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NOVEMBER 1962

2/-

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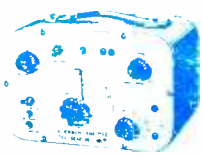

A.C. mains 200/250 v. Provides: **"Wobbulator" (Swept Frequency) Operation,** for FM/TV alignment linear frequency sweep up to 12 Mc/s. From 400 Kc/s -80 Mc/s. **Capacitance Measurement.** Two ranges provided. 0-60pF and 0-12pF. **Special Facility** enables true resonant frequency of any tuned oct. I.F. transformer, etc., to be rapidly determined. Cash price **£6.19.6.** plus 5/6 P. & P. H.P. terms 25/- deposit, plus 5/6 P. & P. and six monthly payments of 21/6.

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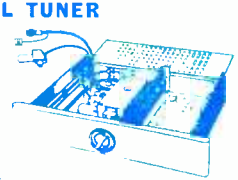

Will tune to all Band 1 and Band III stations. BRAND NEW by famous manufacturer. Complete with P.C.C. 84 and P.C.F. 80 valves (in series). **I.F. 16-19** or **33-38.** Also can be modified as an aerial converter (instructions supplied). Complete with knobs. **32/6** plus 4/6 P. & P.

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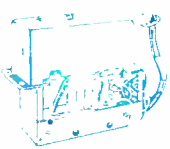

I.F. 16-19 Mc/s continuously tunable from 174-216 Mc/s. Valves required, PCF 80 and PCC 84 (in series). Covers B.B.C. and I.T.A. ranges, also Police, Fire and Taxis, etc.

Brand new by famous manufacturer

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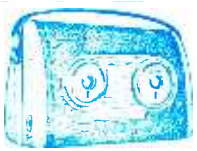

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Carriage and Insurance 10/6 extra on all tubes

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OZ4	5/-	6AL5	4/-	6L6G	8/-	12AX7*	7/6	90CV	37/6	EB34	2/6	EF39	5/6	EM85	16/10	PCF80*	8/-	U19	48/6	UCL83*	18/9	OA86	4/-
1A5	6/-	6AM6	4/6	6L7GT	7/6	12BA6	8/-	150B2	18/-	EB41	9/6	EF40	15/-	EN31	63/-	PCF82	10/6	U22	8/-	UF41	9/-	OA91	3/6
1A7GT	12/-	6AQ5	7/6	6L18	13/-	12BE6	9/-	807	7/6	EB91	4/-	EF41	9/-	EY51*	9/-	PCF84	16/2	U24	29/1	UF42	12/6	OA95	3/6
1C5	12/6	6AT6	7/-	6LD20	15/7	12K5	17/6	5763	7/6	EBC3	23/10	EF42	10/6	EY83	16/2	PCF86*	9/6	U25*	17/6	UF80*	10/6	OA210	9/6
1D8	6/6	6AU6	10/-	6P28	25/11	19AQ5	10/6	7475	7/6	EBC33	5/-	EF50(A)	7/-	EY84	14/-	PCL82*	10/-	U26*	10/-	UF85*	9/-	OA211	13/6
1G6	17/6	6BA6	7/6	6Q7G	9/6	19H1	10/-	AZ31	10/-	EBC41	8/6	EF50(E)	5/-	EY86*	9/-	PCL83*	10/6	U31	11/6	UF89*	13/6	OC16W	35/-
1H3GT	10/6	6BE6	6/-	6Q7GT	11/-	20D1	14/11	AZ41	13/7	EBC81	9/-	EF54	5/-	EZ40	7/-	PCL84*	9/6	U33	25/11	UF89	9/-	OC19	25/-
1L4	3/6	6BH6	8/-	6R7G	10/-	20F2*	25/11	B36	15/-	EBF80	9/-	EF73	16/6	EZ41	7/-	PCL85*	12/6	U35	25/11	UL41	10/6	OC22	23/-
1LD5	5/-	6BJ6	6/-	6U5G	7/6	20L1*	25/11	CL33	18/9	EBF83	13/7	EF80*	6/-	EZ80	7/-	PCL86	16/2	U37	25/11	UL44	25/11	OC26	25/-
1LN5	5/-	6BQ7A	15/-	6V6G	7/-	20P1*	25/11	CY1	18/2	EBF89	9/6	EF85*	6/-	EZ81	7/-	PEN46	7/6	U45	13/6	UL46	14/6	OC28	24/6
1N5GT	10/6	6BR7*	12/6	6V6GTG	8/6	20P3*	22/8	CY31	11/-	EC54	6/-	EF86*	10/6	GZ30	9/-	PL33	18/9	U50	8/6	UL84*	8/6	OC35	18/-
1R5	6/6	6BR8	18/2	6X4	5/-	20P4*	25/11	DAC32	10/6	EC70	12/6	EF89	9/-	GZ32	10/-	PL36*	15/-	U52	6/6	UM4	17/9	OC36	21/6
1S4	9/-	6BW6*	10/6	6X5GT	6/-	20P5*	22/8	DAF91	6/-	EC81	27/6	EF91	4/6	GZ34	14/-	PL38	25/11	U54	19/5	UM84	16/10	OC41	9/-
1S5	6/-	6BW7*	6/-	6/30L2	10/-	25Z4G	11/6	DAF96	8/6	EC92	13/-	EF92	4/6	HN309	23/11	PL81*	10/6	U76	6/-	UM80	14/11	OC44	9/3
1T4	3/6	6C4	5/-	7B7	8/6	27SU	19/5	DD41	13/7	ECC34	23/11	EF97	13/-	HVR2	20/-	PL82	7/6	U191	16/2	UY1N	18/2	OC45	9/-
1U5	6/-	6C5	6/6	7C5	8/-	28D7	7/-	DF33	10/6	ECC35	8/6	EF98	13/-	KT33C	10/-	PL83	9/-	U201	16/2	UY21	16/2	OC65	22/6
3A4	6/-	6C6	6/6	7C6	8/-	30C1*	8/-	DF66	15/-	ECC40	17/6	EF183	18/2	KT36	29/1	PL84*	12/4	U251	14/-	UY41	7/6	OC66	25/-
3A5	10/6	6C9	13/6	7H7	8/-	30F5*	6/-	DF91	3/6	ECC81*	6/-	EF184	12/6	KT41	25/11	PM84	16/10	U281	19/5	UY85	7/-	OC70	6/6
3B7	12/6	6CH6	9/-	7S7	9/6	30FL1*	10/-	DF96	8/6	ECC82*	6/6	EK32	8/6	KT44	12/6	PX4	10/6	U282	22/-	VP13C	7/-	OC71	6/6
3D6	5/-	6CW4	24/-	7V7	8/6	30L1*	8/-	DF97	9/-	ECC83*	7/6	EL32	5/-	KT61	12/6	PY32*	13/6	U301	22/8	VR105	8/-	OC72	8/-
3Q4	7/8	6F1	25/11	7Y4	7/8	30L15*	9/-	DH63	6/6	ECC84*	9/-	EL33	16/6	KT63	7/-	PY33	17/6	U329	14/-	VR150	7/6	OC73	16/-
3Q5GT	9/6	6F6G	7/-	9BW6	14/11	30P4*	15/-	DK32	12/-	ECC85	8/6	EL34	15/-	KT66	15/-	PY80	7/6	U404	8/6	W107	18/2	OC75	8/-
3S4	7/-	6F13	11/6	10C1	13/-	30P12	7/6	DK91	6/6	ECC88	18/-	EL38	25/11	KT88	43/6	PY81	7/6	U801	29/1	W729	19/5	OC78	7/-
3V4	7/6	6F23	10/6	10C2	25/11	30PL1	10/6	DK92	10/6	ECF80*	10/6	EL41	9/-	KTW61	6/8	PY82	7/-	UABC80	9/-	X66	12/6	OC79	8/-
5R4GY	17/6	6F24	12/6	10F1	25/11	30PL13	12/6	DK96	8/6	ECF82	10/6	EL42	10/6	KTW62	7/6	PY83	8/6	UAF42	9/6	X78	22/8	OC81	8/-
5U4G	6/6	6F33	7/8	10LD11	15/7	35L6GT	9/6	DL33	9/6	ECF86	19/5	EL81	16/2	KTW63	8/6	PY88	13/-	UB41	12/-	X79	22/8	OC81M	8/-
5V4G	10/-	6J5G	5/-	10P13	15/-	35W4	7/6	DL66	17/6	ECF804	20/-	EL83	19/5	KTZ63	7/6	PZ30	19/5	UBC41	8/6	X109	16/10	OC82	10/-
5Y3	6/6	6J6	5/6	10P14	18/9	35Z4GT	6/-	DL68	15/-	ECH21	22/8	EL84*	7/6	L63	6/-	R12	9/-	UBC81	11/-	Y63	7/6	OC83	6/-
5Z3	19/5	6J7G	6/-	12AC6	14/11	35Z5GT	9/-	DL72	15/-	ECH35	6/6	EL85	13/7	MHLD6	12/6	R18	14/-	UBF80	9/-	Z66	17/6	OC84	8/6
5Z4G	9/-	6J7GT	10/8	12AD6	16/10	50C5	10/-	DL92	7/-	ECH42	9/6	EL86	16/10	MU12/14	8/-	R19	19/5	UBF89	9/6			OC140	29/-
6A7	10/6	6K7G	5/-	12AE6	13/7	50L6GT	10/-	DL94	7/6	ECH81	9/-	EL91	5/-	N37	22/8	SP61	3/6	UCC84*	14/3	*Transistors*		OC170	9/6
6A8	8/-	6K7GT	8/-	12AH7	8/-	85A2	16/-	DL96	8/6	ECH83	13/7	EL95	10/6	N78	22/8	SU25	27/2	UCC85	9/-	*and diodes*		OC171	10/6
6AC7	4/-	6K8GT	10/6	12AH8	12/8	90AG	67/6	DM70	7/6	ECL80*	9/-	EL820	18/2	N108	23/10	T41	9/-	UCF80*	16/2	OA70	3/-	OCP71	29/6
6AG5	5/6	6K8G	6/6	12AT6	7/6	90AV	67/6	E80F	30/-	ECL82	10/6	EL821	25/11	N308	20/1	TY86F	13/-	UCH42	9/6	OA73	8/-	VCR2	9/3
								E83F	30/-	ECL83	18/9	EL822	19/6	N339	15/-								
								E180F	34/6	ECL86	16/2	EM34	9/6	P61	3/6								
								EA50	2/-	EF9	22/8	EM71	23/10	PCC84*	8/-								
								EA76	9/6	EF22	14/-	EM80	9/-	PCC85	9/6								

* indicates valves with new type chemical cathode for extra life and reliability.

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12" & 14" Types MW 31-74, M W 36-24, SE 14-70; 4/14 C 14 FM

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- ★ Ex Rental and repossessed televisions.
- ★ Two channels more, 7/6 extra.
- ★ H.P. Terms—London area.
- ★ Demonstrations daily.
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Personal collection advised, or Insured Carr., 14", 20/-; 17", 30/-.

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Terms Guaranteed Ins. & Carr. available. 1 year. 12/6.
Add £1, refundable on receipt of your OLD tube.
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110° Tubes in Stock.

Practical Television

AND TELEVISION TIMES

VOL. 13, No. 146, NOVEMBER, 1962

Editorial and Advertisement Offices:

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Contents

The Editor will be pleased to consider articles of a practical nature suitable for publication in "Practical Television". Such articles should be written on one side of the paper only and should contain the name and address of the sender. Whilst the Editor does not hold himself responsible for the manuscripts, every effort will be made to return them if a stamped and addressed envelope is enclosed. All correspondence intended for the Editor should be addressed to: The Editor, "Practical Television" George Newnes, Ltd., Tower House, Southampton Street, London, W.C.2.

Owing to the rapid progress in the design of radio and television apparatus and to our efforts to keep our readers in touch with the latest developments, we give no warranty that apparatus described in our columns is not the subject of letters patent.

Pilkington Postcript

AT the time of writing, it seems likely that the Government will give the go-ahead for the licensing of "Pay-TV" experiments in order to assess the public demand for such a service and to determine the most suitable types of programmes and which form of pay-as-you-view TV is best technically.

It is not our intention to comment on the rights or wrongs of the case for Pay-TV but it is interesting to observe that if it *is* authorised then one more Pilkington Report recommendation goes by the board.

In fact, so many bricks have been knocked off the Pilkington edifice that nothing much remains except the foundations and these—the technical aspects—were laid in the earlier work of the Television Advisory Committee (May, 1960). The recommendations of a technical nature, in fact, appear to be the only ones more or less accepted *in toto*. Yet these were a very small part of the Committee's work, covering a mere 25 of the 342 pages in the published Report.

A study of this now celebrated document gives the impression that the Committee found little point in proceeding too far in the deep waters of technicalities which had already been thoroughly investigated by TAC. In fact it is stated that "Provided that since the Report (*TAC*) was presented . . . no new technical considerations have arisen to question its findings, our concern is essentially to weigh the social and economic aspects of a change in line standards." And, later: "**. . . there** is no reason to qualify TAC's findings."

It seems, therefore, that the Committee was prepared to a large extent to accept the TAC findings. We are not arguing this point one way or another, and it must be remembered that there was only one technical member on the Committee. Nor are we going to be drawn, particularly at this late stage, into the highly explosive moral and social issues arising from the recommendations.

But in view of the drastically decimated state of the original suggestions and advice contained in the Report, and bearing in mind the previous work on the technical aspects provided by the TAC, we are sorely tempted to paraphrase the well-known wartime slogan and ask:

"Was the Pilkington Committee really necessary?"

A FILM SHOW

ON February 1st, 1963, beginning at 7.30 p.m., a film show is to be held at Caxton Hall, Westminster, London. As in previous years this show has been arranged in collaboration with Mullard Ltd. and will include the showing of the two films "Fuel for the Future" and "The Electroneers".

Readers are invited to apply to these offices for free tickets which are now available. When applying for tickets, please enclose a S.A.E. (which must measure at least $3\frac{1}{2} \times 6$in.).

Our next issue dated December, will be published on November 22nd

Telenews

Television Receiving Licences

THE following statement shows the approximate number of Television Receiving Licences in force at the end of August, 1962, in respect of television receiving stations situated within the various Postal Regions of England, Wales, Scotland and Northern Ireland.

Region	Total
London	2,014,520
Home Counties	1,706,085
Midland	1,792,852
North Eastern	1,919,244
North Western	1,588,143
South Western	1,039,796
Wales and Border Counties	726,202
Total England and Wales	10,786,842
Scotland	1,100,152
Northern Ireland	187,776
Grand Total	12,074,770

Doctors Linked by Telstar

COLOUR Television Monitors, working on the American 525-line standards and supplied by Bush Radio Limited, played a key role in a recent Transatlantic Colour Transmission via the communications satellite Telstar.

Three thousand doctors from 50 countries attending the 12th Annual International Conference in Dermatology, in Washington D.C., saw a live "performance" by British doctors and their patients, broadcast from a special studio in the Royal Naval Air Station at Culdrose, Cornwall. They halted a two-way discussion by Landline with British doctors to watch TV transmission. From Culdrose the programme went by microwave link to Goonhilly and was then relayed by Telstar across the Atlantic.

A party of British doctors in a hangar at Culdrose saw the programme on a colour monitor at the same time as their colleagues were watching the transmission some 4,000 miles away!

Mobile TV Equipment

OUTSIDE broadcast equipment manufactured by EMI Electronics Ltd. is to be operated by Trans Europe Television, which has bases in Switzerland and France, to provide a compact and versatile mobile multi-standard television and video tape recording facility.

Trans Europe Television will specialise in the provision to television and industrial organisations throughout Europe and America of full facilities in production and networking of television shows, and of international closed-circuit relays.

The equipment provided comprises two mobile units, each equipped with its own diesel electric generator unit. The first vehicle contains four EMI 4½in. image orthicon camera channels with associated vision mixing equipment and full audio facilities. The second vehicle contains an Ampex 1,000C video-tape recorder. This vehicle is also equipped with 16m telecine and slide scanning equipment. There is a complete range of ancillary equipment including zoom lenses and special effects equipment.

A New 10 : 1 Zoom Lens for Image Orthicon Cameras

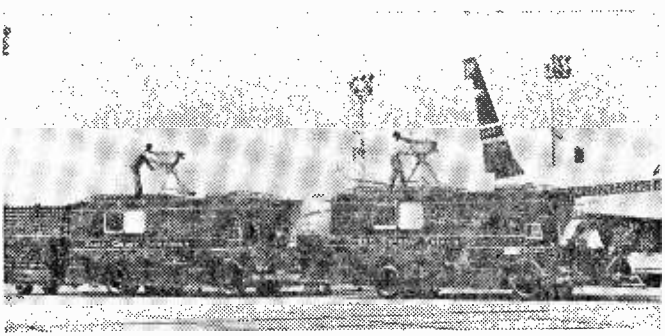
NEW types of optical glass, new principles of mechanical construction, developments in non-spherical lens surfaces and improved techniques in anti-reflection lens coating are features of the latest television zoom lens, the Varotal V, announced by Rank Taylor-Hobson.

This new 10:1 zoom lens for orthicon TV cameras has been specially developed over the last two years to meet the ever growing demands of the TV industry.

This research has resulted in a new type of construction in which the components which move for zooming and for focusing are internal and smaller than before. Although the optical system is more complex the mechanical part is much more simple.

