• MODERNISING OLD RECEIVERS •

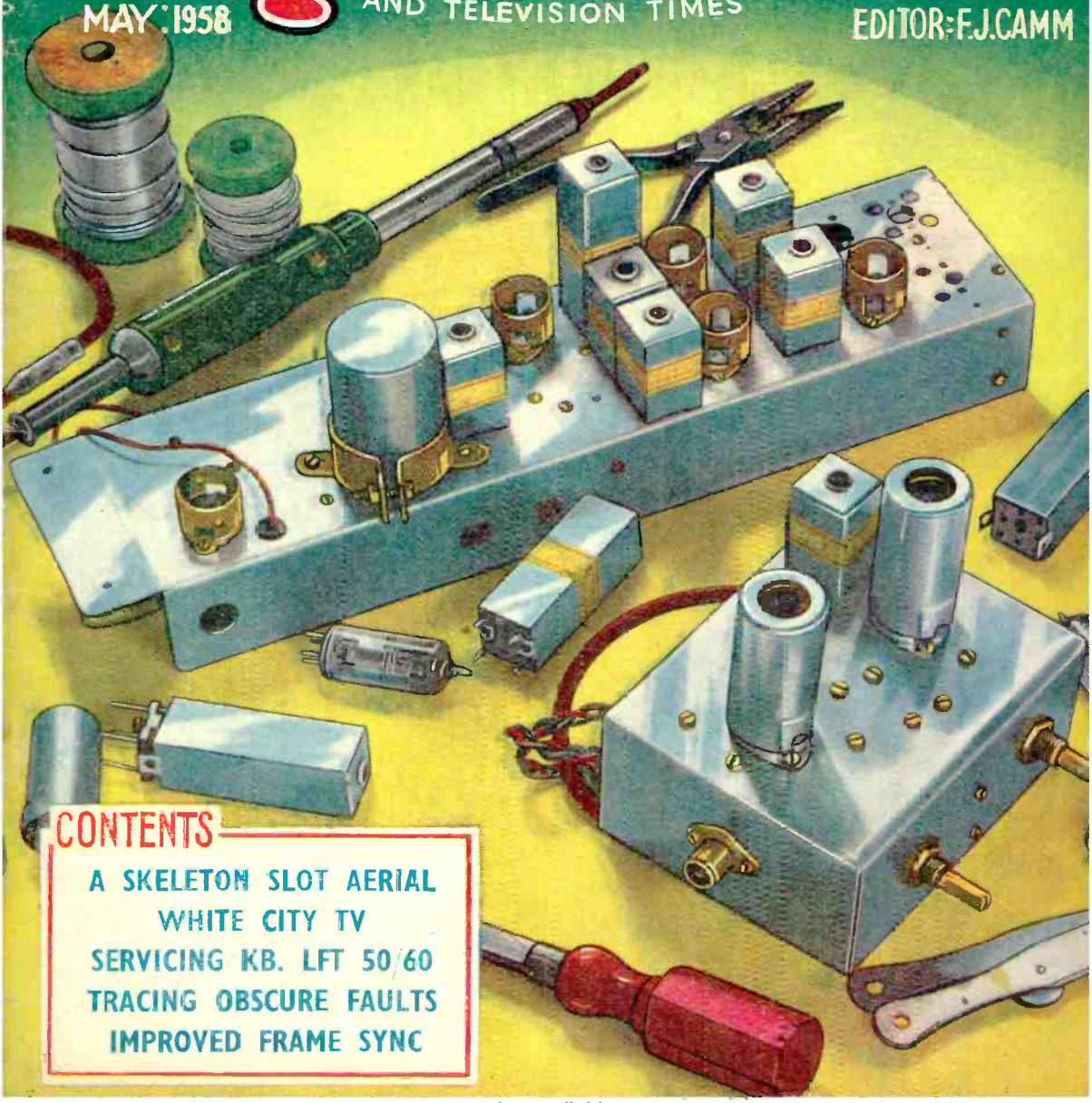
Practical Television

1/3

AND TELEVISION TIMES

MAY: 1958

EDITOR: F.J.CAMM



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Big stocks of all types of components are kept at all depots. Some special component bargains are also listed below.

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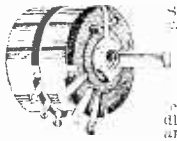

Single and 2 gang types available, standard size with good length spindle, all new and boxed.

Gang type **3/-** each—values available: 5K 5K, 100K–100K, ½ meg, ¼ meg. Single types **1/-** each. Values available: 10K, 25K, 50K, 100K, 250K, 1 meg., 2 meg.

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3-pole, 2-way	1 3
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9-pole, 3-way	2/-
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2-pole, 6-way	2/6
1-pole, 7-way	2/6
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Discount of 10% allowed where a dozen of one type ordered.

Special quotes 144 or over.

