shall be giving the circuitry, block diagrams and operational notes on major sections of this equipment. Our editorial team visiting the 42nd Annual NAB Convention were given every assistance in describing, photographing and illustrating the equipment, and in addition to Mr. Charles H. Colledge (Division Vice-President and General Manager), Mr. John P. Taylor (Manager, Marketing Services), Mr. Wendell C. Morrison (Chief Engineer, Broadcast and Communications Products Division), Mr. Stewart W. Pike (Manager, Functional Design) and the other executives mentioned herein, we are especially indebted to Mr. Edward J. Dudley and Mr. Ralph Lopez (Press Relations, RCA), and to executives including Mr. Donald Macphail (Chairman and Managing Director) and Mr. F. T. Giddins (Supervisor, Distributor Division) of RCA Great Britain Ltd.



BBC-2

THIS IS RIVA, not Riverside. While BBC-2 UHF 625-line service goes on the air, other major European studios such as Riva TV and Film Studios, Munich, are also undergoing major technical changes. For the past eighteen months Riva have been using EMI 4½-in. image-orthicon camera channels. Now they have ordered four more of these outstanding British cameras, together with an eight-channel vision mixer of advanced design.

# Standards Conversion for 625

by *Charles Taylor, F.R.S.A.*

**I**N THE past two issues of International TV Technical Review we have reviewed (in March) the national plan to change over to an all-Britain UHF 625-line service; and last month the major studio and technical changes were dealt with.

Television executives in other countries, even where a high-definition UHF service is already operating, can learn much from the BBC's innovations, for the transmitters, studio and all ancillary equipment are of extremely advanced design and will set the pattern for Continental television broadcasting for many years to come. This is not to say, however, that the existing BBC services are being neglected.

Indeed, early this month 'Theatre 625' was broadcast from Studio 1, the fifth and largest major production studio to be brought into service at the BBC Television Centre, Wood Lane.

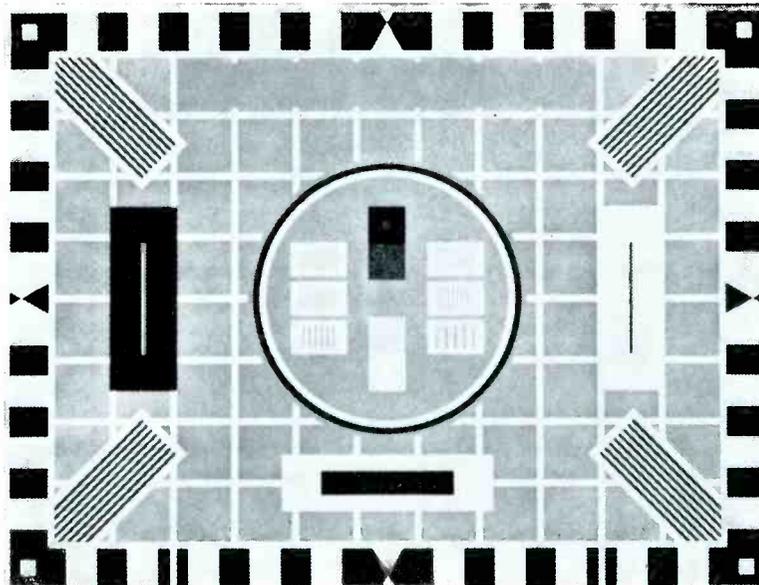
As was perhaps only to be expected with a high-definition TV service, a new test-card has been thought necessary. The design of this card was undertaken jointly by the BBC, the ITA and BREMA, who jointly hold the copyright. There are two

versions of it, Card 'D' for revised standards on 405 lines, and Card 'E' for 625. Although slightly similar to the well-known Test Card 'C' there are changes intended to assess particular characteristics of a video channel as follows.

**Aspect Ratio.** The central concentric black and white circles should appear truly circular when the width and height of the picture are adjusted to the standard aspect ratio 4:3.

**Adjustment of Picture Size.** The limits of the transmitted picture are indicated on the test card by the point of contact of the opposing arrow heads on each side of the test card and by the outer edge of the white squares in each corner. As most receivers have a display area with aspect ratio of approximately 5:4, it is usual to adjust the receiver so that the top and bottom edges of the display area coincide with the arrow heads of the test card and the side castellations of the test card just appear in the display area of the receiver. In this way the correct aspect ratio of the picture is maintained.

**Contrast.** A 5 step contrast wedge appears in the centre of the test card corresponding to a contrast range of about 30 to 1 as between the black and white squares at each end of the scale. Adjacent squares should give equal brightness difference on a correctly adjusted receiver. Within the top and bottom squares



THERE are two Test-cards in this new series, originated by BBC, ITA and Brema. The 405-line and BBC-2 cards are identical except for the six frequency gratings. Lower panel contains identification of originating source. Characteristics of these new cards are discussed this week in the special BBC-2 feature.

## ► BBC-2

are small circular areas of slightly brighter tone. The merging of these areas into the surrounding area indicates white or black crushing as the case may be.

**Resolution and Bandwidth.** Within the circles is a group of six frequency gratings each consisting of alternate black and white vertical stripes corresponding to fundamental frequencies in Mc/s of:—

Test Card 'D'		Test Card 'E'	
1.0	1.5	1.5	2.5
2.0	2.5	3.5	4.0
2.75	3.0	4.5	5.25

The gratings are designed to produce after gamma correction a signal of approximately sine wave form corresponding to 50% modulation (as opposed to the square wave form on the earlier cards). Thus the stripes will have a gradual transition from black to white.

**Scanning Linearity.** The background of the test card is a medium grey, bearing a graticule of white lines. These should be reproduced in all parts as enclosing equal squares and the central black and white rings should appear truly circular.

**Line Synchronisation.** The border of the test card is a pattern of alternate black and white rectangles. The sides of this border serve as a test signal to check the line synchronisation of receivers. Faulty line synchronisation will show as horizontal displacement of those parts of the picture following the white rectangles, in particular giving the central circles an appearance of 'cog-wheels'.

**Low-frequency Response.** Low-frequency response can be checked by means of the black rectangle within the white rectangle at the top centre of the test card. Poor low frequency response will show as streaking at the right-hand edge of these black and white areas and also at the right of the border castellations.

**Reflections.** The white vertical line with the black background and the black vertical line with the white background should appear free from images (ghosts). These lines represent pulses having a duration of 0.3 microseconds on Test Card 'D' and 0.2 microseconds on Test Card 'E'. If there are reflections of the television signal, from hills or large buildings, these may result in displaced 'ghost' images of any significant feature of the picture. This effect will be most readily seen as displaced positive or negative images of the vertical lines mentioned above. These lines are used also to check the transmitter.

**Uniformity of Focus.** In each corner of the test cards there is a diagonally-disposed area of black and white stripes, the focus of these areas and the central area of the test card should be uniform. The stripes correspond to the fundamental frequencies of about 1 Mc/s on Test Card 'D' and about 1.5 Mc/s on Test Card 'E'.

THESE new cards cover 405 lines as well as the BBC2 625-line standard, and again this raises the thorny problems of dual line standards in one national TV-broadcasting system. Mr W. Proctor Wilson, for many years Head of BBC Engineering Research, in his paper **The Challenge of Circumstances**, deals with the urgent problem of standards conversion, in which the BBC has played a pioneer part. Taking us to the very rebirth of the postwar BBC-TV service, he says: 'The BBC resumed its television service on the 405-line standard, adopted in 1936. Abroad, thoughts were turning to higher definition standards. In 1941, American television had begun on the 525-line standard. France was proposing an 819-line standard, while other European countries favoured a 625-line standard. In order to make appraisals of these different systems, laboratory apparatus was made with which it was possible for an observer to compare pictures on any of the standards. Such appraisals, with improved laboratory equipment, have become of increasing importance over the years and have been of great value. By 1951, the 819-line system and 625-line system were established in Europe. Meanwhile, the BBC continued to expand its own 405-line service.'