The resultant reduction of drive torque gives better sensitivity of control and the absence of rotating external parts provides adequate sealing against dust and moisture, better resistance to shock and facilitates the attachment of controls and accessories such as ray shades.

The extended focal ratio of 10:1 has been achieved without sacrifice of optical performance, relative aperture or range of object distance. Its relative aperture of *f*4·0 and its focal range make it equally suitable for outside broadcasting or for studio use.



Mobile units of Trans Europe Television, with EMI cameras mounted on top.

High light transmission characteristics are ensured by the use of new types of optical glass not previously available and by the latest techniques in anti-reflection lens coating.

New Techniques at Cardiff TV Centre

WALES (West and North) Television, the last programme contractor to be appointed by the Independent Television Authority under the Television Act, started transmissions from the new Wales Television Centre in Cardiff, on 14th September.

EMI Electronics Ltd. was appointed the major supplier of studio equipment. The order included the supply of three 4½in. image orthicon camera channels, complete with ancillary rack mounted units; a vidicon camera channel for the presentation suite; three complete sets of telecine equipment, comprising 16 and 35mm projectors and associated video equipment; and a fully transistorised sound mixing system for the main production studio.

Telecine equipment can be controlled either in the telecine area or in the master control area.

Comparable refinements on the main studio control panel allow programme producers to match up and control the light intensity of pictures coming from all three broadcast cameras, no matter where they are situated in the studio. In the past, the individual camera operators were responsible for these controls. This centralisation of control greatly decreases the margin for human error, an important consideration in any broadcasting work.

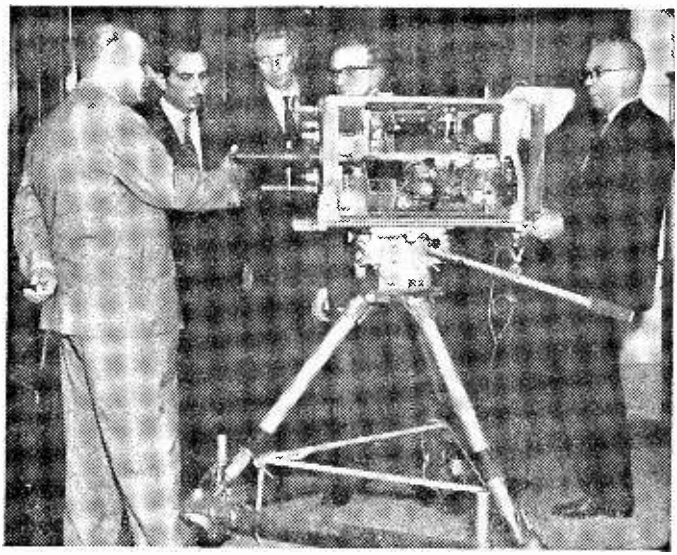
Closed-circuit TV in Air Traffic Control System

THE Southern Air Traffic Control Centre, located at the northern side of London (Heathrow) Airport, is responsible for aircraft movements over the southern half of the British Isles, taking over control of inbound airways traffic as it enters the London Flight Information Region from neighbouring regions and shepherding it along the complicated system of airways, spanning the country, until it can be handed over to airfield approach controllers at the final holding point. Outbound traffic is also the responsibility of this centre, from take-off until it leaves the area.

Methods of control have undergone many changes and have incorporated many improvements during the past 12 years. Among the more important has been the extended use of surveillance radar which, subject to certain precautionary measures, allows the procedural separation distances to be appreciably reduced. In this way controllers can accommodate an increased number of aircraft within the system without any reduction in safety. The minimum horizontal separation between two aircraft under radar control is five nautical miles.

The procedural and radar controllers, who look after aircraft within allotted air space, work as a closely knit team, details of every flight being presented to each in the most appropriate and lucid form. Hitherto, the information for the radar controller has been prepared and kept updated by an assistant seated alongside, and displayed on an edge-lit perspex screen. By the use of the Marconi closed circuit television system the requisite flight information appears on a television monitor close to the radar controller's console. This televised information is initiated remotely by an assistant who writes the information on a translucent screen for each of the radar controllers. Television cameras installed behind each screen will produce a high definition picture for each of the radar controllers.

In order to ensure that this handwritten information appears sufficiently clearly on the television screen to eliminate the possibility of error in reading, even with characters at the very edge of the screen. Marconi's selected a vidicon camera designed for high quality telecine broadcasting work, and incorporated a number of modifications to meet the very high specification demanded by the Ministry of Aviation. The 8½in. monitors also had to be modified from existing high quality designs, and the standard of definition produced makes it possible for a controller to read easily hastily written symbols.



Two Iraqi visitors inspecting a Mark IV image orthicon camera during their recent tour of the Marconi Company at Chelmsford.

Iraqi Visitors for British Firm

MAJOR General Mohammed Oli Baghdadi, Director General of the Ministry of Guidance of Iraq, and Mr. Osama Mohammed Ali, Chief Television Engineer, recently visited the Marconi Company at Chelmsford.

The purpose of their visit was to discuss the latest developments in general communication and television equipment. During their visit they stopped to inspect a Marconi Mark IV image orthicon television camera.

The PRINCIPLES and PRACTICE of TELEVISION

By G. J. King

REFER TO THE FREE DATA CHART, GIVEN AWAY WITH THE OCTOBER ISSUE, WHEN READING THIS ARTICLE

(Continued from page 11 of the October issue)

VERY high-frequency sound and vision signals tend to behave vaguely like light, and the effect becomes more pronounced as the frequency is raised. The signals thus travel in almost a straight line and instead of penetrating large, solid objects they tend to bounce off, rather like light being reflected by a mirror.

At ordinary medium sound-broadcast frequencies this does not happen. These signals find it relatively easy to travel through large masses and are not reflected.

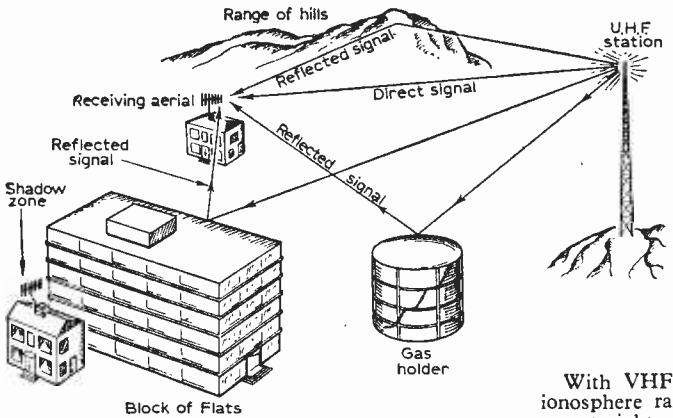


Fig. 7—As UHF signals behave very much like light and because of the very short wavelengths involved, multipath reception will be troublesome in built-up areas. Shadow zones will also be more in prominence than at VHF.

Surrounding our earth are two layers which influence radio and television signals to some extent, depending upon their frequency. The layer nearest the surface of the earth is called the "troposphere" which occurs towards the edge of our atmosphere. The other layer is well above this and, as a general term, is called the "ionosphere". In effect, it consists of several layers of ionisation named after the discoverers.

At broadcast frequencies (e.g., medium and long waves) signals are not affected by the troposphere and they pass straight through without trouble until they arrive at the ionosphere. Here the effect is entirely different, since this layer is highly reflective to such signals, particularly to those in the lower-medium and shortwave bands.

These signals are thus reflected from the ionosphere back to earth again. Owing to the height of the ionosphere above earth, the signals are propagated over very great distances, and this is emphasised by the signals being reflected from earth back to the ionosphere again, giving multi-hop propagation.

Indeed, it is this phenomena which makes world-wide radio communication possible. Unfortunately, however, the ionosphere is often somewhat unstable, drifting like a large cloud, and this changes the reflecting properties and causes fading of the signals.

Moreover, the ionosphere is not always fully effective as a reflector, the properties changing by day and night, for which reason long-distance radio reception is very much tied to the clock.

With VHF signals in Bands I, II and III, the ionosphere rarely plays any part at all, since these go straight through both the troposphere and ionosphere and are thus lost in space. This is not always strictly true, though, for under certain weather conditions the lower frequency signals in Band I are sometimes reflected by a very dense ionosphere, and bounce off to traverse remarkably great distances as already described. As an example, the BBC television signals have often been received at the other side of the Atlantic! And in some extreme cases strong enough to produce a good picture.

This is abnormal propagation which cannot ever be relied upon for a television link. Normally, VHF

signals curve very slightly, as influenced by the lower troposphere, to follow the surface of the earth over a distance of about 50 to 60 miles but, again, depending upon frequency. The higher frequency signals in Band III, for instance, have less of a curvature than those in Band I, and for that reason reliable reception is reduced to about 40 to 50 miles.

During weather conditions usually associated with a fine spell, the troposphere itself alters slightly in character and may then appear to a VHF signal as the ionosphere appears to a medium-frequency signal. When this happens, television signals can be received well in excess of the normal average of 50 to 60 miles. Very great distances, however, are not covered because the troposphere is nowhere near as high as the ionosphere.

Nevertheless, such conditions often prove an embarrassment to shared-channel working, and

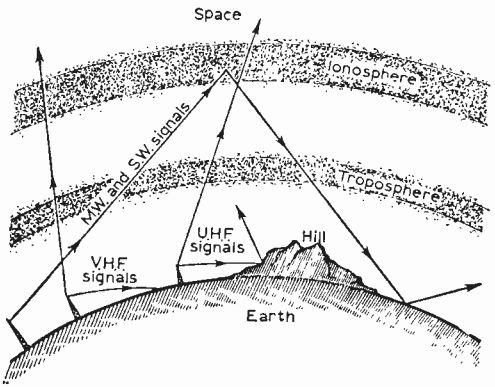


Fig. 8—How the various radio and television signals are affected by the troposphere and ionosphere.

produce the well-known co-channel interference troubles. European stations are then readily receivable in this country, and vice versa, but, unfortunately, often on top of our local programme!

UHF Propagation

Ultra high-frequency signals in Bands IV and V behave more nearly like light than any of the other signals so far considered. They are not affected by the ionosphere and only very slightly affected by the troposphere. There is virtually no bending and far less signal penetration through intervening objects than is the case at VHF.

These things set up various problems which very shortly some of us will be experiencing first hand. Since there is no bending, the range of a UHF station will not be any more than about 20 miles on the same scale as already considered at VHF.

Signals will be very easily cut off due to solid objects such as buildings, trees, roofs, hills and the like, and a signal shadow zone will exist behind them. Because the signals will not penetrate they will be reflected much more easily than we know at present; and because of the small wavelengths involved (30 to 65cm—about 12 to 25in.), even relatively small objects will cause reflections.

One can expect, therefore, that multipath interference (e.g., "ghosting") will be considerably more troublesome than hitherto, especially in heavily built-up areas (Fig. 7). Thus, in addition to the direct signal, the receiving aerial will pick up random reflected signals all arriving at slightly different times after the direct signal.

Happenings of this kind cause several (the number depending on the number of reflected signals received) less intense pictures to appear to the right of the main picture. If the phase between the signals differs, then the reflected or "ghost" picture will be negative and the line and frame holds of the set may be impaired.

The drawing in Fig. 8 shows how the various signals considered in the foregoing behave in relation to the earth, the troposphere and the ionosphere.

It has been calculated that approximately three times as many UHF stations will be required to provide the same extent of coverage as given at present by the VHF stations. But in spite of that large number, there will still be many local shadow zones virtually without signal, and even in certain areas of high signal field multipath interference may complicate the matter of reception and demand the use of elaborate and carefully orientated aerial systems.

Local coaxial relay systems will almost certainly help to overcome some of these problems, and this kind of reception will be considered next month.

Pye Limited of Cambridge has already published a map showing probable sites and approximate service areas for UHF stations of given power, but so far there has been no definite Government sanction for UHF stations in these areas.

Line Standards

As is well known, the existing television system operates on 405 lines. This means that the picture is composed of 405 horizontal scanning lines. In practice, however, there are slightly fewer lines than this on the picture proper, as a few of the 405 are blacked out during the frame sync pulses.

A system of "interlaced scanning" is adopted. That is, one *complete* picture is made up of *two* frames or fields, and each frame contains a picture composed of only half the number of active lines. There are 50 frames and 25 complete pictures each second. The lines of the second frame are so arranged that they interlace with the lines of the first frame and in that way give a picture of the full number of lines.

Or, at least, it appears that way due to the persistence of vision. If something is not quite right in the set, then it sometimes happens that the lines of the second frame fall almost on top of the lines of the first frame. This is called "pairing" and detracts considerably from the overall definition of the picture. Indeed, if the lines of the two frames fall right on top of each other, half the picture is lost, but not only that, since a certain degree of distortion also occurs.

There are many old sets still in operation which give extremely poor interlace performance. The pictures appear very "liny" and such viewers are making do with a picture of 200 lines. On some models careful adjustment of the frame hold control is necessary to secure the best interlace.

More modern sets, however, are not so prone to this trouble under normal conditions, but can, nevertheless, give the effect if a fault occurs in the

frame oscillator or if the screening is removed from the line output stage.

Vertical Definition

The *vertical* definition of a picture is related directly to the number of lines, the greater the number, the better the definition. This is one of the reasons why there is going to be a change to 625 lines. The lines will still be visible, of course, but provided the receiver is interlacing adequately they will be less noticeable than 405 lines, particularly on the larger type of tube.

There will still be 50 frames per second and 25 complete pictures during the same period, as interlacing, as already described, will continue to be used. The 50 frames per second are tied up with the 50c/s mains frequency used in this country. In America, where the power frequency is 60c/s, there are 60 frames per second and 30 complete pictures, as interlace scanning is also in use over there.

The frames are produced in the receiver by the "frame timebase". This causes the "scanning spot" produced by the picture tube to traverse the screen vertically 50 times per second. On each downward "sweep", the spot moves on the screen at a very constant speed, but when it reaches the bottom of the screen it flies back to the top again at a terrific speed. This is called the "frame flyback", and is not normally visible on the picture because at that time the scanning spot is cut off due to the action of the frame sync signal.

On a receiver with only the frame timebase working, the high scanning speed of the spot gives the impression of a vertical, bright line on the screen. But under normal conditions, of course, the spot is at the same time being deflected horizontally, but very much faster.

In fact, it has to be deflected at a speed that will produce 405 lines on the existing system. Since the picture is fixed at 405 lines and that 25 pictures each made up of that number of lines occur each second, the spot has to be deflected horizontally at a speed equal to 405 times 25. This works out to 10,125, meaning that the "line timebase" has to operate at 10,125c/s for a 405-line picture.

The basic functions of the frame and line timebases are shown in Fig. 9. The vertical line which is produced with only the frame timebase running is shown at (a), while with only the line timebase running a horizonal line would be produced as at (b). At (c) is shown the effect when both timebases are running. As the scanning spot is being deflected much faster horizontally than vertically a series of lines are traced on the screen, slightly diagonal, underneath each other.

In effect, the spot takes off at the top left-hand corner of the screen, traces the first line and then flies back very quickly to the left of the screen again, where it commences to trace out the second line, but by now the frame timebase has deflected the spot down the screen a little, so that line and subsequent lines are traced at equal distance beneath each other.

There are one or two technical points here which modify this simple explanation a bit. It will be recalled that a picture of only half the number of lines is produced each frame. This means, then, that the frame considered in Fig. 10 is made up of $202\frac{1}{2}$ lines. For this to happen, and to allow the $202\frac{1}{2}$ lines of the second frame (or field) to interlace accurately with the $202\frac{1}{2}$ lines of the first frame, the first frame scan must finish on a half line, while the second frame scan must start on a half line—the idea being revealed in Fig. 10.

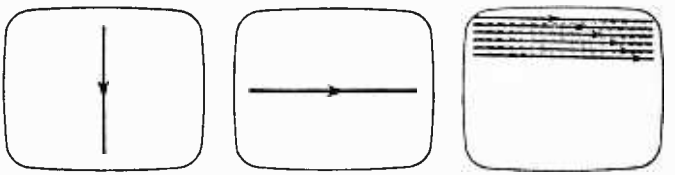


Fig. 9—The action of the timebases: (a) with the frame timebase only; (b) with the line timebase only; and (c) with both timebases.

This demands extremely accurate timing of the timebase, which is accomplished by the synchronising signals radiated along with the picture signals at the transmitter and by the sync circuits in the receiver.

Thus, we have seen that to produce the lines upon which a picture is built (which is called the "raster"), two timebases are required. The frame timebase which works at 50c/s, because this matches the mains power frequency, and the line timebase which, to give a 405-line picture, works at 10,125c/s. The timebases can sometimes be heard operating due to electro-mechanical stress in the associated transformers. The frame causes a buzz, while the line causes a very highly - pitched whistle, which cannot be heard by all.

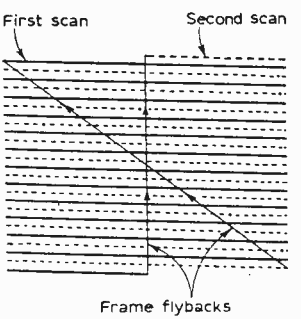


Fig. 10—Showing how an interlaced raster is produced.

How about 625 Lines?