50 Assorted Resistors. Well mixed and useful values, ½ and ¼ watts. Price **5/-** per 50.

50 Assorted Resistors. Well mixed and useful values, 1 watt. Price **6/6** per 50.

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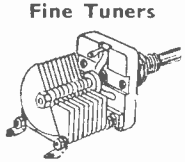


Ceramic trimmers all with ¼in. spindle of fair length. 5, 10, 15, 30 P.F. at **2/3** each or **24/-** per dozen.

Coil Pack for superhet 465 Kc/s I.F. Medium and 2 short waves. **9 6**.

Midget Coils. Ideal for formers in cans, with dust cores. **4 6** per dozen.

T.V. SERVICE SHEETS

100 sheets covering the most popular post-war Televisors by leading makers—Cossor, Ekco, Ferguson, Pye, etc., etc. Give circuit diagram component values, I.F. frequencies, etc., **£1** post free.

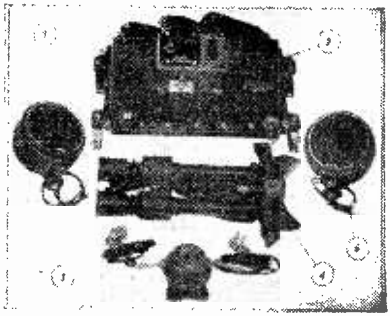
Transistors

A good range of transistor parts, miniature transformers, electrolytics, etc., available at all branches.

Red Spot and audio	...10/-
Blue Spot 1.6 Mc/s	...15/-
White Spot 2.5 Mc/s	...20/-

Valveholders

Amphenol type B7G-B9A and intoctal. Price **5/-** doz.—as you want them. Nylon loaded, **7 6** doz.



TABBY EQUIPMENT COMPLETE

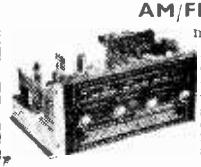
Complete equipment for seeing in the dark, as fitted to Army vehicles for night driving, etc. Complete working equipment comprises: 2 Infra Red Radiators, adjustable binoculars, powerpack for 6 or 12 volts, control units and inter-connection cables. Original cost probably around £100. Unused and in perfect order—**£10**, plus 10/- carriage and insurance. Mains power pack **£4** extra.

19 Range Testmeter

Can be yours for only 10/- deposit and 19 payments of 10/- weekly. Like all AVO meters it is a very fine instrument: it has a sensitivity of 10,000 ohms per volt and 19 most useful ranges as follows—D.C. volts 0-1,000 (seven ranges), A.C. volts 0-1,000 (five ranges), D.C. Current 0-1 amp. (5 ranges), resistance 0-2 megs. (2 ranges). (complete with test leads.) Immediate delivery. **Cash price £9.10.0—non-callers please add 3 6 post & ins.**

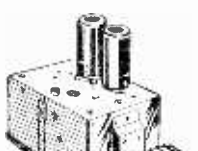
FREE GIFT.—All purchasers of the above item this month will receive the M.M. Range Extender which adds: capacity 0.1 m.f. in two ranges—inductance 0-100 henrys and decible—20 to 36.

AM/FM Chassis



made by the famous McCarthy Radio. This employs a printed circuit in the F.M. Tuner section, it uses 8 valves and has a very attractive three colour dial, size approximately 12 x 5½in., covers four wavebands: 1000-2000 m., 200-550 m., 15-50 m., and 83-100 mc/s. This is a precision made chassis with four controls, tuner, volume, wavechange and tone. Fully guar., Price **£22 10/-**, post and ins. 5/-.

NOW 2 MODELS
Turret Tuner

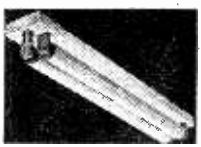


Brand new stock, not surplus, with coils for Band I and III complete with valves. Model 1 I.F. output 33-38 Mc/s. Series heaters. Model 2 I.F. output 16-19 Mc/s. Parallel heaters. With instructions and circuit diagram. **79 6**. With knobs **3/6** extra, post and insurance 2 6.

THIS MONTH'S SNIP

A 10 valve unit complete with valves, unused but a little soiled only **19 6** plus 7/6 carriage and insurance. This unit, the R1155, contains a famous I.F. strip which is usable almost without modification for television. It is in fact an I.F. Amplifier for the R.F. units 24, 25, 26, 27, etc. Data is available showing how to make a television, etc., etc. Contains 10 valves, transformers, coils, pot-meters, etc., etc. Bargain not to be missed.

FLUORESCENT LIGHTS



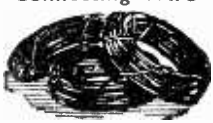
These are complete fluorescent lighting fittings. Built-in ballast and starters—stove enamelled white and ready to work. Ideal for the kitchen, over the work-bench and in similar locations.

Single 40. 4ft. 3in. long, uses a 40-watt tube.

Twin 20. Uses 2 20-watt standard tubes.

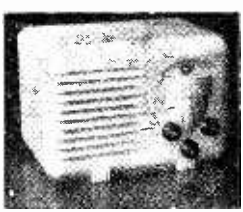
Price for either type **39/6**, with tubes. Carriage and ins. up to 150 miles 5/6, up to 250 miles 7 6.