'The BBC attached great importance to the interchange of live television programmes between the United Kingdom and the Continent. The technical difficulties in achieving this were evident, since no common standard existed. A solution to the problem of converting one standard to another was found by training a 405-line camera upon the screen of an 819-line receiver. Under these rather crude conditions the picture seen on 405 lines was marred by a disturbing pattern—rather like the effect of looking through two sets of parallel railings. There remained the problem of eliminating this undesired pattern without unduly smudging the picture in the process. This was solved. The first standards converter was built, and used in April 1952 for the first direct television programme from Paris ever broadcast in this country. A notable use of this new means of programme exchange was the broadcast to viewers in France,

*(continued on page 192)*



## PHOTOCELLS for LASERS . . . .

**N**EWs comes of two new tube developments from the EMI Laboratories. First, a novel high-current photocell (type 9608) has been developed which is specially suitable for illumination from pulsed light sources such as lasers. It is an opaque cathode cell having a high transmission mesh anode mounted close to the flat window, and only a few millimetres away from the plate cathode. The high anode field with voltages of about 2,000 enables large peak currents to be drawn, up to 1.0-amp, and this is what makes the cell so suitable for laser work.

Second development is a series of 'squirrel cage' photo-multipliers (type 9663). This tube is sensitive to radiation through its side wall, which is made of u/v transmitting glass. The opaque cathode is of bismuth silver. The high gain and low dark-current which are achieved with this series of tubes makes them suitable for low-level u/v and visible radiation spectrometers, and for many other applications.

\* \* \*

### New TV-studio Lighting Bracket

**A** NEW studio lighting hanging bracket, manufactured by Osram (GEC) Ltd, is making its first appearance in BBC television studios. Made from die-cast aluminium, it has been manufactured to a BBC design and specification for suspending studio spotlamps, floodlamps and Cyclorama units from standard two-inch scaffold barrels. It is equally suitable for supporting luminaires in film and photographic studios. The principal advantage of the new bracket over previous models is added strength; an aluminium plate is incorporated between the claws, which virtually eliminates the risk of breakage or distortion.

Weighing only 2½lbs, the bracket will safely hold a working load of 200lbs. It has been proof-tested to 400lbs, and has a breaking strength of four tons.

Features of the bracket include a galvanised safety cotter-pin (made captive to the fitting by a short length of galvanised wire) for attachment to a 1¼in lighting spigot; also two clamping screws—one for securing the bracket to the scaffold barrel, the other for holding the lighting spigot to the bracket. It is being marketed in Great Britain and throughout Europe by Osram.

May 1964

Serial No. **TECH/MA 191**



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'ELECTRON STICK' is a new device for microwave instruction. This 13-in. probe helps when demonstrating two-cavity klystron amplifiers, Adler tubes and similar equipment.



## ► Line-Standards

the Netherlands, West Germany, and Belgium, of the Coronation of the Queen in June 1953. With the growth of the Eurovision network, standards converters of this kind have become an accepted part of Continental television links. Their performance is not perfect, but they have played a not unimportant part in television history.

'When the launching of a second BBC programme was first considered, it became apparent that better standards converters would be needed. The choice of the 625-line standard for BBC2, with the retention for many years of the 405-line standard of the existing BBC and ITA programmes, implies the routine use of standards converters if selected material from one programme is to be repeated on the other. It became clear that a radically different method of converting one standard to another must be found if significant improvements in performance were to be made. A remarkably ingenious and novel form of converter was proposed in 1961 by a team in Designs Department, and a complete equipment was demonstrated to the Press in 1963.

'The American television standard differs from the British not only in the number of lines, but also in the number of pictures transmitted in a second. This means that special precautions are required to avoid intolerable flicker when converting transatlantic programmes. A successful converter for this purpose was constructed and used to provide American-standard pictures of the wedding of Princess Margaret in 1960. These pictures were transmitted by cable and radio links to London Airport, recorded on magnetic tape, flown to Canada, and re-broadcast from there the same day. . . .'

**N**OW there was this growing need for a standards converter to serve BBC2, and a year-and-a-half of research by BBC Engineering designers, under Peter Rainger, head of VTR Department, resulted in the development of the purely electronic converter mentioned by Mr Proctor Wilson. It was, indeed, shown to an International TV Technical Review Special Commissioner in August last year, and its first public demonstrations was in BBC-TV News Bulletins on August 20. Based on an electronic sophistication of the uniselector switch principle, together with a computer-type storage circuit, the machine is expected, in production, to undercut the cost of optical conversion equipment—about £16,000—by a factor of twenty-five to fifty per cent. Running costs with this equipment are almost completely eliminated, as there is no make-ready time involved, and the device needs no supervision. The prototype machine only converts 625-line pictures to 405, although the design team, which includes George Hunt and Leonard Davies, is working on a converter for the opposite function.

In operation, the original and converted picture are almost indistinguishable, apart from almost negligible vertical patterning on the converted picture, and the usual slight loss of definition on a 405-line picture when compared with a 625-line display. In normal practice, it will be impossible to tell whether a picture has been converted or not. The techniques used in the converter include fast switching and sampling processes, similar to those used in high-speed computers. Some of the electronic switches operate at a rate corresponding to 18 million revolutions per minute, and the apparatus includes between 2,000 and 3,000 transistors. In conversion of television signals from 625 lines to 405 lines, each scanning line must be made to last longer and this can be done if the line is cut into small pieces, or elements, which are then stretched out in time. This, by itself, is not enough because there are still too many lines; somehow

220 of them must be rejected, but simply to leave them out would give a poor result because the picture information represented by the 220 lines would be missing. The process used to solve the problem is perhaps best understood by imagining that the picture is cut up into a large number of narrow vertical strips. In any one strip there are 625 such elements and the converter calculates the correct values for 405 new elements to replace this strip and assembles the new strips to compose the required 405-line picture.

**W**HEN our Special Commissioner discussed the electronic converter with Mr Francis C. McLean, BBC Director of Engineering, the following points were made which Mr McLean will probably not mind seeing quoted out of context, as they throw an interesting light on future BBC2 conversion developments.

'This converter uses the avalanche transistor technique. The Mullard group introduced an avalanche technique some years ago, but for a totally different application. . . . Because of the avalanche technique, this machine has a 150-volt supply, as well as the normal lower-voltage supplies one generally associates with transistor circuits. . . . It would be possible to build this type of machine to convert from 819. There are no interlace problems on 819 lines. . . . By doing the job electronically, we suffer from no loss of contrast at all, as the instantaneous signal amplitudes remain the same. The machine is really only a switch, you see. . . . The real difficulty about a two-way 405/625 conversion is that there is not enough electronic video information in the 405 picture to begin with. . . . It is a boon to have an all-electronic system, for continuous observation of tube and camera in the former optical systems were cumbersome, and the device took up to half an hour to get started. Now, with a static device, conversion becomes almost instantaneous. . . . There are virtually no operating costs, whereas in the old days of optical CRT conversion the bill for the continuous working of the camera tube alone probably mounted to £5 an hour. . . .'

It is important to realise that the BBC2 transmissions which British viewers have seen so far are on channel 44 in UHF Band V, with a negatively-modulated vision carrier of 655.25 Mc/s and an FM sound carrier of 661.25 Mc/s. The video bandwidth is 5.5 Mc/s and the sound-vision spacing is 6 Mc/s. As has been pointed out by a Rediffusion expert engaged on the problems of giving viewers a good line service\*, 'the inter-carrier sound circuit has no counterpart in 405-line television. In a conventional 405-line receiver the output signals from the tuner unit are the 34.5 Mc/s (a.m.) vision i.f. and the 38 Mc/s (a.m.) sound i.f. These are separated either at the output of the tuner unit or at the output of a common i.f. stage, and fed via individual i.f. amplifiers to their respective detectors. To prevent any visible effects on the picture from the sound signal, it is necessary to provide at least 40dB of rejection at sound carrier frequency in the vision i.f. response.

'In the intercarrier sound circuit, the vision i.f. amplifier stages accept both the vision i.f. signal of 39.5 Mc/s (a.m.) and the sound i.f. signal of 33.5 Mc/s (f.m.). The sound i.f. carrier is usually 20–26dB below maximum response, and this, com-

\*M.M.L., Technical Supplement to the Rediffusion Bulletin, No 62, May, 1963.

## Standards Conversion

Continued from facing page

bined with the fact that the sound transmission is frequency-modulated, means that no visible sound-on-vision occurs. At the output of the vision detector, there is a video signal (occupying the frequency range d.c. to 5.5 Mc/s) and, at a reduced level, a 6 Mc/s heterodyne, difference frequency or beat between the sound and vision i.f. carriers. This **intercarrier** beat bears both modulations; a.m. due to the picture signal, and f.m. due to the sound. . . .