Exactly the same ideas are employed at 625 lines. The frame timebase still works a 50c/s, but the line timebase has got to go faster to give the greater number of lines. We still get 25 complete pictures per second, so if we multiply this number by 625, we get the line frequency—which works out to 15,625c/s. This has the advantage that it is well above audibility and will thus not be heard as the shrill whistle of 405-line sets.

Clearly, then, among other things, the new dual-standard receivers must have some means of changing the line frequency from 10,125c/s on 405 lines to 15,625c/s on 625 lines.

(To be continued)

The ABC of TV Circuits

AN ANALYSIS OF THE DEVELOPMENT OF TELEVISION CIRCUITS

By T. L. May

(Continued from page 35 of the October issue)

LARGER picture tubes and shorter necks produce greater angles of beam deflection. These in turn demand a greater scanning power than was hitherto required with the earlier types of narrow-angle tubes to deflect the electron beam through the large angle so that it scans the whole face of the tube in a linear manner.

The line timebase is the most important circuit in this respect, for in addition to having to supply scanning power it has to provide EHT for the final anode of the tube, and new tubes and brighter pictures require an EHT voltage which is almost twice that used in sets at the start of the present decade.

With the valve, component and circuit designers working closely together, various new line timebase circuits have been evolved. The aim has been in producing a circuit with the utmost of efficiency, so that the extra power is provided with the minimum of power drain from the H.T. supply, while maintaining the minimum of scan distortion.

New valves and designs for the line output transformer have facilitated these requirements, and the latest type of "wide-angle" receiver is of highly integrated design. The efficiency of the line output stage has been increasing progressively throughout the years and although early receivers had relatively efficient line stages, they are suitable for operating only either narrow-angle tubes and tubes with scanning angles up to about 90 degrees.

This is the reason why it is not usually possible to replace a tube in an early receiver with a wide-angle tube of current vintage without severely modifying the line timebase (and frame timebase in some cases). The new tubes require both a greater scanning power and EHT voltage than the early chassis is capable of providing. The results are usually singularly disappointing if a direct substitution of a new tube in an old set is attempted.

Booster Diode

The booster diode has been a part of the line output stage for almost a decade, and much has been written about its function. Briefly, this diode, apart from boosting the H.T. voltage, provides the first part of the line scanning current. The booster diode then switches out and the line amplifier valve proper switches in to provide the remainder of the line scan.

The extra energy reclaimed by the booster circuit is liberated in the inductive circuits of the line amplifier during the flyback period. In very early sets, this energy was rather an embarrassment, for it used to be responsible for so-called "ringing" in the line output stage, and cause alternate dark and light vertical bars at the left of the picture. This was because the pulse of voltage generated in the inductive elements of the circuit had the form of a damping oscillation (e.g., a decaying sine wave), and this used to modulate the line scanning current in a like manner.

This was partly avoided by causing the inductive elements to be heavily damped during the flyback period, and the power contained in the "ring" or damped oscillation was directed into a high-wattage resistor. The resistor used to get rather hot, and sometimes it was made variable as a rough and ready way of achieving a control of line linearity.

It was later discovered that a diode valve could be used both to suppress the vertical lines at the left of the picture and to capture the energy of the "ring", rectify it and add it to the H.T. line voltage. This was useful, for then it was possible to run the line output stage at greater efficiency.

The next step up the ladder was to get some of the energy of the "ring" to produce a portion of the line scan, and that was also done by rearranging the diode circuit. This kind of system is in use now in all recent models, but the overall efficiency has been enhanced even further during the last two or three years.

This has happened in several ways. A major contribution has been in the line output transformer itself, the efficiency of which has been stepped up remarkably by the use of low-loss ferrite cores. In such components, the "ring" during the flyback is encouraged, for it is this which supplies the extra energy, and thus increases efficiency.

The ratio of turns between the primary and the booster diode

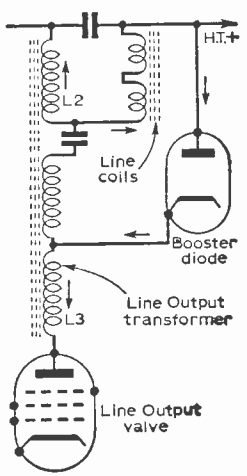


Fig. 16—A basic line output circuit, showing how the flux cancellation occurs in the core of the line output transformer. Since the current flowing in L2 is in the opposite direction to that in L3, the resulting fluxes are in opposition, and the overall flux is zero—or nearly so.

windings determines the relative conduction periods between the line output valve and the booster diode. For maximum efficiency there is a critical ratio, and this is one of the things which has been under examination. Of recent times the ratio has been modified so as to provide a conduction overlap between the line output valve and booster diode.

This arrangement has been found to give a step-up of both scanning current and EHT voltage for a nominal H.T. current. By reducing the tap for the line scanning coils on the transformer, the scanning current and EHT for normal requirements is restored, and the resulting effect is that the H.T. current is reduced—meaning a further increase in efficiency.

High EHT voltage brings in its wake high peak voltages at the line output valve and booster diode, since these are connected direct to the high reflected inductance of the line output transformer. These presented some problems in terms of valve insulations, and special valves were evolved for the new circuits—typically, the Mullard PL36 line output valve and PY800 booster diode.

Although these valves have higher peak voltage and current ratings than their earlier counterparts, it was still necessary to reduce the peaks in a practical circuit on the flyback, and here the circuit designers solved the problem by arranging the line timebase to have a slightly longer flyback time without impairing the newly found efficiency.

While the older type of line output transformer has several separate windings, the new transformers are mainly of the auto-transformer principle, where one highly efficient winding is tapped to the various circuits.

Flux Cancellation

Direct current in the windings of early line output transformer results in a unidirectional component of magnetism in the core, this being superimposed on the normal "swinging flux" caused by the line timebase signal. The flux due to the direct-current (e.g., the anode current of the line output valve) introduces two undesirable features. Firstly, it causes the core of the transformer to saturate on the peaks of the signal. And secondly, it encourages line whistle.

Core saturation is bad since it means that the core has to be of greater volume than strictly necessary for the line signal proper. The line whistle is produced in the core of the line output transformer by a process called "magnetostriction". This is related to the mechanical movement of the core when under the influence of a magnetic field, the movement being proportional to the intensity of the magnetic field produced by the windings.

Now, when the windings are carrying direct-current, the intensity of the magnetic field is greater on one swing of the line signal than the other. On one swing, for instance, the flux due to the direct current will add to the flux of the signal, while on the opposite swing there will be subtraction of the fluxes.

This causes unbalance in the swing of flux in the core, and aggravates line whistle—in rather the same way as an engine becomes noisier when it is out of balance. By cancelling the flux due to the direct current, the swing of flux is made similar on each half cycle, and the whistle is considerably reduced.

This is accomplished basically as shown in Fig. 16. Direct current from the H.T. line flows through L2 of the line output transformer in the direction shown by the arrow, while the current via the booster diode flows through L3 in the opposite direction. This produces two components of flux in the same core, and since these are more or less equal in intensity and opposite in polarity, the over-all flux in the core is almost completely neutralised.

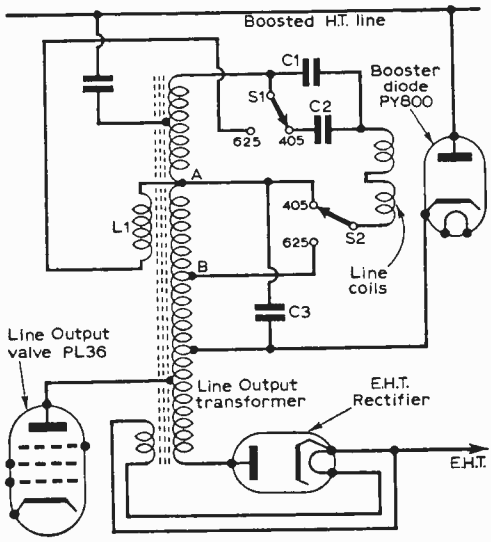


Fig. 17—In order to maintain maximum efficiency in the line output stage on 405 and 625 lines, the line output transformer has to be switched as shown.

This, then, permits the use of smaller cores than in previous transformers and, in spite of the greater power now present in line output stage, the line whistle is now considerably less troublesome than in the earlier receivers.

Tuning on the Flyback

The modern line output transformer is also engineered in relation to its associated components so that its tuned frequency is equal to the third harmonic of the current pulse produced during the flyback period. This is accomplished by a small tuning capacitor being connected to the windings of the transformer.

The transformer, of course, must be specially designed to provide this condition, and it is not usually possible to introduce this feature in a stage employing the old style transformer. Third harmonic tuning ensures that the current generated in the loss inductance of the transformer is completely exhausted at the finish of the flyback.

As a result, the pulse voltage at the anode of the EHT rectifier is increased (thereby providing a greater EHT voltage), while the pulse voltage at the anode of the line output valve is decreased (relieving the strain on the valve). Owing to the

greater EHT pulse, the EHT overwind now requires fewer turns to provide the required voltage. Some transformers use an entirely separate winding for the EHT overwind, and as less turns mean less resistance, the regulation is also improved.

From the foregoing, it will be appreciated that the line output transformer is now very much a part of the actual design of the line output stage, and for that reason the correct replacement transformer should always be used. The former practice of making a replacement with so-called "standard" transformers is now impossible if optimum efficiency of the line output stage is to be maintained. It will also be understood that the line output stage is somewhat delicately balanced in terms of efficiency, so that any shortcoming in a valve, transformer or other component will show up more quickly in the line output stage than in other circuit sections.

405/625 Line Transformer Switching

Since a transformer is geared up to one specific frequency in terms of third harmonic tuning and so on, it follows that its efficiency would be greatly impaired simply by changing the line frequency and without altering any of the other parameters. To provide a 405-line picture the line timebase has to operate at 10,125c/s, while for a 625-line picture the line frequency has to increase to 15,625c/s. This frequency change occurs in the line oscillator stage when a dual standard receiver is switched from one system to the other.

Clearly, then, there must also be some sort of switching in the line output stage to that the efficiency remains high at both frequencies. The basic method of solving this problem is depicted in Fig. 17.

In the 405-line position, S1 connects C1 on parallel with C2 to give the optimum line linearity correction for 10,125c/s. S2 connects the line scanning coils to tap A on the transformer to provide the correct level of scanning current in the coils. The transformer is tuned to the third harmonic of the flyback frequency by C3 in conjuction with the distributed capacitances of the transformer windings. Thus, the stage operates in the manner already described.

In the 625-line position, however, both S1 and S2 change over. C2 is disconnected so that C1 alone is used for optimum line linearity at 15,625c/s. S2 switches the line scanning coils from tap A to tap B, while S1 also switches in winding L1. As this winding is effectively coupled mainly to the EHT overwind, the leakage inductance is reduced and the transformer is re-tuned to third harmonic of the 14,625c/s flyback.

The circuit is designed so that the ratio of flyback to line scan time remains constant at both frequencies, thereby ensuring that both the EHT voltage and the pulses in the various parts of the circuit also remain constant on both systems.

Without such precautions, the line linearity, line scan amplitude and EHT voltage would change radically from one system to the other. Indeed, this is already being discovered by experimenters changing the line timebase frequency of 405-line-only receivers so that they will be ready for the new 625-line test signals and so that the receiver can be used for the reception of Continental transmissions.

(To be continued)

Testing Decoupling Capacitors

By I. F. Skelton

HERE is a rapid means of testing decoupling capacitors in a television set. Apply a signal from a variable oscillator across the capacitor to be tested and measure the signal with the aid of a crystal diode detector and a moving coil microammeter.

If the capacitor is good it will virtually short-circuit the signal and no reading will be measured. However, if the capacitor is open-circuit or low in value an appreciable reading will be observed.

The signal generator can be adjusted to any I.F. or R.F., thus enabling any set to be tested in this way.

The theoretical circuit is given in Fig. 1. D1 is an ordinary crystal diode of the type used in the video detector stage of a television receiver. C1 is a 50pF silver mica or ceramic capacitor.

The probe was constructed inside a valve screening can, but an I.F. screen would be quite suitable. Layout is not critical provided leads are kept short and normal H.F. constructional practice is observed.

This method really does work and saves many hours of valuable time which might be wasted disconnecting capacitors for testing. A further advantage is the fact that the set is not switched on during the test. ■

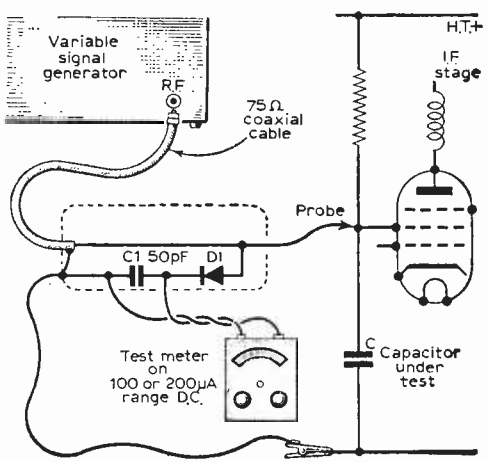


Fig. 1—The arrangement used in the tests.

SERVICING TELEVISION RECEIVERS

No. 83—ALBA T394 and T484

By L. Lawry-Johns

(Continued from page 14 of the October issue)

If the bottom of the picture is compressed in relation to the top which may be extended, check the PL82 and C48 (100μF). If stubborn, check C46-C47. If the bottom is folded up check the PL82 and then C49 0·1μF for leakage.

Vertical Hold

If the hold control is at the end of its travel check R50 and R53. In later models R50 was changed to 1·5M but R53 remained at 470k. If the control is not at one end but the frame rolls up or down the lock being critical, if available at all, check V8 and all components associated with V8A pins 6, 7, 8 and 9. Also check R25 (1·5M) if the line lock is also critical. Weak sync and loss of contrast also results if C20 (100μF) video cathode electrolytic becomes open circuited.

Distorted Sound

This is usually due to R44 (1M) going high. This is the load resistor of the EB91 sound noise limiter. A faulty PL82 (V12) can also cause distortion as can leakage through C42 (0·01μF).

Loud Hum and Distorted Picture

This is usually due to C58 (200μF) becoming open circuit and this of course necessitates replacement of the whole C58-C59 main can electrolytic.

Faults in the Power Supplies

The H.T. is supplied through two PY82 valves, the A.C. being applied to pin 9 of each via a 30Ω wire-wound surge limiter resistor. Always ensure that both resistors are intact. If a meter is not available to check the A.C. at each anode, a neon

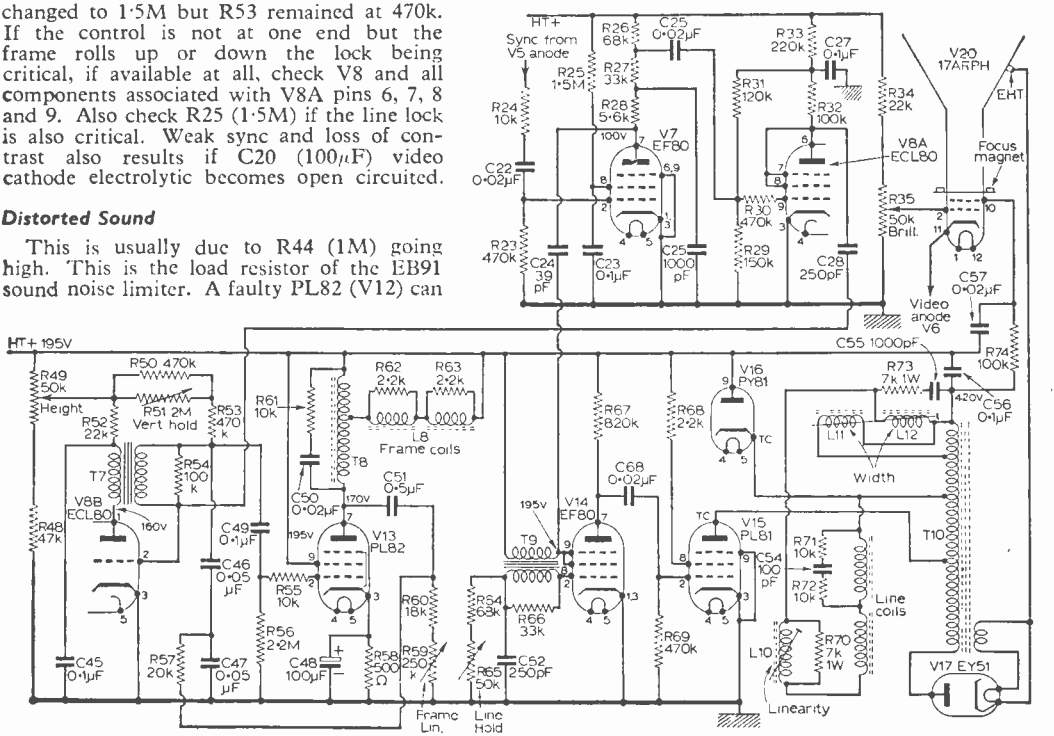


Fig. 4—Timebase circuits.

screwdriver applied to pin 9 of each valve-base will show whether the resistors are intact or not. A visual examination is not sufficient. If the symptoms are of no H.T. at all and neither anode shows the presence of mains voltage, check back to the mains dropper as one section may be open circuited. Although this would normally also put the valve heaters out, if the selector plugs 2 and 3 have been set incorrectly, for example 2 to E, 3 to K, the 9Ω section could fail without affecting the heater chain.

The Heater Chain

This is worth study since a heater to cathode short often develops leaving some valves passing excess current and thus glowing brightly and others without current and therefore unlit. For example, assume that V2 (EF80) develops a heater to cathode short. The circuit as far as heater current is concerned then becomes shorted to chassis before V3, 4, 5, 6, 20 (the tube) and 11. These heaters remain unlit and the others glow more brightly than normal as the circuit contains less resistance and the current is correspondingly higher. The increased current in this case is not generally sufficient to cause other damage but if the failure is further up the heater chain some damage is likely to result. As another example, suppose V7 is defective, all the heater current flows through valves V19, 18, 15, 12, 13, 14, 8 and possibly 7. This could well cause another valve say 13 (PL82) to also become shorted resulting in the whole current passing through valves V19, 18, 15 and 12. At this point several things could happen, one of the PY82 would probably fail and thus blow a fuse leaving the repairer rather a headache in tracing the original cause. Alternatively one of the remaining heaters could become open circuit before the fuse breaks the circuit leaving the repairer with an open heater to trace and two valves with heater to cathode shorts. In some parts of the circuit a heater to cathode failure may not give anything like these symptoms. For example, suppose the detector section of V5 (EB91) develops such a fault, the symptoms are then of bright hum bars (horizontal) on the picture. The centre band may be black with white top and bottom or the bright band may be across the centre leaving part of the top and bottom black. These conditions are reversed when the mains leads are reversed which provides a ready means of identifying this fault from oscillation in the vision I.F. stages which will normally give rise to an overall bright raster but can result in the hum bars described.

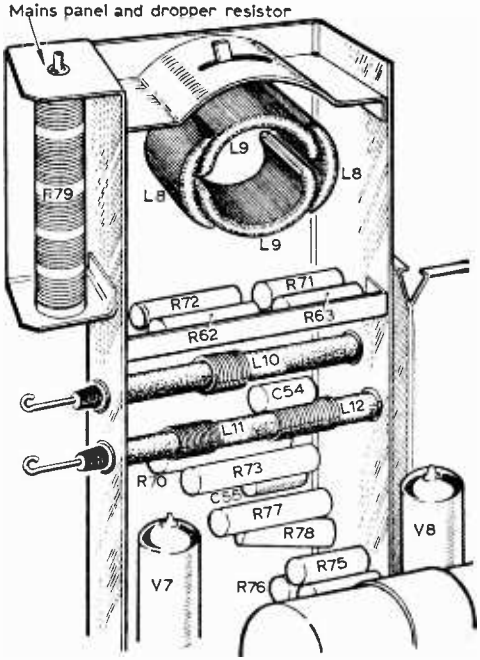


Fig. 5 (above)—A front view of the CRT support, showing the positions of the components beneath the scan coils.

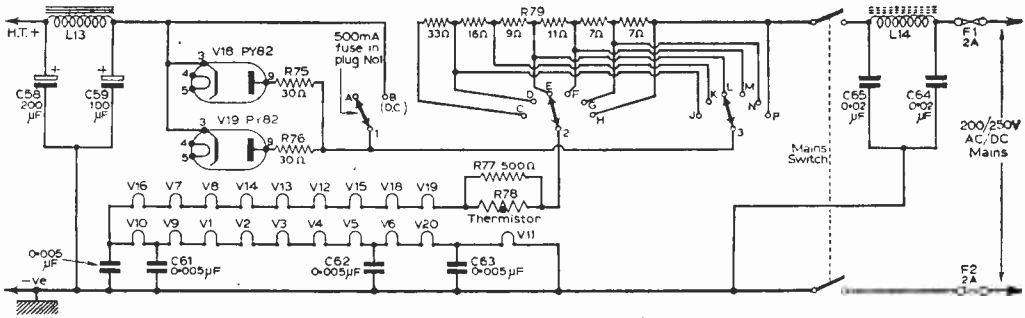


Fig. 6—The mains input and power supplies circuits.

I.F. Oscillation

This often results when a 0·005µF decoupling capacitor becomes open circuited. A test capacitor of similar value shunted across each suspect in turn will usually enable the faulty stage to be located. The test capacitor must have fairly short leads however to avoid setting up oscillation (positive feedback) on this account alone.

Shorted Capacitors

It often happens that one of these 0·005µF decoupling capacitors becomes shorted. In this

(Continued on page 88)

Impedance Bridge for Transistor Measurements

(Continued from page 27 of the October issue)

By N. Mears

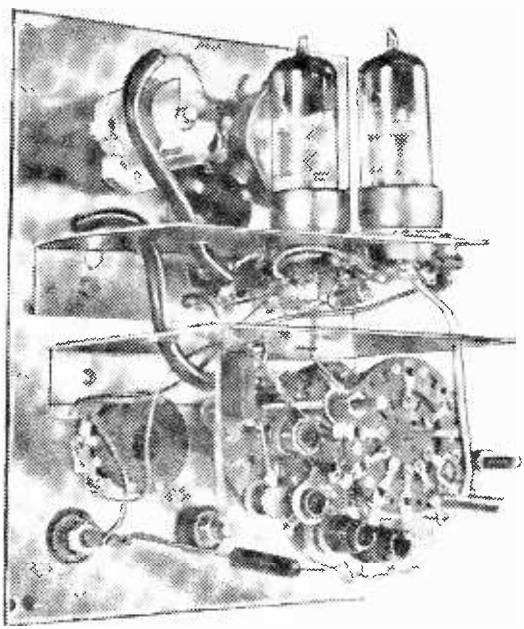
THE main wiring is carried out on a small chassis mounted at right angles to the front panel, and arranged so that the R.F. input leads are kept very short. This arrangement also ensures that the leads to the transistor under test are as short as feasible. Below the main chassis is a screen which serves to shield the input and balancing components from the anode coils; leads are taken through this screen as necessary by the most direct route. Thus the screens divide the assembly into three; the top compartment contains the valve envelopes and the balancing circuits, the small middle compartment contains the valve wiring and the input circuits, while the third contains the anode coils and frequency selector switch together with the valve screen balancing potentiometer and the terminals carrying the power supplies.

It is essential that the potentiometers which together make up R1 are of the carbon track type. During the period of development of this instrument it was desired to use a 500Ω potentiometer for one of these, and the most extraordinary results were obtained. Eventually the case was taken off the potentiometer to see what the arrangement was inside; it was a wire-wound type, possessing very considerable inductance. Replacement of this component by a 1,000Ω carbon track type removed the cause of the trouble and a very puzzling fault was cleared.

These potentiometers should also be of the smallest physical size that can conveniently be obtained; they have to carry only a minute current and power dissipation is not a problem. Inductance and self-capacitance are serious problems however. Only one at most may have an earthed spindle or slider, and if one has either of these peculiarities it should be placed on the "earth" side—electrically it does not matter which is connected to the chassis, but one must be insulated at least. Neither must be connected to the front panel; earthing is accomplished by means of the "outer" of a piece of coaxial cable equal in length to the coaxial lead to the transistor under test, while the "hot" end of both potentiometers and capacitor C1 is connected to the grid of the corresponding valve by means of the "inner" of the same piece of coaxial lead. In this way compensation for the length of leads to the transistor is effected. Similarly, the capacitor C1 is not earthed to the front panel but by means of the coaxial outer which also earths the potentiometer R1. Good insulation from the front panel and small stray capacitance to earth are achieved by substantial discs of Perspex of Paxolin.

Frequency Selector Switch

For the frequency selector switch two Yaxley type wafers are employed, each of configuration two-pole six-way; one of the sets will remain unused. These are arranged on the selector spindle



A view of the interior of the instrument.

by means of appropriate spacers to be about 1in. to 1½in. apart. When wound the anode coils are wired direct between corresponding contacts on the two wafers. The third set of contacts is used to switch the R.F. output cable to the corresponding pick-up coil.

Power Supplies

The instrument has not been provided with its own power supplies, because a suitable bench pack

is available for use with such ancillary equipment as is not in continual use. However, there is no reason why the constructor should not incorporate a self-contained power pack if desired; it need only supply 0·6A at 6·3V and about 20mA at 180V H.T.

Auxiliary Equipment needed

An external signal generator is needed to supply the R.F. input, and if about 10mV is available the indicator can easily be a valve voltmeter or a crystal diode and microammeter. This combination has the big advantage of not needing an external R.F. receiver tunable to the frequencies used. If it were desired to use the design to measure ohms and fractions of a pF the added complication would be difficult to avoid, but for the purpose intended the bridge is sensitive enough to give good accuracy with the simpler equipment.

Alignment and Calibration

Before inserting into the circuit, both the variable capacitor and the potentiometers should preferably be calibrated against known standards. If this is not practicable the makers' stated figures may be accepted to a first approximation and—assuming that a "straight line law" applies—the scales can be divided accordingly.

To set up for use the following simple procedure should be adopted. First, it is required to ensure that both halves of the anode circuit are tuned to the same frequency. To do this, the balancing potentiometers are returned to the position of least resistance and the test leads are left open-circuited. The selector switch is put in the desired position and the R.F. input leads are connected to the signal generator. The output leads are connected to the indicator and power is switched on. After an appropriate warming up period of about ten minutes the signal generator is swung slightly about the nominal frequency until an indication is recorded on the output meter. The signal generator is then tuned as nearly as possible to the peak. A dust core or brass slug is next inserted into one end of the anode coil and screwed in a little, while the signal generator setting is varied a little one side or the other. If the output reading increases the slug is screwed in a little more and the signal generator setting varied, until a position of the slug and the generator can be found which gives the maximum output. If on insertion of the core the reading first decreases the core has to be screwed right through the coil until it engages with the opposite winding; again a position is found which gives the maximum output reading. This process is now repeated for each selector switch setting in turn. It may well happen that the tuning point is awkwardly sharp, and if this is found the Q of the tuned circuits should be reduced by connecting a resistor of between 5 and 10k direct between the anode contacts on the wafters. This is unlikely to be found necessary if dust cores are used, but if silver-plated brass slugs are employed it may be useful.

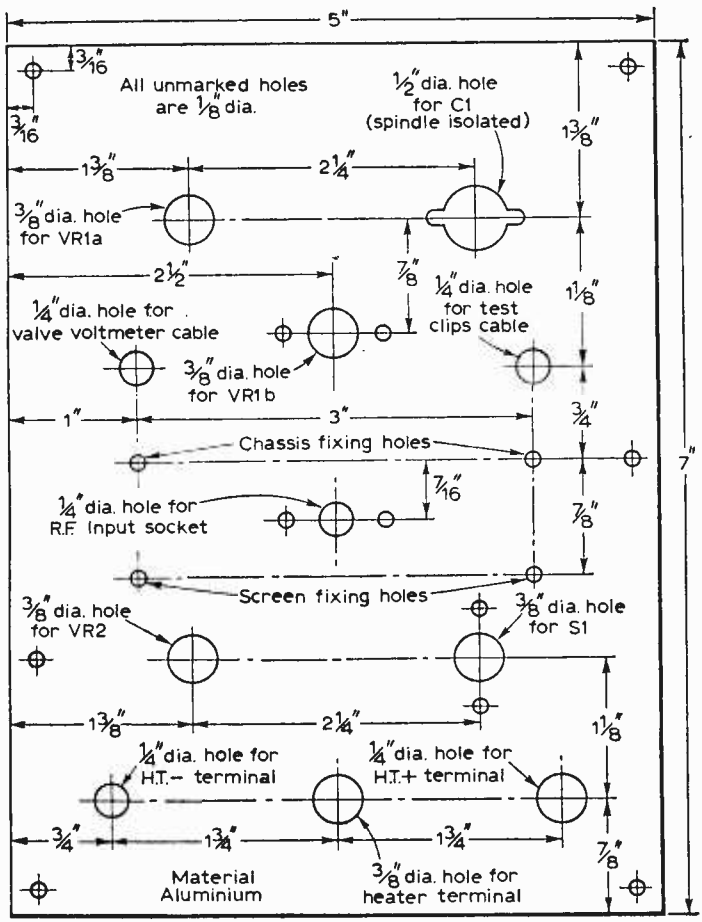


Fig. 5—The front panel drilling diagram.

Next, the amplification of the pentodes must be equalised. For this purpose the input terminals are left open-circuited and the coaxial leads to the balancing network R1C1 are temporarily unsoldered. Setting the selector to any desired range a R.F. signal is injected and the potentiometer in the screen lead to V1 is rotated until the output reading is zero or very nearly so. It may happen that to obtain a reasonable zero the pentodes have to be changed over, as mentioned earlier.

The balancing network is now soldered into circuiting the test leads, zeroing the balance potentiometers and the capacitor C1, and then

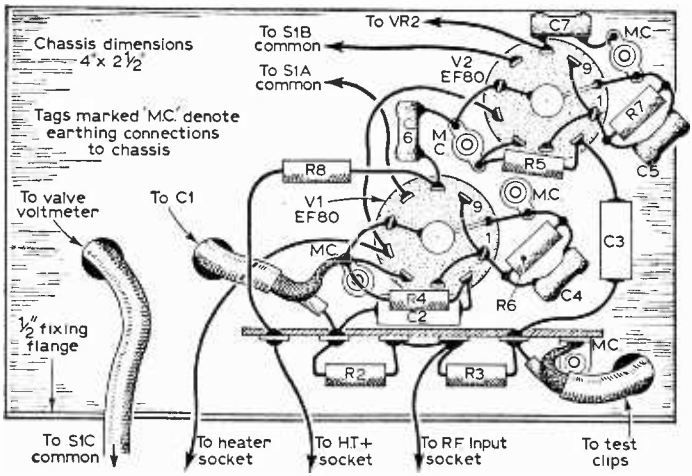


Fig. 6—The valve base wiring diagram.

checking once more to see that in this position a null reading is obtained on the output meter. If not, and if it can be assumed that R2 and R3 are equal. it means that one of the potentiometers has not a true zero or else that an unwanted coupling exists between input and output. If the latter,

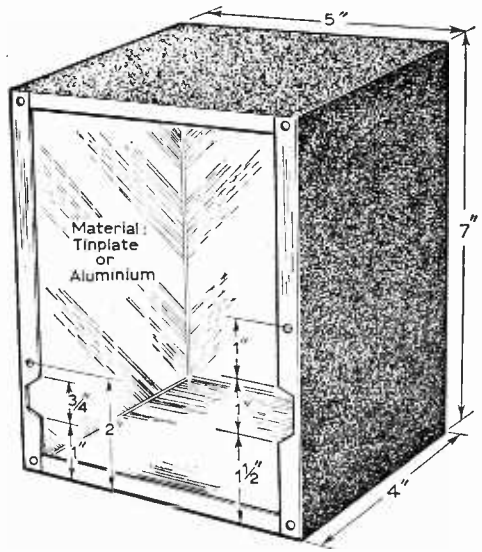


Fig. 7—The construction of the cabinet.

attention must be directed to locating the cause of the trouble. If the former, the balance potentiometers should be removed, the cases opened and a small strip of copper foil soldered to one of the end lugs so that the slider makes good contact with it at the end of its travel. Carbon track potentiometers are especially prone to this absence of a true zero, but the modification needed to correct it is simple to apply.

Taking Readings and Recording Results

To take readings the method is to zero R1 and C1, leaving the test leads open-circuited. Tune the signal generator to obtain maximum output. Connect the test leads to the device whose impedance is to be measured, and rotate R1 and C1 together until zero or as nearly zero as possible is recorded on the output meter. The resistance and capacitance are then read direct from the calibrated scales.

The result may be recorded immediately as so many ohms in parallel with so many pF, and in this form it is suitable for many purpose. If, however, it is desired to introduce the figures obtained into certain calculations, it may be preferable to convert the readings into admittance, when the relationship

$$Y = G + jB$$

holds where $G = Y \cos \Theta = R/(R^2+X^2)$ and is the conductance while $B = Y \sin \Theta = X/(R^2+X^2)$ and is the succeptance; both are given in ohms. Θ is of course the phase angle and X is the reactance of the capacitive component.

(Continued on page 84)

COMPONENTS LIST

Resistors:

R1	(See VR1a/b)	R7	150Ω
R2	1·2kΩ	R8	2·2kΩ
R3	1·2kΩ	R9	2·2kΩ
R4	1·5MΩ	VR1a	1kΩ carbon pot.
R5	1·5MΩ	VR1b	25kΩ carbon pot.
R6	150Ω	VR2	10kΩ carbon pot.

(all resistors ¼watt carbon)

Capacitors:

C1	100pF miniature air-spaced variable		
C2	500pF suflex	C3	500pF suflex
C4	1500pF ceramic	C5	1500pF ceramic
C6	1500pF ceramic	C7	1500pF ceramic
C8	1500pF ceramic		

Switches:

S1 two-wafer type, each wafer 2-pole, 6-way

Valves:

V1, V2 EF80

Miscellaneous:

R.F. socket. Terminals. Crocodile clips. Two B9A skirted valveholders. Knobs. Materials for panel and box.

SERVICING DATA AND MODIFICATIONS

By D. Elliot

(Continued from page 43 of the October issue)

THESE models are sometimes prone to spurious oscillation in the PL36 line output valve. The effect on the picture is a broken vertical line between one-third and half way in from the left-hand side of the picture, and sometimes more apparent when the set is operating on the Band III channels.