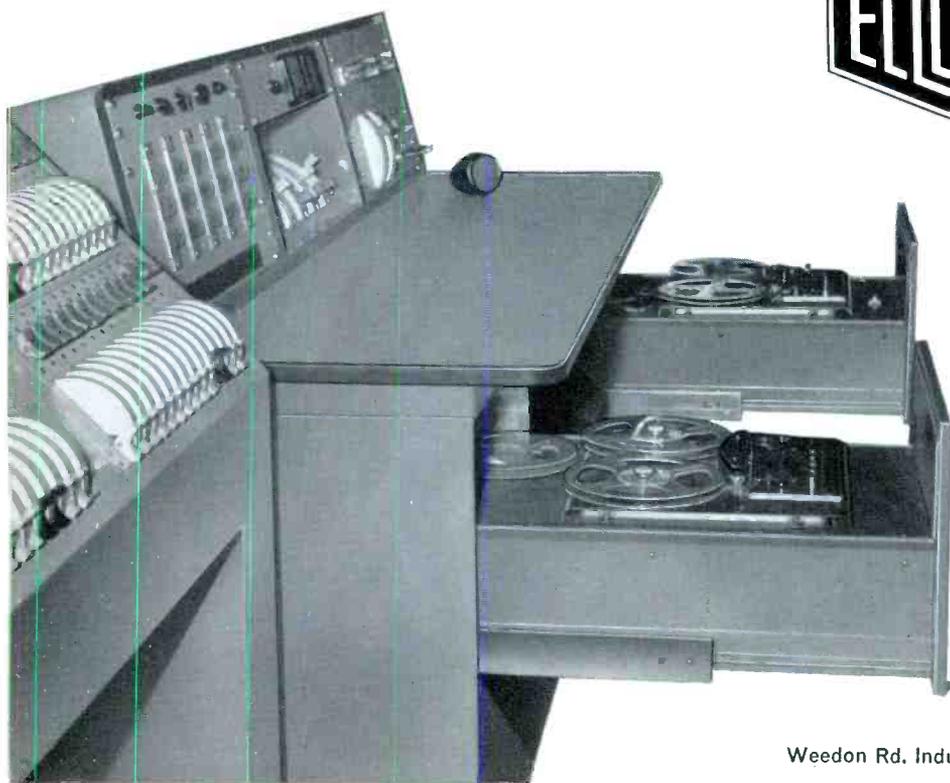
The only disadvantage of intercarrier sound is the presence of the strong vision a.m. on the f.m. intercarrier signal. The f.m. limiter and/or detector can only cope with a certain amount of amplitude modulation (especially in the downward direction) and this is one reason why the minimum amplitude of the negatively-modulated vision carrier must not fall below 10% of maximum amplitude during peak white. There is also the danger of a poorly-designed or poorly-aligned sound i.f. stage producing spurious phase modulation from the amplitude modulation of the intercarrier signal, and once this has occurred, any amount of a.m. suppression by the f.m. detector would not remove the vision buzz from the sound. . . .

**A**NOTHER interesting BBC2 development has been made by the Mullard group, who have devised an economical circuit incorporating the new EH.90 for the detection of the FM sound transmissions of the 625-line television system. This circuit—known as the locked oscillator discriminator—is used in many of the latest dual-standard receivers. The principle of operation of the locked oscillator discriminator is that the magnitude of the mean anode current of the EH.90 is a function of the phase relationship of the voltage at the two control electrodes—the first and third grids—of the valve. The tuned circuits associated with these grids are physically separated but are coupled by the

electron stream within the valve. This electron coupling may be regarded as coupling by means of a negative capacitance. The negative sign indicates that energy is being supplied by the electron stream, and this implies that amplification can be obtained between the two grids. As is normal with loosely coupled circuits, the phase angle between the two voltages is 90 degrees at resonance. Feedback occurs through the internal capacitance between the two grids, and this maintains oscillation.

If the frequency of the input signal applied to the first grid changes, the oscillator remains frequency-locked, but the phase relationship between the voltages at the two grids varies in proportion to the signal frequency. The effective vectorial sum of the currents appears as an amplitude variation in anode current. Frequency modulations at the signal input grid are thus converted to amplitude modulations at the anode, and these are subsequently amplified and fed to the loudspeaker. The electron coupling and frequency-to-amplitude transfer characteristic of the EH.9 are good. The valve is thus very suitable for use as a locked-oscillator discriminator, and will contribute notably to the benefits accruing from the adoption of FM sound transmissions for BBC2 transmissions.

**R**EVERTING to the transmission side of BBC2, it will be appreciated that in the next few years a large number of technicians will have to be trained in UHF techniques and the operation of microwave tubes. We were at the Institution of Electrical Engineers during the recent Conference on Design and Use of Microwave Valves, and were able to test EMI's new 'electron stick'. This is in essence an isolated electron beam which may be inserted into various circuits. In this fashion certain microwave tubes such as travelling-wave tubes, twin-cavity klystron amplifiers, Adler tubes and backward-wave amplifiers can be constructed to demonstrate the principles of operation in a very versatile way. The 'stick' is 13-in long, 1-in diameter at the gun, and 5-mm diameter at the tube probe itself. This electron stick is a useful companion to tools which engineers are now using for BBC2 work, the range including EMI signal generators and power units for bench UHF equipment.



## COMPLETE SOUND MIXING CONSOLES

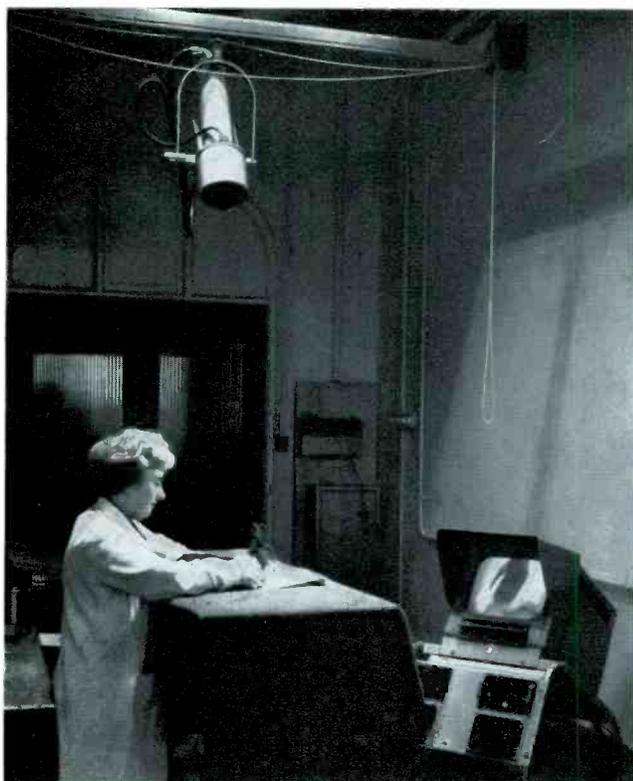
Elcom are now producing **complete** Sound Mixing Consoles based on their new Electronic Fader — using the components which have made them famous throughout the world.

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MARCONI CCTV is used by lecturers at Sheffield University now. There is a remote-controlled camera mounted away from the studio, which can be switched in by the lecturer to provide alternative pictures.

#### BBC-US Engineer

WE ARE ABLE to announce the appointment of Mr L. G. Dive, AMIEE, AMIERE, as Senior Engineer, United States Office ((New York) in succession to Mr D. A. V. Williams, BA, AMIEE, who is returning to the United Kingdom after completing his two-year term of office in that capacity.

Mr Williams joined the BBC in 1950 as a Technical Assistant, Television Studios. In 1951 he was promoted to Engineer grade in the Television Studio section of the Planning and Installation Department where he remained until his appointment as Senior Engineer in New York.

Mr Dive joined the BBC in 1944 as a Maintenance Engineer at the Tatsfield Receiving and Measurement Station. In 1945 he became Station Instructor for the Tatsfield Station and the BBC Monitoring Station at Caversham Park, near Reading. Following the centralisation of Engineering Training he became in 1947 a lecturer at the Engineering Training Department at Wood Norton, near Evesham, Worcestershire, and in 1951 he was promoted to be a Deputy Senior Lecturer. In 1954 Mr Dive transferred to his present post of Senior Assistant in the Engineering Information Department, from which post he will take up his new appointment.

\* \* \*

#### Calibrating by Closed-Circuit TV

RADIATION-MEASURING instruments used in the Central Electricity Generating Board's nuclear power stations throughout the United Kingdom are accurately calibrated before going into service, with the aid of remotely-controlled closed-circuit television equipment supplied by EMI Electronics Ltd.