Certain PL36 valves appear to cause the trouble more than others, and in the majority of cases the fault can be eliminated by replacing the valve. However, this is not always a permanent cure, for after the replacement has been in service for a while the symptom is likely to occur again. This can prove expensive if the valve is replaced each time, for usually it is otherwise electrically sound.

Other methods have been adopted to clear the effect, and one which is often successful if the valve was free from the trouble to start with is the fitting of two ferrite beads on the PL36 anode lead, immediately adjacent to the top cap connector. These increase the inductance of the lead and shift the resonant frequency away from the passband of the receiver. Such beads are known as Ferroxcube FX1115. A range of beads suitable for this purpose is also marketed by Radiospares Limited (and are obtainable through a dealer), and cost about 3s. for a packet of one dozen.

If the inductance increase by the use of ferrite beads is insufficient and the trouble remains, a small wire-ended television suppression choke (1A type) can be connected in series with the anode lead. These are also marketed by Radiospares and retail about 1s. each.

In obstinate cases of the fault, it may also be necessary to include beads on the cathode lead of the efficiency diode valve or, if necessary, a second television-type choke.

Dust on Picture Tube Screens

Although this has been a big problem in the past, it will give considerably less trouble in the future since a new range of picture tubes is being produced on which the implosion guard is intimately bonded to the face of the screen. Sets featuring this type of tube, therefore, do not incorporate a separate glass screen or guard in front of the tube face.

The cabinet is so designed that the front of the bonded tube lies flush with the front of the cabinet, it thus being necessary simply to wipe the face of the tube with a damp cloth to clear dust and dirt.

The loss of light through this type of tube is also far less than with the old method, and reflections are less troublesome since there are less reflecting surfaces.

However, there are still millions of sets in use with the original set-up, and the precipitation of dust on the screen and on the inside of the protective glass window results in loss of light and contrast, and the need for periodic cleaning.

Several methods have been devised to minimise the need for cleaning by reducing the intrusion of dust. Some models incorporate a soft rubber loop which fits snugly between the crack round the edge of the tube face and the mask. Others use a rubber mask which has a wide flange firmly clamped over the bulb of the tube with the implosion guard let into the rubber moulding.

Many models, though, have no dust-excluding arrangements at all, and it is often an extremely difficult exercise to remove the tube for cleaning. With that in mind some manufacturers designed their cabinets so that the screen and implosion guard could easily be removed from the front of

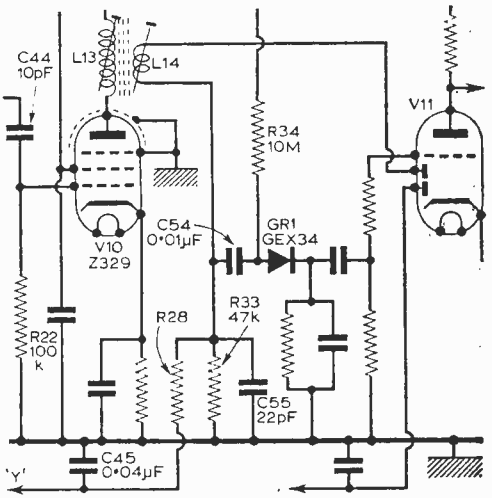


Fig. 38—The G.E.C. circuit without AGC applied to the sound I.F. valve.

the cabinet without having to interfere with the chassis or tube; but, unfortunately, this idea was by no means universally adopted.

Readers often request details for cleaning the tube face and screen so as to reduce dust precipitation in the future, and thereby avoiding frequent cleaning. This can be done by eliminating the electrostatic charge on the tube face, for it is that charge which attracts the dust particles to the screen. Repulsion of the charged particles from the screen causes the characteristic "bloom" on the inside surface of the window.

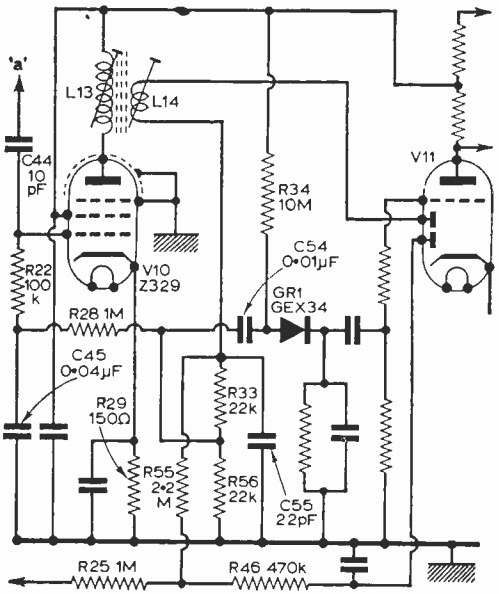


Fig. 39—How the arrangement shown in Fig. 38 can be altered for sound I.F. AGC.

The charge can be effectively decreased by maintaining the tube face at chassis potential by the use of a semi-conducting coating applied to the face. Such a coating has been evolved by the Imperial Chemical Industries Limited, Plastics Division, Welwyn, and is known as "Perspex Polish No. 3". It can also be obtained from an I.C.I. agent or from certain dealers

A little of the paste should be spread evenly over the whole face of the picture tube, and then lightly polished off with a soft, lint-free cloth. The paste should also be applied round the edges of the screen to touch the parts already treated and to form a band about 2in. wide. This coating should not be polished.

To achieve electrical connection from the paste to the chassis of the set, a thin piece of metal foil should be clamped between the tube support so that it makes contact with the coating on the edge of the tube. The other end of the foil should be clamped to chassis. On some models the metal tube cradle will automatically "earth" the paste coating.

GEC Models BT1746 and BT1252 Series

These models feature a tuner in which the fine tuning cam often breaks away from the plastic shaft. The tuners concerned switch over three programmes (channels) and are sometimes used as converters, going under Models BT201 and BT206. As it is now often difficult to obtain replacement cams, a few notes on how a broken cam can be repaired may be useful.

The best adhesive to use is the Araldite epoxy resin, which is generally available from retail sources in a small pack containing adhesive hardener. Other adhesives may not give sufficient strength over long periods of time.

The two surfaces should be thoroughly cleaned and a thin, even coating of the previously mixed adhesive and hardener applied. The two parts should then be pressed firmly together. If the hardening action is accelerated by heat, as described in the instructions, the repaired cam is ready for fitting after about thirty minutes.

Care should be taken when refitting to ensure that the metal pressure plate does not bear too heavily on the cam. If necessary, the pressure should be reduced by bending the plate a little.

GEC BT1155, BT2253 and BT3252 Series

On some early versions of the above series excessive sound signal may cause overloading and resulting distortion in the first A.F. amplifier V11 (Figs. 1 and 2). This is essentially because AGC is not applied to the sound I.F. amplifier valve, only to the R.F. amplifier and common I.F. stages.

AGC can be applied to the sound I.F. valve quite easily, however, on Models BT2253 and BT3252 by changing the existing circuit (Fig. 1) to that shown at Fig. 2. This simply involves disconnecting C45 from the 2·2M AGC resistor and reconnecting between R22 and chassis. Replacing the diode load resistor R33 by two series-connected 22k resistors ($\frac{1}{4}$W type).

Transferring C54 to the junction of the two 22k resistors, and adding a 1M $\frac{1}{4}$W resistor from the junction of the two 22k resistors to the junction of R22 and C45. Note that later models already incorporate this modification.

On Model BT1155, remove the connection between R28 and the junction of R24 and R25.

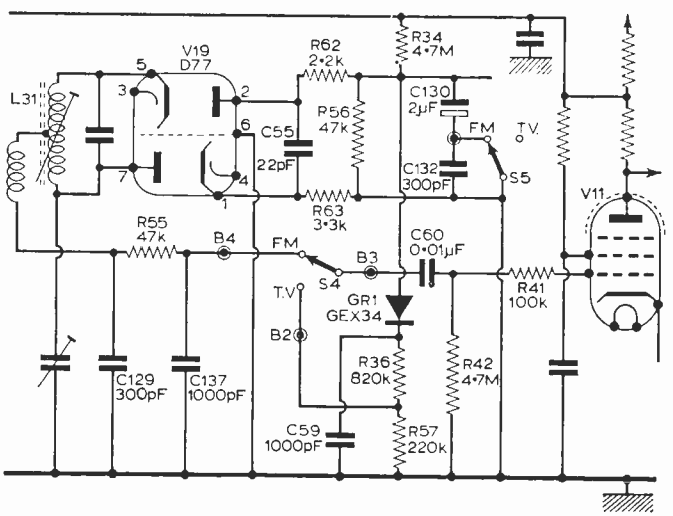


Fig. 40—The modification used in the G.E.C. range of receivers (see text) to improve sound interference suppression.

Add an 0·04μF 150V working capacitor between R22 and chassis, and connect R28 to the junction of this capacitor and R22, as shown in Fig. 1.

Improved Noise Suppression on Models BT2748 and BT8742 (GEC)

These sets have facilities for the reception of the F.M. signals on Band II, and a circuit change to provide more efficient sound noise suppression is given in Fig. 3. Later models incorporate this modification and can be identified by the suffix letter "A" after the model number.

The modification involves the following: Transfer C54 from switch B8 to the junction of R62

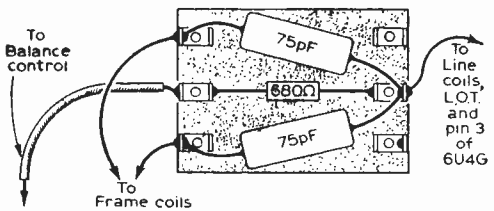


Fig. 41—A 680Ω resistor connected to the "balance control" circuits of Pilot 84 and 87 series receivers helps to eliminate corona effect on the picture.

and C130 in the discriminator circuit. Transfer C60 from the junction of R36 and the GEX34 diode to switch B8. Remove the connection between switch B2 and the junction of R56 and R57 (note that these two resistors may be replaced by a single 47k ¼W component.) Replace R36 by two series-connected ¼W resistors—820k to the GEX34 and a 220k to chassis.

Connect the junction of these two resistors to switch B2. Add 1,000pF capacitor between switch B4 and chassis. Reduce the value of R34 from 10M to 4·7M (¼W).

GEC BT1155, BT2253, BT3252, BT2748 and BT8742 Series

It sometimes happens that when the N308 line output valve is changed in these models there is a change in line amplitude and/or in EHT voltage. If this is outside the range of normal correction, then a slight modification should be made to the line oscillator stage. This simply involves changing the value of the anode load resistor of the line oscillator valve. This valve is a Z329 and the anode load resistor is 470k.

This resistor should be removed and two series-connecter 270k resistors should be fitted in place. If the line amplitude and EHT voltage are low, the two resistors should be linked in parallel, but if high, then the two resistors should be retained in series.

On some early models the frame hold control was affected by bursts of impulsive interference, resulting in a loss of synchronism. On Models BT1155, BT2253 and BT3252 this can be avoided as follows: Remove the green wire linking pin 2 (anode) of the D77 frame interlace filter valve (V7B) and pin 2 (triode grid) of the LN319 (V17), and insert a 47k ¼W resistor between the two points.

On Models BT2253 and BT3252, remove the 390k resistor from its position adjacent to the vertical hold control and connect the vacated tag to chassis. Transfer the yellow lead on the hold control from pin 9 (pentode grid) of the LN319 (V17) to a spare tag on the adjacent tag panel, and reconnect the 390k resistor from that point to pin 9 of V17.

Pilot Models of the 84 and 87 Series

Instability on models featuring a 13-channel turret tuner is sometimes caused by misplacement of the lead from the centre of the coaxial socket into which the I.F. lead from the tuner is plugged. The centre pin of this socket is connected by a short lead to one of the pins of a plug-in type I.F. transformer (underneath the chassis). This lead should be carefully positioned as close as possible to the chassis until the instability is cured.

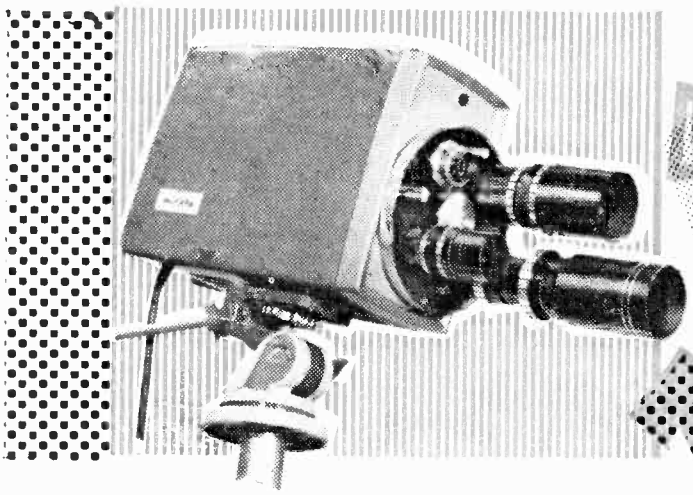
No other adjustments are usually required, other than replacing the position of the lead, providing that the receiver itself is in satisfactory condition.

Corona discharge effect

The formation of a corona discharge effect, taking the form of a vertical line of white spots about 2in. from the right-hand edge of the picture, may be caused by a high peak voltage appearing across the "balance control".

This can be remedied by connecting a 680Ω resistor (½W). The resistor should be fitted on the scanning coil panel, and should be wired in series with the lead to the balance control, using the spare tag for the junction of the resistor and the lead, as shown in Fig. 4.

(To be continued)



Using CLOSED CIRCUIT TV

THE recent introduction of low priced closed circuit television units makes it almost certain that such equipment will soon be available at reasonable fees to organisers of exhibitions, public meetings, entertainments, and so forth.

Some readers may, by virtue of their interest in television, be prevailed upon to operate the camera —usually at short notice. This has already happened to the writer, and the first part of this article deals mainly with the experiences of attempting to produce pictures and sound of entertainment quality from one of these units at a local exhibition.

A quick glance at Fig. 1 will show how little of the necessary equipment is usually provided as a CCTV unit, and details of the extra gear needed are given for the benefit of those who find themselves in a similar position, handling this fascinating new medium.

The Camera Unit

The camera that was hired was a Pye Industrial Unit with a 1in. Vidicon tube. This has a single 1in. lens with variable aperture and focus, and gives a field of view comparable to that seen in the viewfinder of the average 8mm or 16mm cine camera.

It can be regarded from an operational viewpoint as typical of the majority of CCTV units. There are no controls on the camera head apart from optical focus and aperture (iris) on the lens. Ten feet of multiple cable separates the head from the suitcase-sized control unit, which houses the controls for "beam current", "target bias", and "electrical focus".

Unlike the newer low priced units, it includes a step counter chain which relates the line and frame scanning speeds to the supply mains and also gives correct sync waveforms permitting accurate interlace and a true BBC type signal. This facility will be discussed later, but is not essential for the production of acceptable pictures.

The outputs from the control unit are a video feed of 1V positive-going picture and 80Ω impedance from which the grey metal-clad monitor receiver is supplied, and a modulated R.F. signal tunable to any Band I channel giving better than 10mV in 80Ω.

It is of course double sideband, and with the average 17in. receiver needs detuning from the nominal carrier frequency by a few hundred kilocycles towards the upper adjacent sound channel in order to approximate the overall response characteristics of a broadcast signal.

The unit just described is ideal for all industrial uses but is rather limited when televising entertainment in the manner now familiar to us. There is of course, no sound channel provided, and portability is limited by the proximity of the camera head to the control unit and the monitor receiver.

A Vidicon tube is a medium sensitivity tube, and to get good pictures indoors a fair amount of stage type lighting is desirable. The operator has no viewfinder and needs to be able to control the lens aperture and focus, point the camera, and use the beam current and target bias controls on the control unit from time to time. He must be able to see the monitor throughout. With only one camera and one lens there is no choice of angles of view.

To overcome most of these limitations the camera, its tripod, control unit and monitor were mounted on a rubber tyred dolly which was loaned by a local builder. A central control point, which mixed the sound, and gave talkback instructions to the camera crew was connected to the dolly by a 50yd home constructed multiple cable.

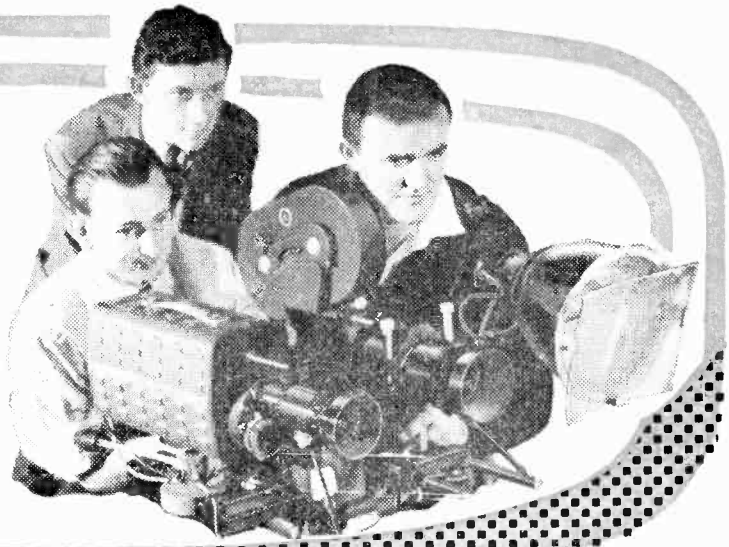
From the control point sound and vision were

ACKNOWLEDGEMENTS

Cover photograph by courtesy of the Bury Free Press.

Heading photographs show Murphy CCTV camera and Beulah D800 camera in use in a film studio.

CAMERA TECHNIQUES EXPLAINED



by H. PETERS

distributed to nine domestic television receivers in various parts of the exhibition hall, with a conventional P.A. amplification system used for the sound in preference to a modulated R.F. supply.

The block diagram of the entire system is given in Fig. 1 and a cross section of the 50yd of multiple cable between the dolly and control unit is given in Fig. 2.

The Camera Crew

A crew of three is needed. The engineer in charge sits at the control console (which in our case housed the sound equipment and a 14in. monitor TV) and directs the camera crew through headphones on a talkback system

He listens to a combined microphone pick-up from the dolly and from other microphones mixed into the P.A. amplifier in one ear and to the output from the tape recorder in the other ear by splitting the headphone leads, and can thus pre-select music or speech independent of the outgoing sound.

He can, in fact, carry out a two-way conversation with the camera crew whilst music or recorded announcements are being fed into the network of nine receivers. In our case this facility was to be of utmost value as the exhibition organisers sealed off one of the two doors leading into a large side hall from which several programmes were scheduled.

The door that was closed was the large one capable of admitting the dolly, which therefore had to be dismantled of gear, squeezed through the small door and built up again inside. It is to the credit of the camera unit designers that the time taken from switching off prior to dismantling until the camera was back "on the air" again was less than 10 minutes.

During this time a still pattern, usually black level with sync pulses, was fed to the receivers from a pattern generator to stop the line timebase from "running wild".

The other two members of the crew stay with the dolly. One is the cameraman, whose duties have just been outlined, and the other is the dolly pusher, who also pays out cable, keeps the inquisitive at bay, acts as studio manager, caption peeler, tea boy, and microphone rest.

The Distribution Systems

Vision signals were distributed on channel 1 as the local Band I signal was on channel 3. Although up to a dozen standard receivers can be operated from the camera unit's R.F. outlet without additional amplification, nine is the ideal number as it simplifies the distribution networks as shown in Fig. 3.

The vision signal can be split by four networks each comprising four 39Ω ¼W resistors connected in star and fitted into ordinary electrical junction boxes. This arrangement gives a 78Ω match throughout the system and about 2·5mV to each set (well above the "snow level").

The loudspeakers, each 5Ω approximately, are isolated from the live chassis of the associated receiver and connected in threes in series, resulting in three 15Ω legs, which in parallel matched the

continued over page

5Ω outlets of the P.A. amplifier and the tape recorder.

Provided a good recorder is used there is adequate output to give the required amount of sound. The one in use had an EL84 single ended output. If difficulty is experienced in isolating the loudspeaker safely from the chassis, as is possible in the more compact sets, a separate extension loudspeaker can be concealed within 3ft of the receiver without anybody spotting the deception.

A dummy load should be connected in place of the receiver speaker to avoid the possibility of extraneous noises being radiated. The cables used are standard coaxial for vision, and cheap plastic lighting flex for sound, and losses over 150yd are negligible.

Receivers

With the type of unit which gives a fully interlaced picture, it is possible to use a mixture of all types of receivers, provided that waveform generators in the camera control unit are correctly set up.

The size of the front and back porches (governed by the line sync blanking pulse) is critical, and so is the ratio of sync to vision. Should these be upset there is a tendency to experience AGC lockout on receivers with gated AGC systems, and an inability to obtain good contrast on receivers with mean level AGC.

In fact the only safe set for a maladjusted camera is one without AGC, and these are becoming very rare, but fortunately, anybody with television servicing experience, can usually set the unit up correctly by comparing the sync waveform at the video amplifier of a receiver with the same waveform on a BBC test card.

When using the lower priced cameras with free running line timebases, it is better to try and avoid using receivers with gated AGC and with flywheel sync. Fortunately most domestic receivers of the last year or two are of the non-flywheel mean-level AGC type.

Whenever possible stray lights (e.g., table lamps) should not be allowed to enter the field of view of the camera as these can cause flaring and flattening of whites, due to the inability of the camera tube beam to fully discharge the target plate around the overloaded area.

For a stage such as the one that most of our programmes came from, three or four 1,000W floodlights gave sufficient overall lighting to enable good pictures to be obtained from all angles at any distance. Spotlights give harsh shadows and should be avoided, or diffused.

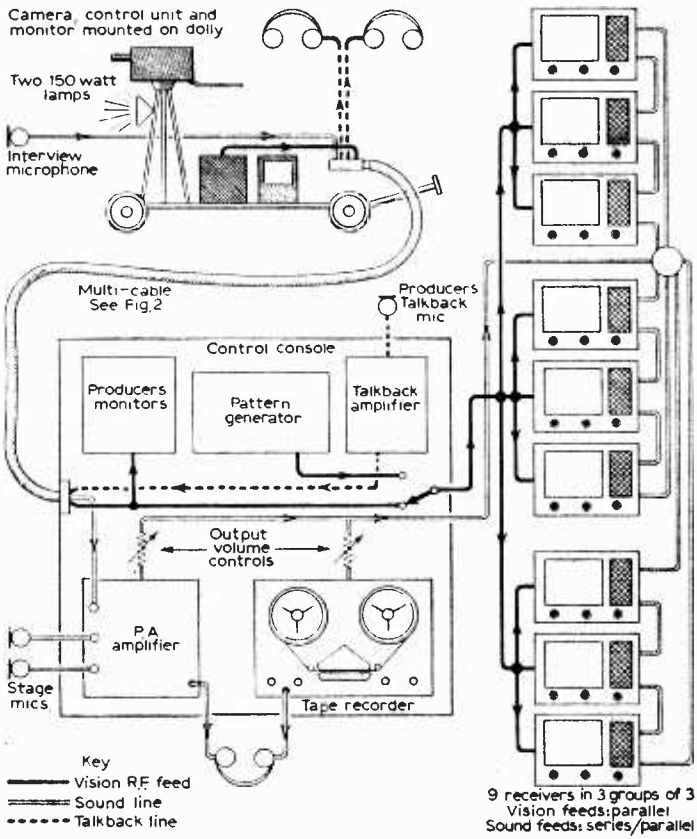


Fig. 1—A block diagram showing the inter-connections of all the equipment.

Lighting

As has already been stated, the average room light is inadequate to produce good pictures with a reasonable depth of focus. Pictures of sorts can be obtained of very dark scenes, but they tend to be noisy and have harsh shadows.

Frontal lighting of the kind recommended for colour photography seems to give the best pictures and to this end our own dolly had two 150W lamps in reflectors mounted on the pan and tilt head of the camera so that they moved around with it.

Programmes

As far as spectators are concerned the operation of a CCTV unit is just as interesting as the pictures it produces. This is fortunate as it permits fairly long intervals of blank screen and music whilst the dolly is moved from one place to another. It is however advisable to fill up as much waiting time as possible with "See yourself on TV" of which the public never seem to tire.

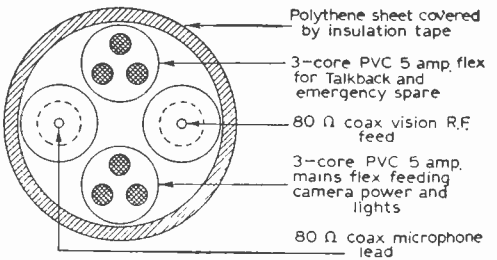


Fig. 2—A section through the 50yd multi-cable connecting the dolly to the control console.

Programme schedules should be laid well in advance, and any very ambitious schemes that the non-technical suggest can be immediately vetoed by a "Can't be done, old boy"!

Simple variety shows, fashion parades, and interviews with exhibition stall holders are practical propositions, and if (as at most exhibitions) the people appearing before the camera have an axe to grind, presentation can follow ITA lines, with "commercials" added between programmes.

These can be printed on cards the same size as the captions and test card. An ideal size is approximately 10in. x 12in. and the cards used should be tinted to give a mean grey shade on the screen. Lettering can be done in white poster paint, with Indian ink backgrounds.

The most effective method of presenting the "commercials" is to arrange them on a music stand in a stack so that they are allowed to fall forward one at a time into a tray. The camera is lined up on the front caption so that it is under-scanned, that is to say the edges stick out beyond the field of view.

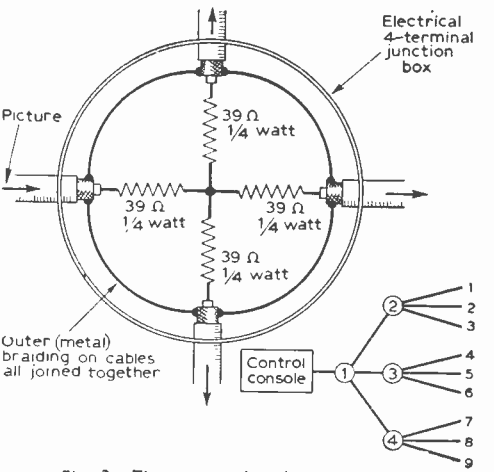


Fig. 3—The picture distribution boxes.

If the fall-down time is fairly rapid and the operators fingers do not appear on the screen, it is difficult to see how the caption change is performed. The accompanying sound can be pre-recorded with speech and "jingles" overlaid on timed music to guide the caption dropper, who may also work from a script.

The Main Problem

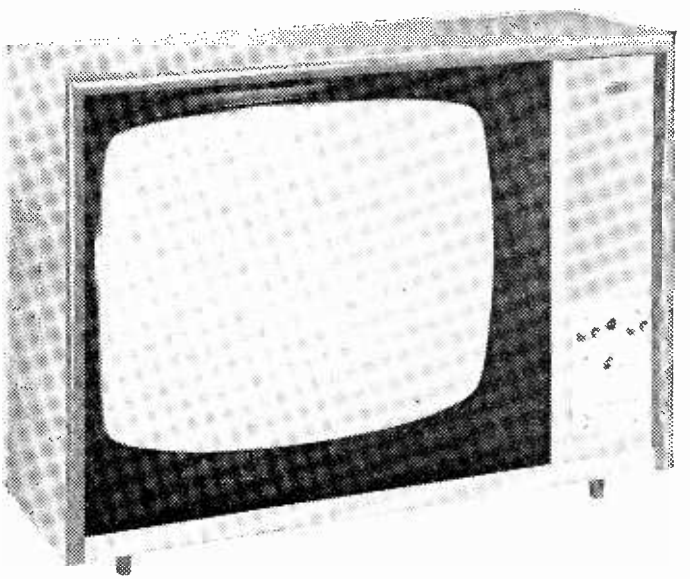
The main problem with other types of entertainment is to hold the interest of the viewers eye, limited as one is by "one camera, one lens". The golden rule of amateur cinematography is "Keep the camera still, and let the subject move", and this should be ruthlessly applied whenever possible.

In practice this was found to be simple for the fashion parade, but difficult for the instrumental trio, which didn't move about. Two separate techniques were evolved and are described below.

For *fashion parades* the set up in Fig. 4 is used, the camera being stationary. Models walk slightly diagonally towards the camera. Around about point A the whole of the model is in the field of view.

As she approaches point B, her head and feet go out of shot and it is advisable to tilt down to feature accessories, i.e., handbag, gloves and shoes. At the nearest point to the camera (C) the model slowly turns as is apparently her custom, and the cloth of the garment fills the screen completely.

By rapidly refocusing, excellent pictures of the texture of the cloth are obtained, usually taken at about waist level where the speed of rotation is slowest. As the model walks back the millinery is



A 23in. video monitor made by Murphy and incorporating a 3-channel press-button selector.

featured at B2, and the final tilt down to the original shot is made as she passes A. At A and B still objects such as a fern or floral display are carefully introduced for focusing purposes.

It is difficult to operate the focus control continuously on a camera not intended for broadcasting, but three separate refocusings at points A, B and C are well within the capabilities of the cameraman.

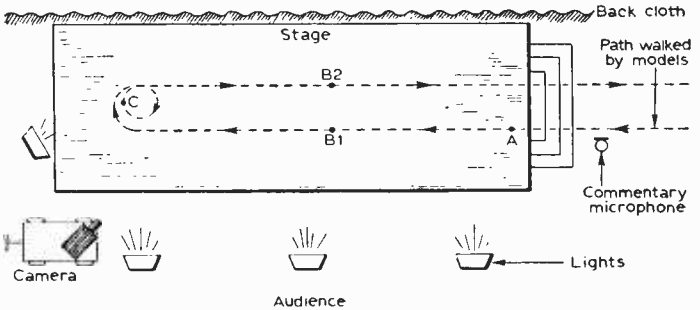


Fig. 4—A simple set-up for a fashion parade.

The routine should be worked out in advance with the fashion commentator, so that the sound relates to the picture being screened. It is inadvisable to provide amateur commentators with a monitor screen as there is a tendency for them to get interested in the pictures, whereupon they stop talking.

For *instrumental groups, etc.* the example shown in Fig. 5 of a rhythm trio can be regarded as representative. The camera is shown initially lined up on the opening caption, and as the show starts it pans right to give an over-all view of the trio. Panning should be done slowly, as a fast pan makes viewers feel dizzy, and they can occasionally be seen grasping tightly to upright objects.

After dwelling on the opening scene for a while the dolly tracks into the central figure (in our case a man seated playing a zither) the camera closes in so that the fingers plucking the strings fill the whole screen. Whilst the camera dwells on this close-up, the dolly can be carefully swung round to a different angle, and, as interest in the close-up wanes, tracks slowly out to give a different long-shot of the stage.

This process can be repeated from time to time, closing up on the different members of the group as they take their solo, or for light relief, upon the tapping feet of the audience.

Lens Turrets

If the user is more fortunate than we were, and has a choice of two or three lenses, scope is considerably wider. If some means of blacking out the picture during lens change is not provided on the camera, it should be done optically, by stopping down the aperture, to avoid distressing effects on the screen.

When using a telephoto lens, the dolly and tripod must be kept rock steady as the slightest movement will show as picture shake.

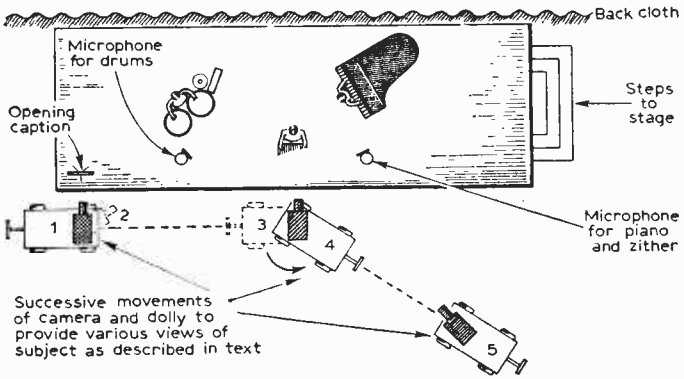


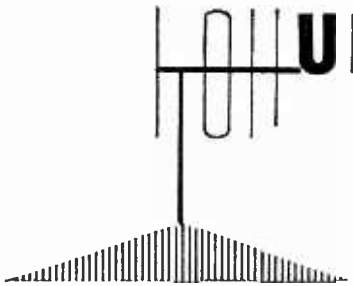
Fig. 5—The same stage as in Fig. 4, used for a musical trio.

Faults

There is a limit to how much repair work can be done during the show. Faults in the multi-cable can be overcome by using the 3-core flex originally intended as the talkback circuit. This can carry the mains, or the microphone feed of R.F. picture signal (or both of the latter) in an emergency. The talkback can be restored by using the two coax outers, which seldom go down.

A pre-recorded breakdown apology followed by music should be standing by at all times at the control panel, and a breakdown caption can be put in front of the camera to cover up a hitch in the production side. Ours read: "No apologies for the breakdown—it was bound to happen".

(To be continued)



UNDERNEATH THE DIPOLE

A MONTHLY COMMENTARY

BY ICONOS

IT takes a little time to digest all that one sees at the annual Radio and Television Show at Earls Court. My considered opinion is that the standard of black-and-white commercial television receivers is once again improving—a comment I haven't made for two or three years.

The loudspeakers are now forward-facing, instead of being around the side or the back of the sets, and there are even two or three makes which incorporate some form of D.C. restoration for ensuring a correct reproduction of the grey scale, from black to white. The 625-line closed-circuit pictures were impressive, but the colour sets showed little improvement on previous years and demonstrations.

Colour Television

I have yet to see more than one colour TV camera in operation together that match one another in colour balance, and the wide variation of colour bias on the receivers was very noticeable. It has been said that colour TV receivers will cost about £750 each for the first year or so of regular transmissions.

Colour television cameras cost about £14,000 each, and the increased costs of colour switchers, monitors, lighting and other equipment adds about £100,000 to the cost of each television studio which is turned over from black-and-white to colour.

Actually, the cheapest and most reliable method of making colour television productions is to film them in colour with motion picture cameras and to broadcast them from colour telecine machines. It will be far too expensive to mount a colour television play for a single live transmission; and colour telerecording is in its very early stages of development.

Retrospect

Thinking again of the stands at Earls Court that most impressed me, neither the BBC nor the ITA take their place in my "top ten". The most interesting exhibits were those of the Post Office and the Armed Forces, where ingenious working models of all kinds attracted crowds. The Independent Television News presented a film about the evolution of the ITA, with emphasis upon the erection of the latest transmitter in Wales.