At Berkeley Nuclear Laboratories in Gloucestershire, a 400kV accelerator produces high energy gamma-rays and neutrons in known quantities for calibrating gamma-ray and neutron monitors. It is not safe for staff to remain near the high-voltage terminal during operation, so a type 6 closed-circuit TV camera transmits the readings on the accelerator meters to a TV receiver in a control room some yards away.

## new developments

# THE INDUSTRY

Another type 6 camera monitors the remotely-controlled operation of a source handling machine, when it is required to calibrate instruments with various radioactive sources. This camera will also observe readings on instruments during either calibration procedure. The equipment to be calibrated is mounted in the centre of the room above a false floor grating, to minimise effects of reflected radiation from solid floor, walls and ceiling.

Gamma survey meters are calibrated by use of an X-ray set which emits a radiation field too intense for continuous human exposure. A type 6 mini-camera transmits the survey meters' readings to a receiver in the control room where they are compared with those from an NPL calibrated standard dosimeter.

\* \* \*

#### Solartron's Digital Voltmeter

PRICE OF THE recently introduced Digital Voltmeter, Type LM 1420, devised, developed and manufactured by the Solartron Electronic Group Ltd, Farnborough, Hampshire, is £325. This revolutionary instrument, which has twice the accuracy and ten times the sensitivity of any comparable instrument commercially available and yet selling at a small fraction of their prices, is the result of the unique techniques developed by Solartron based on counter integration. The Solartron Electronic Group claim that with this instrument they have made a break-through in the design of digital voltmeters, and certainly as regards the price.

\* \* \*

BEFORE THE Professional Group on Electromagnetic Wave Propagation, of the Electronics Division of the IEE, an interesting lecture on the engineering and scientific aspects of the Canadian ionospheric satellite was given recently by Mr E. D. R. Shearman, BSc(Eng) and Dr J. W. King, BSc, MSc, PhD, AInstP.

The Canadian built satellite 'Alouette' carried a swept-frequency ionospheric pulse sounder into orbit above the earth's atmosphere for the first time. It was designed to study the



ARTHUR H. COOPER, Technical Director of EMI Electronics, demonstrates new colour camera to international delegates of the London International Youth Science Fortnight, held under patronage of HRH the Duke of Edinburgh.

variation of electron concentration with height above the peak of the F layer and to map these concentrations over the earth. The satellite was successful beyond the hopes of the designers, and it has revealed a number of new phenomena in the upper atmosphere which it is now timely to review.

The design of the experiment involved a careful consideration of satellite height, orbital inclination and time and location of launch in order to obtain the fullest mapping of the geographical, diurnal and seasonal changes in the ionosphere. The design of the satellite-borne ionosonde demanded the solution for the first time of three major problems: how to build a transistorised 100 watt pulsed transmitter swept in frequency from 1-12 Mc/s, how to deploy a 150ft long dipole aerial from a satellite and how to telemeter a 100  $\mu$ sec pulse echo pattern to earth with the requisite dynamic range.

#### **New DC Calibrator**

**A**N INTERESTING new DC Calibrator, to be known as Type 126, has been designed and developed by G. and E. Bradley Ltd and was first seen at the recent Instruments, Electronics and Automation Exhibition at Olympia, London. The object of this lightweight calibrator is to extend up to 2.5kV, the present range of stable and accurate DC voltage provided by the Bradley DC Signal Generator Type 123.

Using similar techniques to those employed in the DC signal generator, the reference is a temperature-compensated zener diode of high stability, and voltage output is controlled by decade switching. The possibility of breakdown through sustained short circuit is eliminated by the provision of overload protection. The output voltage range is from 50V to 2.5kV DC in steps of 50V and 500V. An additional control giving nominal 10V resolution from 0V to 100V is also provided. Continuous variation of any selected output over a range of

$\pm 5\%$  may be obtained by means of a built-in percentage deviation control.

The compact Bradley model 126 is an ideal voltage source for the calibration of DC voltmeters and oscilloscopes. It can also be applied to the testing of cathode-ray tubes, photo-tubes, insulation resistance, and many other applications requiring a variable, highly stable low power DC source.

#### **Tap-changing Stabilisers**

**S**MALL, RELIABLE, low-cost tap-changing mains voltage stabilisers have been introduced by Claude Lyons Ltd.

Many electrically powered instruments and television processes are designed so that their operation is not impaired by moderate variations in the supply voltage. However, if supply voltage variations exceed the limits allowed for in the design, incorrect or imperfect operation results. Series VB tap changers provide the degree of mains voltage stabilisation needed.

The VB series operate on the same principle as the well-known series ASR and ATC stabilisers, which they replace. The new models feature a transistorised control circuit, and are smaller in size and considerably cheaper in price. The output voltage from the unit is monitored by the transistorised electronic control circuit, controlling relays which select tapplings on a booster transformer. As the voltage varies, it is automatically corrected in steps, and maintained within the specified limits.

Series VB tap changers are made in two basic sizes, VB1 and VB2, each of which is available in high-voltage and low-voltage versions. In the high-voltage units (suffix 'H'), the nominal voltage can be set to any required value in the range from 200 to 254 volts, and is set to 240 volts before despatch unless otherwise ordered. Low-voltage units (suffix 'L') are adjustable from 100 to 127 volts.

**LAST MINUTE NEWS: Fairchild, outstanding U.S. producers of military silicon transistors, now to enter the European 'entertainment' video field. First technical details will be given in next issue.**

**THIS SPACE RESERVED**

**FOR**

**PHOTO-PRODUITS GEVAERT S.A.**

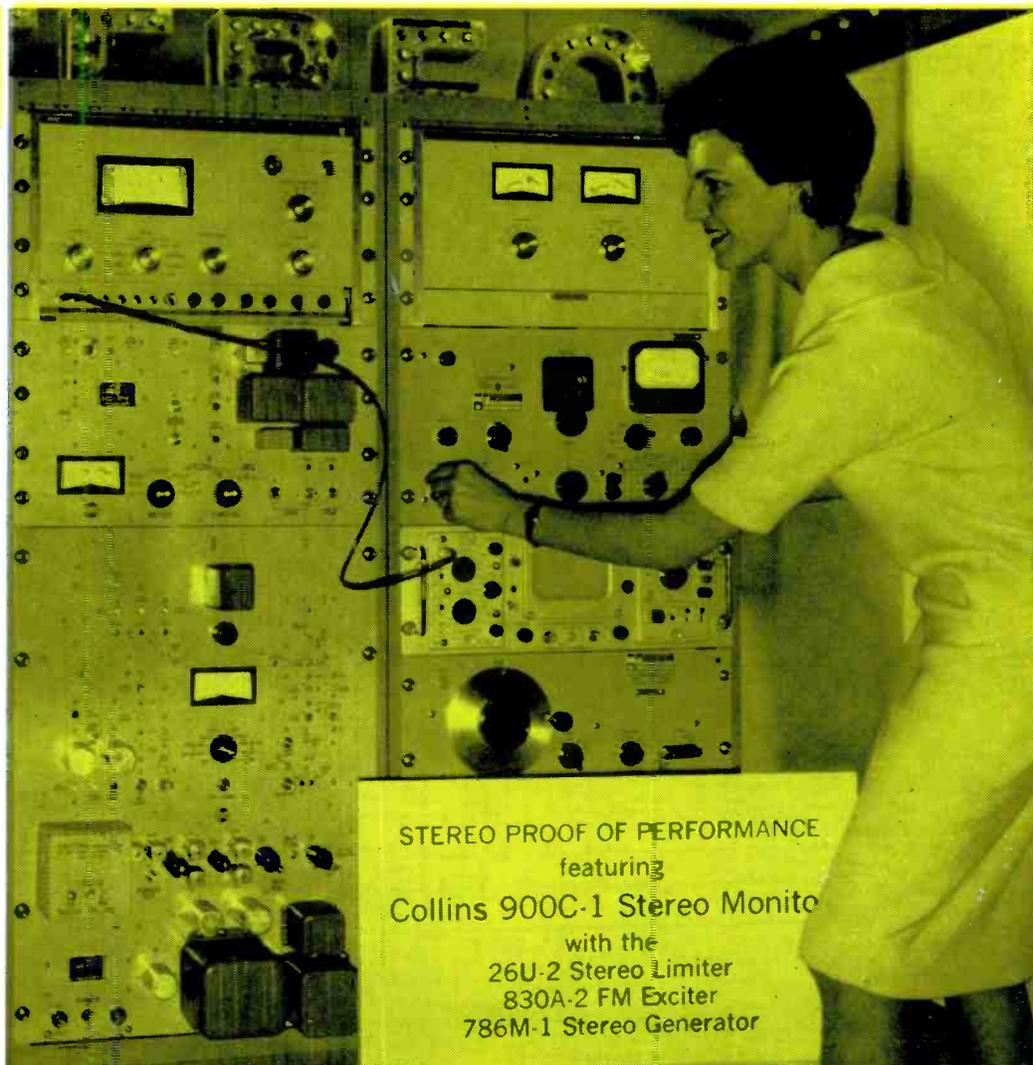
**MORTSEL (ANTWERP)**

**BELGIUM**

# NAB Report

deliver as much as 3.5 volts of video into a 75ohm load with extremely low distortion. For applications in which both sound and picture are to be transmitted over a single output channel, the unit can be furnished with provisions for mixing a 4.5mc sound sub-carrier with the video output.

Before actually visiting the **LTV Continental Electronics Division** display, and meeting personalities including Mark W. Bullock, J. O. Weldon, Ernest Ankele and Vernon Collins, we attended a lecture at the NAB Broadcast Engineering Conference given by Continental's electronics marketing manager, Don W. Clark. He described how a 24-hour fully-automatic and unattended programming is one of radio's latest steps in this push-button age. Don explained how his firm's automatic programming and logging system, ProLog, is based on a station's daily log. (A log, of course, is a typed schedule of all material to be broadcast during a 24-hour period). This log, coupled with taped programmes and announcements, is the heart of the operation. The log is coded with type-written symbols for the time an item is to be broadcast. As a symbol passes under a photo-electric head in the ProLog unit, it warns the machine containing the next scheduled tape that that item will be aired next. The movement of the log is triggered by an inaudible tone at the end of the tape being broad-



**NEW CONCEPT** in magnetic recording for radio spot announcements, by Ampex Corporation. Magnetic disc is used, not tape. Disc is slipped in slot of recorder which automatically centres and cues it for recording or playback. Full playing time is three minutes, and maximum cueing time five seconds.

*AUDIO EQUIPMENT shown at NAB by Collins Radio Company featured this comprehensive 900C1 stereo monitor, in addition to FM and AM transmitters and a wide range of audio control gear. The unit shown incorporates FM exciter, and stereo generator and limiter.*

cast. This same tone activates a printer which records on the log the exact time each item goes on the air.

If a station prefers to combine its ProLog system with manual operation, a few simple controls give the announcer access to all tapes and functions. For a live sequence, the announcer can be coded into the log. The system then will handle automatically all station breaks, taped introductions and commercials, and will switch to him as indicated. He is relieved of all logging and switching operations except to press a button when he has completed his part. An emergency button gives him immediate access to live operation without waiting for completion of the item playing. Keeping pace with the flexibility required in today's radio formats, the ProLog system also allows for last minute

*(continued on page 199)*

598 621.397.13:621.039

**The application of closed-circuit television in the nuclear industry.** P. Barratt and I. M. Waters.

Systems must be designed for use in the intense radiation fields and high ambient temperatures and pressures which occur in a nuclear reactor. The influences of these conditions upon television camera design are discussed, with indications of the ways in which specific problems may be solved.  
Vol. 20, page 225, March 1960.‡

599 621.397.13:621.391.822

**The relative visibility of random noise over the grey-scale.** K. Hacking.

The main factors which influence the relative visibility of random fluctuation noise over the grey-scale of a television display are examined. By applying existing data relating to the perception of small differences in luminance, theoretical relative visibility curves are deduced for three elementary types of noise source encountered in television systems.  
Vol. 23, page 307, April 1962.

**COLOUR TELEVISION (621.397.132)**

600 621.397.132

**Colour television—BBC experiments.**

Details are given of the equipment and modified NTSC signal used.  
Vol. 15, page 576, November 1955.

601 621.397.132:535.6

**A survey of the methods and colorimetric principles of colour television.** J. E. Benson.

After an outline of the principal historical steps in colour television, the basic requirements of a satisfactory system, the principal current methods and future trends are discussed. The basic principles of colour specification, measurement and calculation are described, the concept of colour space being employed to explain the algebraic development of the trichromatic theory of colour representation. This leads to an explanation of the origin and principal characteristics of the chromaticity diagram of the International Commission on Illumination. An outline is given of the principles of colour television systems. 124 refs.  
Vol. 13, page 9, January 1953.

602 621.397.132:535.6

**Colour television.** G. N. Patchett.

The theory of colour mixing and of colorimetry is discussed briefly. Various systems for colour television are outlined and studio and receiver equipment described. The NTSC system and its modification to British standards are discussed. 155 refs.  
Vol. 16, page 591, November 1956.

603 621.397.132

**A constant luminance colour television system.** I. J. P. James and Karwowski.

A colour television signal employing three basic components

$$E_Y, \frac{1}{y} \left( E_R \frac{1}{y} - E_Y \frac{1}{y} \right) \text{ and } \left( E_B \frac{1}{y} - E_Y \frac{1}{y} \right)$$

is proposed for use in NTSC and Secam type systems. It is shown that this leads to certain improvements both in the quantity and quality of the transmitted information. Methods of receiving such a signal are described and it is concluded that theoretical considerations of the system have reached such a stage that experimental work would be both desirable and justified.

Vol. 23, page 297, April 1962.‡  
Awarded the Associated-Rediffusion Premium for 1962.

604 621.397.132

**Some aspects of vsb transmission of colour television with envelope detection.** G. F. Newell.

The assessment of the merits of a colour television system in fulfilling the principle of constant luminance must take into account the errors that can result from the use of a vestigial-sideband emission with envelope detection. Comparison is made between the NTSC system and the modified form of this proposed by James and Karwowski. As regards the reproduction of colour in large areas, the NTSC system is in some respects superior to the James and Karwowski system. (Abstract 603).  
Vol. 23, page 316, April 1962.‡

605 621.397.132:621.391.822.3

**Fluctuation noise in two forms of the NTSC colour television system.** A. V. Lord.

A recently proposed modification to the coding of NTSC-type colour television claims to offer some improvements in the picture displayed by both colour and black-and-white receivers. The effects of fluctuation noise in colour receivers are investigated for both the modified system and the normal form of NTSC system. The analysis assumes that 'flat-spectrum' noise is added to the signal at a point prior to decoding in the receiver, and the visibility of this noise is calculated for a series of test colours; the results given include allowance for the reduction of receiver ratio by ambient light falling upon the screen. It is shown that both systems have a substantially similar sensitivity to fluctuation noise. These findings are discussed in the light of experiments carried out in the USA and Britain.  
Vol. 23, page 322, April 1962.‡

606 621.397.132:535.6.08

**A colorimetric study of a constant luminance system.** W. N. Sproson.

The assessment of any system of colour television depends to some extent on the colours chosen for the test. Electronically-generated colour bars may show faults which are non-existent in the transmission of ordinary pictures. A set of standard colours, which is typical of modern pigments and printing inks, is proposed for the purpose of assessing the colour and luminance fidelity of a colour television system. The method is illustrated for a constant-luminance colour television system (proposed by James and Karwowski—Abstract 603) under two conditions: (i) ideal analysis, (ii) analysis by an existing colour scanner. The use of a uniform chromaticity diagram gives a convenient means of assessing the colour errors in subjective terms.  
Vol. 23, page 311, April 1962.‡

607 621.397.132:621.397.222

**A vidicon camera for industrial colour television.** I. J. P. James.

The choice of systems, i.e. field-sequential or simultaneous, is discussed, and it is concluded that it would be expedient to exploit the simultaneous colour camera using three vidicons. The main features of the camera and its associated control equipment are described. The optical system employed allows for maximum light efficiency, and reduces vidicon lag to a minimum; there is a combined focus-and-turret control. Negative feedback forms an essential feature of reliable colour equipment, especially for continuous operation by relatively unskilled personnel. Particular attention has been given to monitoring facilities for checking the amplifier operation. All of the electrical registration controls are situated at the camera control unit.  
Vol. 19, page 165, March 1959.‡  
Awarded the Marconi Premium for 1959.