Too many dawn and sunset scenes cast shadows across a brave effort, which seemed austere when compared with the brashness of the BBC's disc jockey stand. There are rumours that it will be two years before the next Radio and Television show. I may grumble about the show in these columns, but I hope this isn't true. After walking around the stands for a few hours it's not me that protests—it's my feet!

The Granville Studio

There may be no business like show business, and I suppose this is because of its ups and downs. Music halls, theatres, circuses and film studios have all had their good and bad times, though they have been mainly bad of late—for which television is blamed. It is, therefore, sad to have to record that the Granville TV Studio, Walham Green, is closing.

This studio was ingeniously converted from a music hall by Associated Rediffusion, and, quite recently, brought thoroughly up-to-date with a new lighting grid and 4½in. Pye image orthicon cameras for live TV or for video tape recording via a line to the Museum TV Exchange. Yet it is now off the air—mainly because one of the industry's trade unions will not allow taped advertising commercials to be broadcast more than once!

It is stated that the film technicians fear they will be out of work if the use of video tape spreads into the "commercials" field! Which only goes to show how stupid some people can be! The video-taped commercial is very limited in use and cannot approach the film for flexibility of handling, editing, captioning and cheapness. Taped commercials have their uses for coupling advertising to hot news, such as the result of a motor race or a beauty competition.

Continental Programmes

Two items of Continental origin which impressed me very much were respectively from Brussels and Munich. From Brussels came the beautifully video-taped ballet "The Four Brothers", which included the famous game of chess with live chessmen. This production was by Granada, who sent a large unit of technicians and director Gordon Flemyng, together with a mobile control room, TV cameras and video tape machine to record it in an improvised TV studio in a circus in Brussels. The result was superb and the recorded tape was broadcast most appropriately at the time of the Edinburgh Festival, where the same talented company also presented it.

The second notable Continental programme was "Too Young to be Blonde", the Bavaria Film Studios prize winning entry from the Montreux Festival. This was a fast-moving revue about a German concert party travelling from town to town by bus to play one-night-stands. The music was lively and gay, the girls were strikingly beautiful, and one didn't have to know the language to appreciate a first-class production. This film was made with the aid of the Arriflex Electronic-Cam System which has been previously mentioned in these columns.

This employs a number of motion picture cameras controlled with the electronic aids and vision

mixer just in the same way as live television or telerecording. This is a new technical philosophy. It isn't really television and it is certainly not filming in the traditional way. The final result is achieved in much the same way as for video-taping—but the end product is high-quality film negative, which yields 35 or 16mm film prints which can be shown on television anywhere in the world.

BBC's Edinburgh Regional Studio

Distinguished artists who appeared in the Edinburgh Festival took part in an "informal" television programme recorded in the BBC Edinburgh Studio. Elizabeth Söderström, the charming and talented Swedish soprano introduced the guests who played or sang music of their own choice. The setting was an elegant drawing room and the guests were in evening dress, moving and talking with poise appropriate for a dazzling salon of the Edwardian era.

If this programme turned out to be far from informal, in the modern sense of Edwardian informality, it was all the more welcome. The fine technical work of the director, Alan Rees, and the designer, Douglas Duncan, was worthy of the fine performances offered by the artists from many nations.

The handling of the cameras and cutting during John Ogdon's short but excellent piano recital, was unusual and effective, especially a new type of overhead shot. The programme concluded with a beautifully modulated song by Elizabeth Söderström herself. Credit must be given in this programme to the excellence of the sound balancing.

"What's In it For Walter"

I wish I could say the same things about the sound balancing in the TV play "What's In It For Walter", Barry Thomas's television play of the Tilsey novel, the dialogue was often drowned by the musical background. This is possibly not surprising, because Walter is the pianist of a dance band at a holiday camp, and he has been persuaded by the crooked manager to play for a hundred hours without stopping —a piano marathon.

Naturally, there was a solo piano background throughout the rest of the play. John Stratton gave a brilliant performance of the tiring musician, playing the piano with great precision (to playback) and getting the utmost out of rather poor dialogue writing.

The faulty sound balancing occurred mainly in the opening sequences of this play, when the off-stage complete dance band, with saxophones, etc., obscured the dialogue in the nearby manager's office. The main fault of this television play was, however, the contrived story which made one wonder why anybody took the trouble to write a complicated TV play script of it.

Portaiture and Make-up

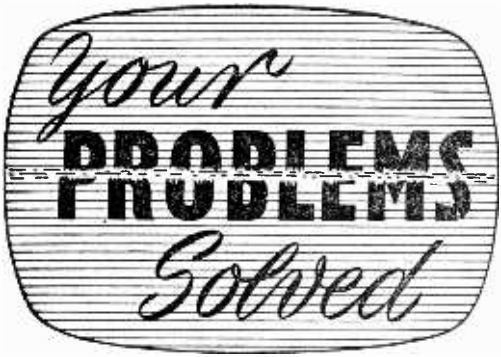
Television is largely a close-up medium. The immense crowds and spectacular long shots of super-colossal Cinemascope and wide screen films mean little on the small television screen.

It is, therefore, all the more important that lighting supervisors of television plays observe the rules of portraiture. Modelling of the face, avoidance of ugly shadows and ability to see the eyes of the players should be the principal objectives in lighting set-ups. The key lights, filler lights, back lights and kicker lights all play their parts in building up a pleasing picture.

Lighting for two or three TV cameras naturally leads to flatter lighting than is possible in the film studio, where usually only one camera is used and much time is spent over every individual close-up. That first-class lighting can be obtained with multi-camera technique is demonstrated by the superb results obtained by the BBC in "Steptoe and Son", results which survive the degradation that must result from transfer to magnetic tape or by telerecording to film.

On the other hand, the same remarks do no apply to "Hugh and I", a delightful series in which Terry Scott and Hugh Lloyd take over a situation comedy series of the Tony Hancock—Sidney James type. Terry Scott has improved enormously as a television actor, but he is not helped by the shadows that obscure his and other actors' eyes in this series. The use of small lamps called "bashers" fitted to the cameras, which only become effective at short range, should remove the screening effect of shaggy eyebrows.

As regards the ladies, the lips are particularly important. Pale lipsticks look even paler when the studio lighting is dimmed a little, and it is not difficult to make a healthy looking young female look like an anaemic invalid. By far the best close-ups on television were obtained with CPS Emitron cameras and little or no make-up for the actors. But these cameras need about twice as much light as the modern image orthicon cameras.



Whilst we are always pleased to assist readers with their technical difficulties, we regret that we are unable to supply diagrams or provide instructions for modifying surplus equipment. We cannot supply alternative details for constructional articles which appear in these pages. WE CANNOT UNDERTAKE TO ANSWER QUERIES OVER THE TELEPHONE. The coupon from p. 84 must be attached to all Queries, and if a postal reply is required a stamped and addressed envelope must be enclosed.

PAM 555 F.M.

Until recently this set was working well, but on switching on, the other day, it was completely dead.

On inspection I found that all the valves were alight, except the EY86. This I replaced with no results. The PY32 has also been replaced recently. I would be grateful for any information you could give me regarding this fault.—J. Ward (Londonderry).

The symptoms you describe suggest a lack of H.T. and we advise you to check the 23Ω surge limiter in the PY32 anode circuit and also the mains dropper sections.

COSSOR 950

The sound is as normal, but there is only a bright horizontal white line, about an inch wide, across the screen. All the valves light up.—T. Gormley (Rowlands Gill, Co. Durham).

Check the valves, V14 (ECC82) and V5 (PL84), which are on the frame timebase printed panel.

MURPHY T.V. 270A

The fault with this set is vertical distortion. I have no service data for this receiver, but I have found that by rocking a small potted transformer at the rear of the chassis, the verticals will straighten. Could you confirm that this is the line oscillator transformer?—W. E. Waters (Wadebridge, Cornwall).

The potted transformer you refer to is the line oscillator transformer. A frequent cause of the trouble you are experiencing is a poor chassis connection, either of the metal case, or on the adjacent tagstrip beneath the chassis in the region of the transformer. Check also for dry joints.

MURPHY V214

This receiver was working normally with an excellent picture until recently, when suddenly the picture vanished completely with no fading at all. The sound is still present.

I noticed at the time, that the U25 rectifying valve was glowing blue, but this was replaced with no results. The line timebase whistle is present. —P. Bottomley (Sutton, Surrey).

Check the EHT rectifier which may have shorted out. (The way to check this component is to disconnect it.) If oil leaks from the line transformer, this may be faulty.

K.B. KV50

Is there any turret tuner which can be easily fitted to this set—which at the moment covers three channels only—to give all channels?—A. R. Ferguson (Dovercourt, Essex).

The Brayhead multi-channel turret tuner type 16P, is suitable for your set. This should be ordered with a B7G R.F. plug and a 16BA6 adaptor. It is then simply a matter of removing two valves from the set and plugging in the tuner in accordance with the instructions supplied.

BEETHOVEN

This 14in. receiver is about eight years old and marked "Beethoven Electrical Equipment Ltd.", but I can find no model number. As I wish to send for the service sheet for this set, I would be grateful if you could possibly identify the model from this information.—S. Swan (Paisley, Renfrewshire).

This is probably of the Beethoven B77 series. It uses EF80 valves and a Mullard MW36-24 CRT.

FERGUSON 992T

The trouble with this set is that the picture has vertical lines on it about $\frac{1}{4}$in. wide, where the picture content is very bright. Adjusting the line linearity magnet moves these lines but does not remove them.

Another fault is a regular noise, not unlike interference, which is present on sound and sometimes appears as black bars across the screen. This only happens when the set has been on for about five or ten minutes and is tuned to ITV. —L. Pearson (Liverpool).

A low emission PY81 or PL81 aggravates the "ringing" effect described. Other causes are low H.T. and a defective line output transformer.

The noise on Band III should lead to a check of the tuner valves. If the valves themselves are in order, check that they are making good electrical connection with their bases. Also check all other external connections and "earths".

H.M.V. 1843

I would appreciate any instructions you could give me regarding the correct method of resetting the ion-trap magnet on the neck of the tube, as I have recently had to repair the fibre band on this component.

At the moment I receive a picture, but I would like to make sure of the setting.—J. W. Gilton (St Helens, Lancashire).

Once a picture has been obtained by adjustment to the ion-trap magnet it is necessary simply to adjust the magnet along the neck of the tube and axially for the brightest possible picture, with the brightness control turned to about half-way. If necessary, re-centre the picture by the shift controls on the focus assembly.

ULTRA V71

The fault with this set is that although the sound is present, the only picture obtainable is a bright horizontal line across the centre of the screen.

I would be grateful for any advice you could give me regarding this fault and for any information you could let me have as to how to change this set from a channel 5 receiver to channel 4.—G. A. Wood (Peterborough).

The horizontal line is caused by failure of the frame timebase. The usual cause of this trouble is an open-circuit 24μF electrolytic capacitor connected between the frame scanning coils and chassis. If the trouble persists, check the UL46 frame amplifier and 6K25 frame oscillator.

There is no specific procedure for changing channel on this fixed channel model, but it is usually possible to change from channel 4 to channel 5 by unscrewing the oscillator trimmer two or three turns and readjusting the grid and anode tuned circuits of the R.F. stage for optimum sound and picture quality. The idea is first to adjust the oscillator to get sound and vision on the new channel (with a strong aerial signal) and then to follow up with the R.F. adjustments while reducing the setting of the contrast control. Alternatively, a signal generator is required to establish the new frequencies as the tuned circuits are adjusted.

H.M.V. 1826

I recently bought a re-gunned Mullard 43MW-64 tube to replace the one in this set. However, I cannot get the picture into proper focus unless the brightness is turned down to such an extent that the picture is not worth looking at. When the tube is lit up, the whites are defocussed rather badly. I read in one of your back numbers that pin 7 should be tied to the cathode pin 11 on this tube. Is this correct? At the moment the second anode is left free.—L. Rees (Bristol).

The MW43-64 differs considerably from the Emiscope 4/14, the former being a pentode and the latter a tetrode. The second anode of the former must be connected to the cathode, but the main requirement to worry about is a smaller focusing field with the pentode, and this may necessitate a different focus assembly or considerable readjustment to the original.

DECCA DM 14

The frame linearity on this set takes nearly an hour to reach normal. At first it is stretched at the bottom and although it eventually rights itself, it takes a long while. As the linearity changes, it affects the interlace so that this cannot be controlled for some time. The frame will lock over a wide range of the frame hold setting but the control for the interlace is critical and alters with linearity.

Recently the bars on Test Card C have become indistinct—on BBC the 2·5Mc/s bars are faint and the 3Mc/s bars are missing. On ITA this condition is worse. Would a failing R.F. amplifier valve be the cause of this?—F. Johnson (Fareham, Hampshire).

The frame linearity trouble should first lead to a check of the frame amplifier valve, the H.T. voltage and the setting of the mains adjustment. Also, if necessary, the components associated with the frame linearity control should be tested, as one or more may alter in value with increase in temperature.

Impaired definition could be caused by the failing tube or misalignment of the vision I.F. channel. A defective R.F. amplifier valve would not usually cause the trouble.

FERGUSON 992 SCH.E.

The screen suddenly went blank except for the raster. Adjusting the brightness and contrast controls fully clockwise brought back the picture but with flyback lines present. However, in this condition the picture was too bright and retarding the brightness control caused the screen to gradually become dark, with the darkness moving across the screen from the right, until all the screen was black.

The voltages on the tube base have been tested and found to be correct. The sound remains good at all times and tapping the tube base has no effect.—J. Hood (Seaham, Co. Durham).

This could be a tube defect, but from your remarks the trouble would appear to lie either in the video amplifier stage or in the vision I.F. amplifier as instability. If the trouble clears when the control grid of the video amplifier is shorted to chassis (there will be no picture, of course) then I.F. instability is the cause. If the uneven illumination remains, however, suspect the tube and video amplifier circuit.

FERGUSON 988T

This set went dead one evening as though it had been switched off. On examination neither the valves nor the CRT showed signs of life, with the exception of the three valves in the converter, which is wired as an integral part of the receiver.

I have completely replaced all the valves and the CRT; I have tested the fuse and checked as much wiring as I can. Everything appears to be in order, but still the set remains dead.—R. Whittington (Thornton Heath, Surrey).

Check the thermistor, the mains dropper and the on/off switch, as one of these items—assuming that the valve and tube heaters are intact—in the series-connected heater chain must be defective.

K.B. PVP.20

I have recently serviced three of these receivers with the same complaint, which is that the horizontal and line hold controls need frequent adjustment. After changing the valves in one receiver in the frame timebase and sync separator stages, I still had occasion to adjust the horizontal hold control several times.

I would be very grateful if you could give some idea of what could cause this condition.—R. Dawson (Gateshead, Co Durham).

The usual causes of this trouble are: drift in the PCF80 triode section used as line oscillator; drift in the 470k resistor connected to the line hold control; a fault in the line blocking oscillator transformer, and alteration in the value, when hot, of the 300pF capacitor connected to the control grid of the line oscillator triode.

DECCA DM.55

This receiver was working quite normally, when the picture suddenly jumped upwards three inches.

(Continued on page 83)

I have replaced V16, V8, V7, V6 and the 500μF capacitor, C76. I have tested by substitution the rectifier PY82, but the fault still remains.—B. Tandy (West Bromwich, Staffordshire).

The trouble lies in the frame timebase. If the valves and smaller components are in order, particularly those associated with the frame linearity control circuit, suspect shorting turns in an associated transformer.

DECCA DM.4

The sound on this receiver is perfect, but there is no picture or raster whatsoever. The EY86 has been replaced but without success. Most of the valves have been checked and found in order, with the exception of an ECL80 which was replaced but with no improvement in the condition of the set. The CRT heater lights up.—C. Saphery (London).

If the EY86 is not lighting up, the trouble is in the line timebase section. If the line whistle can be heard when the line hold control is rotated, the trouble lies in the line output stage. In this event, check the PL81 and PY81 valves. If these are in order, check the smaller associated components. If there appears to be no obvious fault, shorting turns in the line output transformer may well be responsible.

FERGUSON 991T

This set was working well until recently, with both the sound and vision perfect. However the picture suddenly collapsed completely leaving the sound only.

I have replaced the EY51 twice, but each time the set functions for a very short time only, and then the picture goes leaving the sound.

I suspect a short in the windings of the line output transformer, as on close inspection it seems to be overheating.—K. G. Fenner (Sutton, Surrey).

Shorting turns in a winding of the line output transformer is a frequent cause of the trouble described, but this can only be proved conclusively by trying a replacement transformer.

PILOT TV94

This set uses a 14in. C14FM CRT. I have replaced quite a few of the valves which were weak and now I would like to replace the tube which has been boosted for some time and is now nearly useless. Could you please tell me if it would be possible to use a 17in. tube, type C17FM, and what snags I might run into during the process of changing them over.—W. E. Dodd (Doncaster, Yorkshire).

Electrically, the tubes mentioned are very similar and a direct substitution is possible. However, the 17in. tube usually requires slightly more EHT voltage than the 14in. tube to give a picture of equivalent brightness, and this may not be obtainable from the chassis in question. The effect, therefore, should be a slightly less bright picture.

SOBELL TS17

There is a continuous buzzing from the loudspeaker which alters as the volume control is rotated. I have substituted the valves in the sound section. Also I have adjusted, very slightly, the studs on the turret to see if this made any difference.—J. Henderson (South Shields, Co. Durham).

This could be caused either by faulty H.T. smoothing or vision breakthrough in the sound channel. In the former case, replacement of the defective electrolytic would represent a cure, while in the latter case, complete realignment may be required.

PYE C14

When this is switched on, the screen is covered with " wicket-work " and cannot be corrected with the horizontal hold control. A picture can be obtained, however, by clicking the tuner from one channel to another and back.

The horizontal hold is very critical and usually breaks up when the programme changes. The picture quality seems to have gained in contrast lately. I have tested by substitution V1, 2, 7, 21 and 23.—A. D. Phillips (Sunderland, Co. Durham).

Check the discriminator circuits behind the PCF80 line oscillator valve, particularly the D321Y discriminator diode and the two capacitors connecting it to the sync transformer.

EKCO 169

The trouble with this set appears to be connected with the volume control, which is in the cathode circuit of the first sound I.F. valve (V11). I can receive both sound and vision as normal, but when the volume control is turned fully up, both sound and vision disappear, leaving only a bright raster on the screen. I am unable to understand why the vision should be affected in this way.

The wire-wound volume control is in working order.—H. J. Sagar (Ashton-under-Lyne, Lancashire).

The symptoms you describe suggest instability in the sound I.F. stages. Check the 0·003μF and 0·001μF capacitors by bridging each with a known good component.

RGD 600

On the BBC channel (Sutton Coldfield) there is sound-on-vision causing a breaking up of parts of the picture, in the form of horizontal lines. This fault occurs particularly during passages of music and loud noises. This fault is not present on the IV channel.

On any other BBC channel, the picture is free from this fault but I receive no sound.—J. Taylor (Nottingham).

We suggest that you check the BBC aerial arrangements for your receiver, as these could be faulty. We do not advise you to adjust the tuner unless you have experience of this operation.

EKCO T327

This receiver functions quite well when first switched on and continues so for a good five minutes. After this, however, the picture gradually fades. The sound is unaffected, and the picture remains complete throughout. After about ten minutes, the set settles down to a position where vague shadows can be seen on the blank screen. These can be faintly brought up when setting the contrast and brilliance controls to approximately the mid-way position in each case, but the picture is completely lost if either control is moved away

from this setting.—F. D. Cosgrove (Marlow, Buckinghamshire).

This fault could either be a faulty U25 or a defective CRT. If the U25 is faulty the picture will swell up if the brightness is advanced, but if the tube is faulty the size of the picture will remain the same.

MURPHY V250C

There is a line timebase fault on this set and I suspect the scan coils as the horizontal scan is reduced to approximately 4in.—D. D. Powell (Horsham, Sussex).

The normal cause of this fault is the failure of the 0·25μF efficiency diode smoothing capacitor. This is beneath the U251 and 20P4 valveholders.

Impedance Bridge

(Continued from page 66)

Accuracy

With care in construction and use an accuracy of better than 5% may be obtained on the lower frequency ranges while at 100Mc/s the best obtained has been 7%. The accuracy of 200Mc/s is hard to assess, because the self capacitance of the resistors R2 and R3 affects matters, while the inductance of test resistors and crocodile clips is not negligible. A conservative estimate might be that with care 15% accuracy may be achieved, and this is probably enough for most purposes. ■

The British Amateur TV Club

SIXTH AMATEUR TELEVISION CONVENTION

MEMBERS of the public had an opportunity to see amateur-built television transmitting equipment in operation during the sixth Amateur Television Convention held at The Conway Hall, London, on Saturday, 8th September, 1962. This Convention is a bi-annual event organised by the British Amateur Television Club.

The equipment arrayed around the hall provided examples of the different branches of vision pick-up and transmission technique practised by members. Due to the complexity of the apparatus needed for a complete TV transmitting station, not to mention its cost, it is not surprising to find that for the majority of members specialisation is the order of the day. The individual usually concentrates upon experimenting with either camera equipment, telecine or TV transmitters.

One of the most important functions of the Club is to co-ordinate these individual activities and thus enable enthusiasts, who so desire, to work in association and to integrate their equipment into complete systems for transmitting and receiving pictures over the permitted frequency channels. Whichever subject the television amateur decides to pursue he is certain to find ample scope for absorbing experimental work.

Camera construction, rather naturally, is highly popular and several closed circuit systems were in operation throughout the day. An interesting exhibit was a "slow scan" equipment. A line rate of 25 per second with one complete frame in five seconds, is used in this system; this allows picture information to be transmitted within bandwidths not exceeding 4kc/s and is also suitable for video recording on to magnetic tape.

Among the transmitting exhibits were complete set-ups for 70cm operation.

During the afternoon three short lectures were given by members of the Club, the subjects being: "Colour Television", "Transmitting Problems" and "Semiconductors in TV circuits". The second lecture included a report of amateur endeavours in establishing two-way contacts, and particularly of the organisation of a network covering a wide area of East Anglia.

Topographical features are limiting factors in cross-country link ups, and opportunities abound today for amateur incentive to "blaze a trail" for VHF TV as in the earlier days of radio communication.

The last lecture was especially notable for the technique of presentation employed for here was an excellent example of amateur contructed closed-circuit equipment performing a serious task. As an accompaniment to the lecture, diagrams and oscilloscope traces were reproduced on a large screen monitor facing the audience, the use of two cameras allowing the lecturer to present a diagram or a trace alone, or one image superimposed on another, at will. ■

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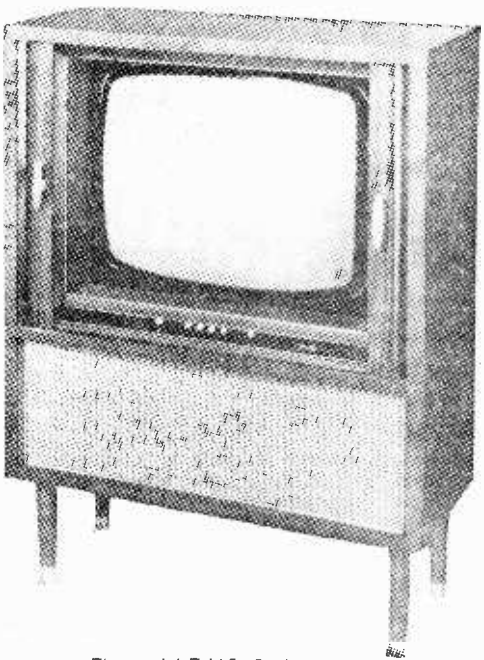
Trade News

New Receiver

THE model T.115c is a new receiver from Bush Radio Ltd. It has a 19in. picture tube with aluminised screen and electrostatic focus. It incorporates a switchable dual standard timebase as well as flywheel synchronisation. It is sufficiently sensitive to operate under fringe conditions and readily convertible by internal plug-in receiver and tuner units for UHF 625-line reception.

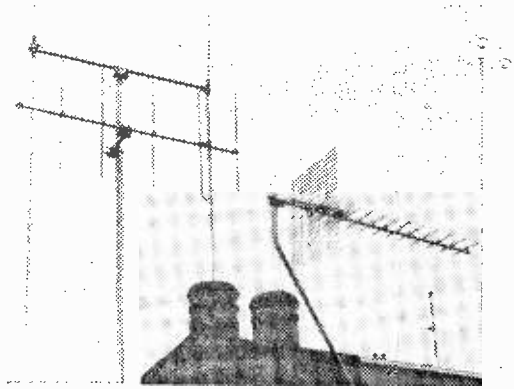
The T.115c is housed in a Walnut veneered cabinet with tambour doors and the price of this receiver is 81 guineas. The manufacturers are *Bush Radio Limited, Power Road, Chiswick, London W.4.*



The model T.115c Bush receiver.

New TV Aerial

A BATCH of aerials, suitable for use at UHF, has been manufactured by Belling and Lee Ltd. for reception of the test transmissions by the BBC from their Crystal Palace station. Although different aerials will be required to receive the London area service transmissions when they commence, these aerials will enable the potentialities of the coming service to be demonstrated. *Belling and Lee Ltd., Great Cambridge Road, Enfield, Middlesex.*

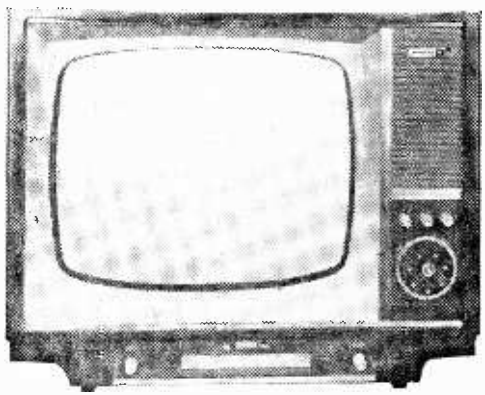


A Belling-Lee Band V aerial mounted beside standard Band I and III arrays.

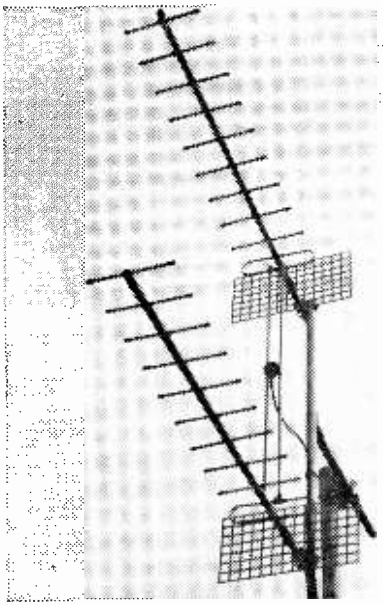
New Range of Receivers

RECENTLY a new range of television receivers has been brought out by Murphy Radio Limited. The range consists of four Astra Mark 2 receivers each capable of conversion to 625-line/UHF standards. The Murphy conversion unit—incorporating a UHF tuner and 625-line I.F. strip—can be added to the bottom of all their sets now in production.

The price of these new receivers ranges from £69 6s. to £88 4s. *Murphy Radio Limited, Welwyn Garden City, Hertfordshire.*



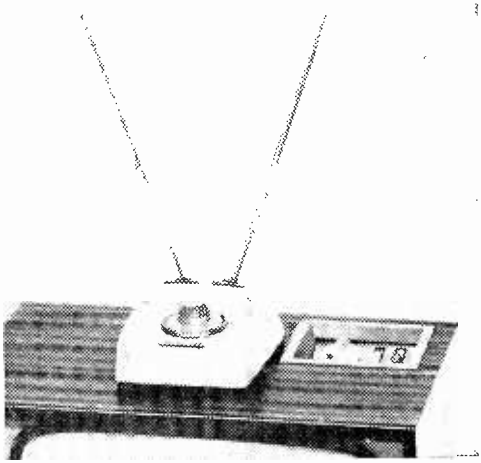
A Murphy receiver fitted with a 405/625 conversion unit at the base of the cabinet.



A new Aerialite aerial for UHF.

UHF Aerial

AMONGST the new range of aerials designed by Aerialite Ltd., for UHF test transmissions, is the model No. 45/D11, which is illustrated on this page. This is a high gain, wide spaced, wide stacked, medium band width type of aerial and is suitable for fringe area reception. It incorporates a broadband mesh reflector and is priced at £11 10s. The makers of this aerial are *Aerialite Ltd., Hargreaves Works, Congleton, Cheshire.*



The new "Veemaster" set-top aerial made by Antiference Ltd.

Set-top Aerial

A NEW aerial for use on Bands I to V has been introduced by Antiference Ltd. The name of this aerial is the "Veemaster" and is made to be mounted on top of a television receiver.

The Veemaster incorporates a variable loading circuit which, in conjunction with the natural harmonic content of the elements, enables the aerial to be tuned to any channel in Bands I to V. Its telescopic elements, which have a wide range of adjustment, are chrome plated and isolated from the receiver.

The price of the Veemaster, complete with the lead and plug, is £3 10s. The manufacturers are *Antiference Ltd., Aylesbury, Buckinghamshire.*

SERVICING TELEVISION RECEIVERS

(Continued from page 63)

event the feed resistor is often burned out and becomes open circuited, thus preventing that particular stage from working (resulting in no picture, no sound or both) or the resistor may drop in value to become a virtual short itself thus overloading the H.T. supply and causing a fuse to blow. In this case visual inspection will often reveal the charred resistor and the associated decoupling capacitor is then immediately suspect.

Picture Shift

A means of centring the picture on the screen is provided. Models T394 and T484 may be fitted with three screws on the focus magnet and the adjustment of these also affects the focus as well as moving the picture. Later models in the T301 series used two concentric knobs or a single shuffle plate lever. These adjustments have a considerable effect upon the setting of the ion trap magnet and the adjustment of one will affect the other. The only correct position for the ion trap magnet is that which gives maximum picture brilliance and the picture is lost completely if the trap magnet is moved more than a slight amount from its required position.

Letters to the Editor

The Editor does not necessarily agree with the opinions expressed by his correspondents

SPECIAL NOTE: Will readers please note that we are unable to supply Service Sheets or Circuits of ex-Government apparatus, or of proprietary makes of commercial receivers. We regret that we are also unable to publish letters from readers seeking a source of supply of such apparatus.

TV SET TO 'SCOPE

SIR,—With reference to the problem of G. J. Powell in the September issue concerning the conversion of a TV receiver to an oscilloscope, I should like to say that a friend and I completed exactly such a task some time ago.

The receiver we used was a 9in. Bush model. We started by stripping the complete chassis with the exception of the EHT unit (line oscillator and line output valve, etc).

We next had to build an oscillator suitable for scanning the oscilloscope. Our lack of knowledge forced us to copy the frame oscillator of a television receiver. The output valve of this system was fed to the line coils. Several transformers were tried and the most suitable selected for matching the output valve anode circuit.

Next we constructed an audio amplifier with gain and feedback controls for stability. This took the form of a single output stage and this was then coupled to the frame coils.

The chassis required no new drilling. The controls were kept as simple as possible. The finished product of this work was a basic 'scope, suitable only for audio frequencies, but which was capable of having further modification.

We have, in fact, replaced the cumbersome EHT unit by a mains EHT transformer, etc.

One point to note is that the line coils, until they are disconnected, act as a load, and a load for the line output transformer may be required if the original EHT unit is to be retained.—G. RAINEY (Cheltenham).

TV SOUND

SIR,—I see on the Data Chart, given away in your October issue, that both the American and European systems for transmitting television employ F.M. sound, while in this country we have to make do with A.M. Although, when one's concentration is mainly centred on the television screen and the audio side of things is taken for granted, how often a good TV show would be made better if the sound were of a higher standard.

Of course, the poor quality of the sound cannot be blamed entirely on the transmitting authorities. The miniature loudspeakers employed in most receivers nowadays must account largely for the poor reproduction of TV sound. I consider this a pitiful economy on the part of the manufacturers and one which could well be dispensed with to the advantage of their sales.

Although I have heard nothing to indicate it, I only hope that the forthcoming changes to our television system will include provision for improvements in the transmission of sound.—D. B. WILLIAMS (Cardiff).

POST-PILKINGTON

SIR,—Now the Press has had a go at the Pilkington report, please let me have my say. As far as I can see the report, as far as colour is concerned, is more or less OK, but the rest of it on extra channels and so forth is so much eyewash. It is too obvious, isn't it? Let's divorce colour entirely from the arguments raging and get on with it, for having colour reception on UHF and 625 lines won't make any moral difference at all. This old diehard story of colour not being cheaply available for the public is not or need not be true; that is if certain electronic industrialists stop pouring out their negative propaganda. I for one am working very seriously on an experimental colour chassis. I will build my own motorised UHF "bow-tie" loft aerial and match it up through a UHF booster via a 300Ω twin low-loss feeder.

A good many suitable components are already available if one only takes a little trouble to look. The tricolour kinescopes will become available and a good ham should be able to produce his set at a fraction of the cost of those new ones which will sell far above the price which they are worth. The 300Ω ribbon antenna lead is available at a very reasonable cost and is quite suitable for experimental work and those people who are near the first UHF transmitter need not worry about booster stages.—K. R. CRASKE (Lincoln).

SOUND-ON-VISION

SIR,—Referring to "Your Problems Solved", July *Practical Television*, and the letter from Mr. K. Taylor on the K.B. QV20, if, after adjusting L36, sound-on-vision is not cured or adjusting L36 has no effect, I would suggest the replacement of C42 and C43, both 120pF 5% capacitors, as in several of these sets and other K.B. models these capacitors develop a leak, causing this effect. These capacitors are in the can containing the sound rejector coil. Also check the continuity of the coil.

In one particular set (a QV40) these capacitors and the coil were OK. Also the alignment of the set was in order. A cure was not effected until the main electrolytic capacitor 100+400μF was replaced.

The 400μF section had reduced in value to 105μF. It is wise to check this component with a parallel capacitor of about 200μF if no fault can be found with the rejector coil circuit.—S. WHITTON (Buckingham).

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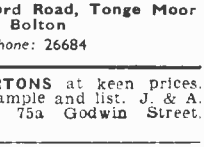

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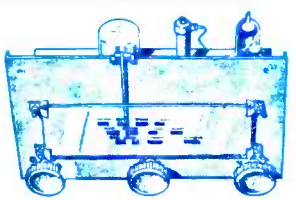

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