608 621.397.13:621.395.42

**Operational facilities in the RCA colour television tape recorder.** A. H. Lind.

The electrical delay adjustments are intended to make greater precision readily available and facilitate tape interchangeability. A detailed account is given of the manner of making the adjustments to reduce quadrature errors at the heads.  
Vol. 20, page 611, August 1960.‡

(continued over page)

# I.E.R.E. JOURNAL DIGESTS

*Continued from  
preceding page*

609 621.397.132:621.374.33

**A gating circuit for single-gun colour television tubes.** K. G. Freeman.

Gating circuits and their limitations are discussed. A new type of gating circuit which employs low-level gating of the red, green and blue video signals in conjunction with a wide-band amplifier is described. By fairly simple modification the circuit is applicable to either reversing colour sequence, continuous colour sequence or to colour difference operation.

Vol. 19, page 667, November 1959.‡

Awarded the Associated Rediffusion Premium for 1959.

610 621.397.132

**A subcarrier regenerator circuit for colour television receivers.** M. C. French.

The three principal circuits used to provide a continuous source of subcarrier in an NTSC colour receiver are briefly described. The phase and frequency controlled crystal oscillator circuit, commonly called the automatic phase control circuit, is investigated in detail, and a suitable circuit is described.

Vol. 25, page 83, January 1963.

621.397.132:621.397.62:535.88

**A colour television projector for medium screen applications.** (Abstract 667).

## TRANSMISSION SYSTEMS (621.397.2)

611 621.397.2:621.391

**Economy of bandwidth in television.** D. A. Bell.

In the light of the theory of the communication of 'information' the paper reviews both the nature of television signals and a number of devices which have been proposed to improve the ratio of picture-quality to bandwidth. The characteristics of the spectrum of the signals generated by the conventional method of scanning a picture are then examined, and attention drawn to some little-known theoretical limitations. The methods of 'off-set carrier' and 'tête-bêche' for reducing shared channel interference are then described. A number of devices which have been proposed either for reducing bandwidth or for transmitting additional information through the existing bandwidth are reviewed, including colour television systems.

Vol. 13, page 447, September 1953.

Discussion: Vol. 13, page 590, December 1953.

Awarded the Louis Sterling Premium for 1953.

612 621.397.2

**Phonevision—an effective method for subscription television.** A. L. C. Webb and A. Ellett.

A brief analysis of the economic problems of television shows that the subscription or home box-office method of obtaining extra income is especially suitable for countries like Australia. The requirements of a subscription television service are discussed and the operation of the Phonevision system is then described. Details are given of the video and sound coding and decoding methods.

Vol. 16, page 205, April 1956.

613 621.397.2

**Radio and television broadcasting in Great Britain.** (Institution Report).

Prepared for the Committee on Broadcasting, the survey recommendations include a change to 625 lines, 8 Mc/s bandwidth, the limited use of UHF, extension of wired television possibly using waveguide transmission and the establishment of a National Communications Authority.

Vol. 21, page 379, May 1961.‡

613A

621.397.2

**The Report of the Committee on Broadcasting 1960.**

Further comments by the Institution arising out of recommendations made in the above survey (Abstract 613) which appeared to have been misinterpreted by the Committee on Broadcasting.

Vol. 24, page 4, July 1962.‡

614

621.397.2

**Reduction of television bandwidth by frequency-interlace.** E. A. Howson and D. A. Bell.

A method analogous to the NTSC colour television system is used to obtain a bandwidth reduction to a black-and-white video signal by a factor of approximately 2:1. The normal signal is split into two frequency bands, nominally zero to 1.5 Mc/s and 1.5 to 3.0 Mc/s. The latter is used to amplitude-modulate a sub-carrier, whose frequency is an odd multiple of half the line scanning rate. The lower sideband of the modulator output is selected and combined with the original zero-to-1.5 Mc/s band, so that the spectra of the two signals interleave. The combined signal may now be sent over a channel of 1.5 Mc/s nominal bandwidth. At the receiving end of the channel the composite signal is applied to a synchronous demodulator. Photographs are given showing various interference effects produced.

Vol. 20, page 127, February 1960.

615

621.397.2

**Television standards.** (WEM).

The considerations involved in determining the line standards to be employed in Great Britain are reviewed.

Vol. 21, page 289, April 1961.

## WANTED - TV ENGINEERS

An Australian television company situated at the thriving City of Greater Wollongong (pop. 143,000), on the coast of New South Wales 50 miles south of Sydney, requires the services of several television engineers:

1. One supervising engineer with at least 4 years' experience in the operation and maintenance of television transmitters.

The successful applicant should be 27-35 years old and must hold City and Guild's Full Certificate with television broadcasting as a subject, or a technical college Diploma in Electronics and Telecommunications Engineering with television engineering as a subject or the equivalent.

The station's transmitter is situated 18 air miles from the Wollongong studio and a comfortable flat is available free of charge.

Salary will range from £A1,800 to £A2,000, according to experience and qualifications.

2. Three engineers with at least 4 years' experience in the operation and maintenance of television studio equipment including cameras, telecine and video-tape.

Minimum qualification is the City and Guild's Telecommunications Technicians Certificate, or the equivalent, and the successful applicants should be aged 25-30 years.

Salary range, £A1,500—£A1,800.

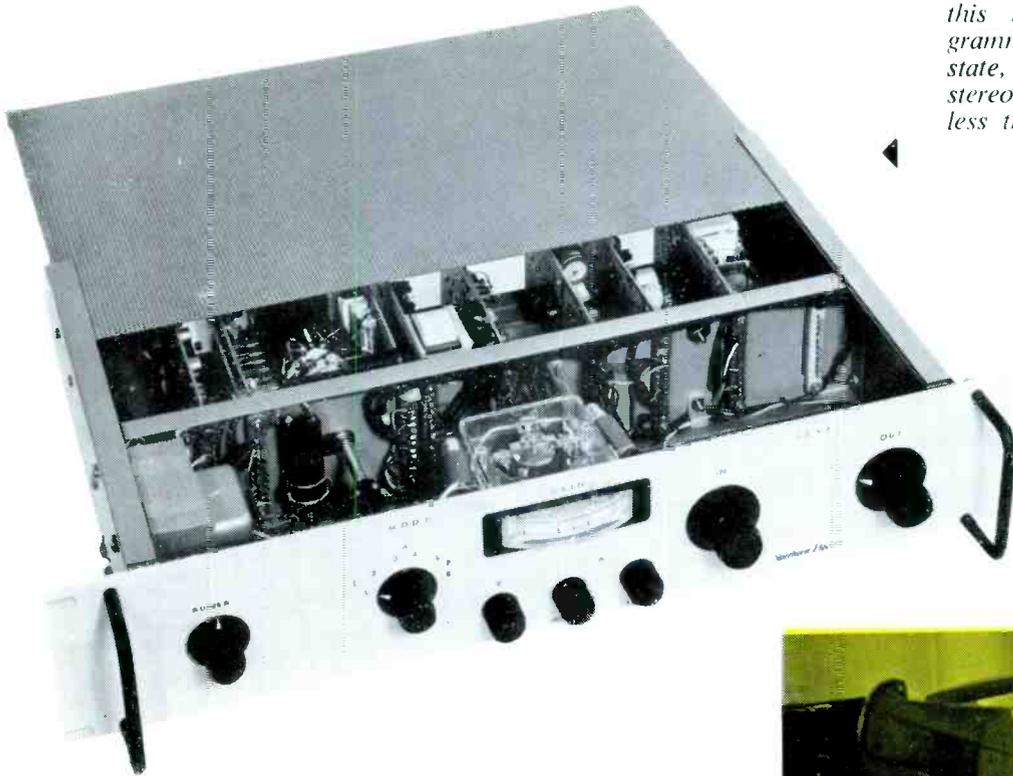
Successful applicants must be eligible to migrate to Australia under the Commonwealth Government's assisted passage scheme and the company will make every effort to expedite their passage. Suitable accommodation will be found in Wollongong by the company if desired.

Applications with full details of age, experience, qualifications and family background should be made by June 30 to:

**Television Wollongong Transmissions Limited**  
WIN Channel 4

c/o News Limited of Australia  
Keystone House, Red Lion Court  
Fleet Street, London, E.C.4.

FROM ONTARIO, CANADA, comes this Northern Electric PCA-1 programme-controlled amplifier, solid-state, capable of being adapted for stereo max. gain 50 dB. Noise level less than 65 dBm output with maximum gain.



PYE 2014 image-orthicon camera was ordered at previous NAB Convention by State University of Iowa, modified as described in this journal last December. Latest Pye cameras were shown again at 1964 NAB Display.

insertions. A change simply is typed on a gummed, perforated paper and applied over any item on the log. ProLog systems are combined according to a station's needs. They are made up of plug-in modules so that minimum systems may be expanded as desired.

**I**N the television sphere, Continental are well-known for a portable video tape machine, using 2in standard Mylar tape, with the following technical specification. **VIDEO INPUT:** 75 ohms unbalanced, terminated internally. Composite signal, sync negative, .8 to 1.2 volts peak-to-peak composite. Either standard EIA or industrial sync, interlaced or non interlaced may be used. Any number of scanning lines at 60 fields/second can be accommodated. Video input is adjustable. Minimum input level is 0.5 volts of peak-to-peak composite video. **VIDEO OUTPUT:** 75 ohms unbalanced, 1 volt  $\pm 10\%$  peak-to-peak, composite. Output can be fed to any video monitor employing AFC horizontal sweep circuitry having normal time constants or to any RF Modulator driving conventional TV receivers employing AFC horizontal sweep circuitry of normal time constants.

**AUDIO INPUTS:** One 600 ohms balanced or unbalanced line input at  $-10\text{dbm}$  minimum. Terminated internally. One microphone input, nominal  $\frac{1}{2}$  millivolt across 50,000 ohms (typical high impedance microphone).

**AUDIO OUTPUT:** 600 ohms, balanced or unbalanced, at  $+4\text{dbm}$ .

**MECHANICAL SPECIFICATIONS** 29 $\frac{7}{8}$ in wide, 14 $\frac{1}{2}$ in high, 17 $\frac{3}{8}$ in deep. Weight: approx 100lbs.

**OPERATING CHARACTERISTICS** Tape speed: 3.7in per second (9.4 cm/sec).

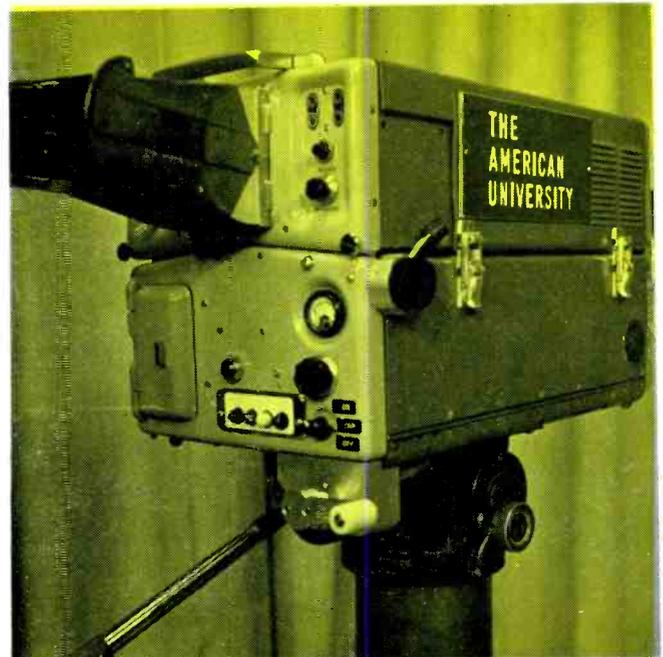
**RECORDING TIME:** (on standard SMPTE reels) 6 $\frac{1}{2}$ in reel (750ft) 40 minutes 8in reel (1,650ft) 90 minutes 10 $\frac{1}{2}$ in reel (3,600ft) 3 hours and 15 minutes 12 $\frac{1}{2}$ ft reel (5,540ft) 5 hours.

In the larger world of transmission, Continental have pioneered a technique known as the TRC-3 transmitter remote control. All meter readings are presented on a single meter which is calibrated in 'Percent of Normal.' Observation and logging of any function is direct and simple, with all normal readings requiring only a standard log entry. Dials, charts, and scale interpretations are

replaced by individually designated push-buttons, thereby minimising human error. All pushbuttons are illuminated red, green, or yellow to logically indicate the active functions, and also to provide report-back signals for certain transmitter functions. Red lamps indicate presence of transmitter plate voltage, and are extinguished automatically on plate overload.

Operational dependability is further assured by use of all relay DC control circuits which eliminate stepping relays, tone channels, and marginal relays. Faults resulting from line noise and lightning discharge, are eliminated. The basic system consists of a TRC-S Studio Terminal, TRC-T Transmitter Terminal, and a number of accessory items, the exact number of which are determined by specific station requirements. The

*Concluded over page*



# WHAT IS NAB?

A LARGE section of this issue is devoted to a technical survey of equipment exhibited at the 42nd Annual Convention of the National Association of Broadcasters. What is this NAB? In brief, it represents an industry which touches the daily lives of every American who switches on one of the nation's more than 180-million radios or 58-million television receivers.

Like the industry it represents, the NAB had modest beginnings with a handful of members. Today it counts among its members nearly 3,000 radio and television stations throughout the 50 states, the District of Columbia, and Puerto Rico, as well as all seven national radio and television networks. A non-profit organization, NAB was set up "to foster and promote the development of the arts of aural and visual broadcasting in all its forms; to protect its members in every lawful and proper manner from injustices and unjust exactions; to do all things necessary and proper to encourage and promote customs and practices which will strengthen and maintain the broadcasting industry to the end that it may best serve the public".

NAB has enabled broadcasters to operate more efficiently by

- \* gaining authorization by the Federal Communications Commission (FCC) for remote control for all radio stations.
- \* drafting engineering and recording standards universally accepted by the broadcasting industry
- \* devising a cost accounting manual system for broadcast stations and advertisers
- \* introducing simplified programme and engineering logs meeting FCC requirements.

NAB also represents the industry before Congress, at the White House, and at administrative agencies. The Association initiated the first department of radio advertising in 1941. This was the beginning of the independent organization now known as the Radio Advertising Bureau. The Association also helped set up the independent Television Bureau of Advertising. The National Association of Broadcasters is the focal point of opposition to schemes to convert the American system of broadcasting from a powerful means of communicating to all those with radio or television sets into a medium of special interest enjoyed only by those who could afford to pay for their programmes. In its opposition to pay television, the NAB has had the overwhelming support of the public and the commendation of leaders throughout the country.



*John M. Couric*

The pioneers who organized the NAB in 1922 with the late Eugene F. McDonald Jr. as its first president were concerned with the growing pains which beset all new industries. These included undisciplined use of radio frequency channels. Early dreams of the founders to bring order out of chaos culminated in the enactment of the Radio Act of 1927, the very beginnings of the American system of broadcasting as it is known today. The NAB has grown up with the broadcasting industry to unified strength. In 1945 the FM Broadcasters Association became a department of NAB. Since 1938 NAB has had a full-time president. Many distinguished men in U.S. television broadcasting have served the Association. In 1961, LeRoy Collins, former Governor of Florida, became President of NAB. To the outside world a tower of strength to NAB is John M. Couric, vice-president for public relations, thanks to whose competent Press coverage NAB is well reported in several national and technical journals. Prior to NAB, Couric served as Washington correspondent to United Press and as a wire-service writer. In 1951, the Television Broadcasters Association merged with the NAB and the name was changed to the National Association of Radio and Television Broadcasters. The Association reverted to its former name in 1958.

## ► NAB Report

terminal units are constructed on vertical chassis with hinge-down front panels for maximum component accessibility. They are designed for mounting in standard 19in equipment racks and require vertical panel spaces of 8½in for the Studio, and 12½in for the Transmitter Unit. All studio control of metering and switching functions is duplicated at the transmitter terminal. A duplicate meter and indicating lamps are also provided. System components are of MIL-Spec or telephone quality throughout. They are conservatively rated for years of trouble-free service. All relays are of the plug-in type, and most are hermetically sealed.

This Type TRC-3 system requires two interconnecting telephone lines which may be inexpensive, signalling grade,

commercial service. Both must be continuous metallic balanced pairs, and each may have up to 8,000 ohms loop resistance. One pair is used for control from the studio to the transmitter with high-level DC voltages impressed from either side of the line to ground. The other pair returns low-level metering signals via a balanced connection to the studio. Fail-safe operation is assured through the use of normally energised circuits throughout the system. The transmitter cannot be locked on the air due to any failure of telephone line or serious faults in the system itself.

THUS far a review is given of NAB exhibits ranging from solid-state sync. pulse generators to aerial towers, from portable video recorders to huge

FM and UHF transmitters. Dominating the 1964 NAB Convention Exhibit is the RCA Display, since for this year the great Radio Corporation of America has completed an entirely new-engineered Philosophy of their electronic apparatus in the broadcast communication field. The complete RCA exhibit is described and illustrated in detail in the section of this journal starting on page 172. In the next issue of International TV Technical Review a further selection will be given of text and pictures dealing with the latest and best television equipment now on the U.S. market, and seen for the first time at the NAB Convention. The next section to be published will include, among others, Thomson-Houston, Gates, Dresser-Ideco, General Electric, Raytheon, Q-TV and Sarkes Tarzian.

# United States Patents

★ A page to keep you informed of latest United States Patents in the television world. This list also includes patents taken out in the United States by foreign companies and inventors.

- 3,110,762** November 12, 1963  
**Franklin Institute, Philadelphia, Pa., (Wallace E. Frank).**  
 Method and apparatus for improving images (with television and fibre optics applications).
- 3,110,763** November 12, 1963  
**International Standard Electric Corporation, New York, N.Y. (Albert Lieb).**  
 Arrangement for the transmission and reproduction of images (using radiation-sensitive elements and electro-luminescent-exciting voltage).
- 3,110,764** November 12, 1963  
**Leonard D. Barry, 19300 Pennington Drive, Detroit 21, Mich.**  
 Magnetic recording and reproducing (scanning-beam vacuum-tube magnetic recording and reproducing head).
- 3,111,555** November 19, 1963  
**United States Steel Corporation, New Jersey (Geo Dykeman and James A. Milnes).**  
 Apparatus for visually inspecting strip travelling at high speed.
- 3,111,556** November 19, 1963  
**Servo Corporation of America (Joseph Knoll and Israel J. Melman).**  
 Image pickup devices and scanning circuits therefor.
- 3,111,602** November 19, 1963  
**Westinghouse Electric Corpn, East Pittsburgh, Pa. (M. J. Hellstrom and Chas H. Wood).**  
 Deflection circuits (for cathode ray deflection systems).
- 3,111,603** November 19, 1963  
**Radio Corporation of America, Delaware (Thos G. Marshall and Carl G. Seright).**  
 Television deflection circuit.
- 3,111,609** November 19, 1963  
**General Electric Co, New York (Herbert J. Webb).**  
 Deflection yoke and method of making.
- 3,111,663** November 19, 1963  
**General Precision Inc, Delaware (Gus Stavis).**  
 Radar and television navigation aid.
- 3,112,359** November 26, 1963  
**Paul Raibourn, Southport, Conn.**  
 Post-deflection color tube.
- 3,112,360** November 26, 1963  
**Winston Research Corpn., Beverly Hills, Calif. (David Paul Gregg).**  
 Scanning with light conducting rod (optical fibre principle).
- 3,112,364** November 26, 1963  
**Northern Electric Co Ltd, Montreal, Quebec, Canada (John S. Myles).**  
 Television apparatus for locking the phase of vertical synchronizing pulses.
- 3,112,421** November 26, 1963  
**Paramount Pictures Corpn, New York, N.Y. (Paul Raibourn and Harry Gewertz).**  
 Display screen grid structure for color television tubes.
- 3,112,424** November 26, 1963  
**North American Philips Company, Inc, New York, N.Y. (Robert Suhrmann).**  
 Automatic brightness and contrast control circuit.
- 3,112,425** November 26, 1963  
**Telefunken GmbH, Berlin, Germany (Paul Theisen).**  
 Protective circuit for cathode ray tube.
- 3,113,178** December 3, 1963  
**Admiral Corporation, Chicago, Ill (Robt A. Wolff).**  
 Oscillator circuit (as used in television receivers having remote control units).
- 3,113,179** December 3, 1963  
**General Electric Co, New York (William E. Glenn).**  
 Method and apparatus for recording (thermoplastic).
- 3,113,180** December 3, 1963  
**Philco Corpn, Philadelphia, Pa. (Frank J. Bingley and Joseph F. Fisher).**  
 Composite image reproducing means.
- 3,098,895** JULY 23, 1963  
**Hazeltine Research Corpn, Chicago, Ill (Bernard D. Loughlin).**  
 Electronic previewer for televised colour pictures.
- 3,098,896** JULY 23, 1963  
**General Electric Co, New York (Edward I. Lynch and Thomas T. True).**  
 Cathode ray tube system using indexing signals.
- 3,098,897** JULY 23, 1963  
**Russell J. Callender, 115 Wildwood Beach, Mahtomedi, Minn.**  
 Unitary television equipment.
- 3,100,816** AUGUST 13, 1963  
**Ampex Corporation, Redwood City, Calif. (Charles H. Coleman and Peter W. Jensen).**  
 Timing control for signal reproducing systems (particularly colour television recorders).
- 3,100,817** AUGUST 13, 1963  
**Ball Brothers Research Corporation, Boulder, Colo (Gottfried R. Rosendahl).**  
 Image converter and amplifier.
- 3,100,886** AUGUST 13, 1963  
**Admiral Corporation, Chicago, Ill (Meyer Marks).**  
 Compressional wave transmitter.
- 3,102,162** AUGUST 27, 1963  
**General Dynamics Corporation, Rochester, N.Y. (Joseph T. McNancy).**  
 Image projection system.
- 3,102,163** AUGUST 27, 1963  
**Fernseh GmbH, Darmstadt, Germany (Emil Sennhenn).**  
 Circuit arrangement for producing a control voltage for automatic control of electric signals (especially in television amplifiers).
- 3,102,212** AUGUST 27, 1963  
**Motorola Inc, Chicago, Ill (Kurt Schlesinger).**  
 Cathode ray tube with low velocity deflection and post deflection beam acceleration.

# The next best thing to being there is watching it on **PETO SCOTT CCTV**

In the stillness of an operating theatre—in the rush and bustle of an Underground station—in work or sport—CCTV can see and display, providing facilities for remote observation and control.

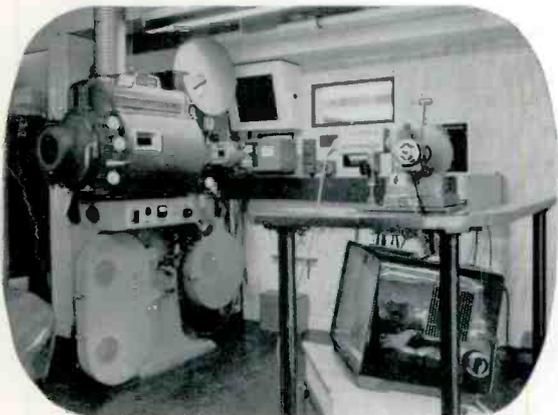
But as the photographs show, no two installations of CCTV are alike. Peto Scott Electrical Instruments, with its 45 years of experience in the electronics field, offers you the unique knowledge and experience of its engineers, to study your problem and to come up with the right answer for your particular requirements.



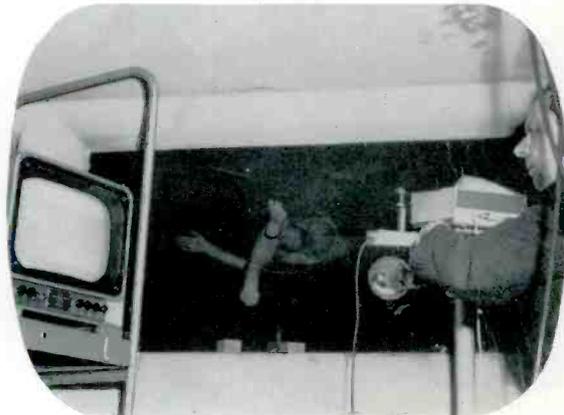
Above the operating table a mirror and a TV camera permit a number of students to see every detail of the surgeon's work.



Three Peto Scott cameras at Holborn Underground station, London, enable one man to direct the crowds and reduce delay to trains.



Masius & Fergusson, leading advertising agents, produce films on both 35 mm. and 16 mm. They can be projected in the theatre and televised to a number of offices.



At London's Oasis swimming pool a Philips Compact camera at one of the ports enables the underwater action of a swimmer to be studied.



The Army uses CCTV to study a bridge building operation, so that HQ can observe progress and keep a look-out for enemy forces.



On the liner France an extensive TV system allows film, live action or broadcast programmes to be viewed in all parts of the ship.

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