Connecting Wire



P.V.C. covered in 100 ft. coils—**2 9** a coil or four coils different colours, **10/-** post free.

MAINS-MINI



Uses high-efficiency coils, covers long and medium wave-bands and fits into the neat white or brown bakelite cabinet—limited quantity only. All the parts, including cabinet, valves, in fact, everything, **£4 10 0**, plus 3/6 post. Constructional data, free with the parts, or available separately **1 6**.

GLASS PANELS

Size 10½ x 9½—parcel of five panels. **7 6**, plus 3 6 carriage.

EX-GOVT VALVES

Many types in stock. Here are some of the more popular ones:

1T4	7 6	6L6	9/-	1625	10 6
1LD5	3 6	6N7	7 6	DDT4	8 6
2X2	4/9	6SA7	8/-	DDT13	8 6
3A4	7/-	6Q7	9 6	DH73	9 6
5Z4	8 6	6SJ7	8 6	DL74	9 6
5U4	8/-	6SK7	8/-	EF39	8 6
6AC7	6 6	6SL7	3/-	EL50	10 6
6AL5	6 6	6V6	9 6	H63	6 6
6B8	4/-	7A7	9 6	HL4G	6 6
6C4	6 6	7V7	9 6	HL13	9 6
6C6	6 6	7Y4	8 6	HL1320	9 6
6D6	6 6	25Z4	9 6	KT61	9 6
6F6	7 6	25Z6	10 6	KT72	9 6
6F8	9 6	25Y5	10/-	KTW61	4 6
6H6	2 6	43	10/-	KTW73	9 6
6J5	5/-	75	12 6	KTZ41	9 6
6J7	6/-	77	8 6	U12	8 6
6K6	7/-	78	8 6	U74	9 6
6K7	7 6	84	8 6	U71	9 6
6KS	9 6	954	3 6		

Practical Television

& TELEVISION TIMES

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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 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, Strand, W.C.2.

Owing to the rapid progress in the design of radio 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.

TELEVIEWS

INTERESTING STATISTICS

THE adult population of this country totals 22½ million and it is computed that six out of ten people aged 16 and over can now see television in their own homes, whereas six years ago the figure was 10 per cent. Ten years ago it was 0.2 per cent.

It is a reasonably accurate computation to say that there are probably over 8½ million TV sets in use, more in fact than in any other country except the United States.

Ninety-eight per cent. of the population is covered by BBC transmissions, while ITA covers 75 per cent. Over a third of all adults are able to view ITV programmes in their own homes, and this is likely to increase very considerably in the near future. The average evening viewing time is between 6 o'clock and 11 o'clock and most people look in for about 11½ hours a week or about a third of the programme time available to them.

In February, 1958, those with a choice of programmes divided their evening viewing time in the proportions, BBC 37, ITV 63, compared with BBC 34, ITV 66 in the same period last year, and BBC 41, ITV 59 in February, 1956. The average TV audience is now more than twice as great as the average radio audience. The most popular BBC TV programmes reach a total of about 11 million adults and ITV from 7½ million to 8 million. These statistics have been compiled by Political and Economic Planning, who have just published an interesting booklet on television in Great Britain.

BBC TELEVISION CENTRE

THE main block of the BBC Television Centre is taking shape and its main framing is complete. It is, of course, located at Shepherd's Bush on the White City site. It will be the largest television headquarters in Europe and will occupy 13 acres. The main block is to be a circular building of 3½ acres, which is nearly twice the area covered by St. Paul's Cathedral. There is an inner ring going up to the seventh floor and outside this ring are the studios which are, so to speak, radiating from it. The ring encloses a circular garden, in the centre of which will be a fountain and sculpture. More details will be found on page 465.

TV LINK WITH NEWFOUNDLAND

THE Postmaster-General recently referred to the £9 million telephone cable to be laid between Scotland and Newfoundland, stating that it held remarkable possibilities for direct TV to and from America. No information was given when this link was to be finally forged.—F. J. C.

Our next issue, dated June, will be published on May 22nd.

Scanning & Synchronisation

9.—FLYWHEEL SYNCHRONIS ATION

By G. K. Fairfield

IT was shown in the last article how the synchronising pulses are separated from the combined video and sync signal. Unfortunately a third unwanted component is often present, superimposed on the signal, and consists of pulses of man-made interference radiating from car ignition systems, electric motors, etc., and in the case of very weak signals even the amplified noise generated within the receiver itself. Due to its pulsating nature the receiver timebases are often triggered by this noise and this is particularly the case with the line circuit, due to its high repetition rate, resulting in an unpleasant ragged edge to the vertical elements of the picture. A study of noise pulses themselves shows that they are usually of a fairly short duration, although of large amplitude, and attention is directed towards synchronising circuits which average out the incoming sync pulses over periods of time longer than that of the interfering pulse train. Thus the average effect of the interference is made very much smaller. This is helped by using very stable line oscillator circuits which remain at a constant frequency even in the momentary absence of a sync pulse.

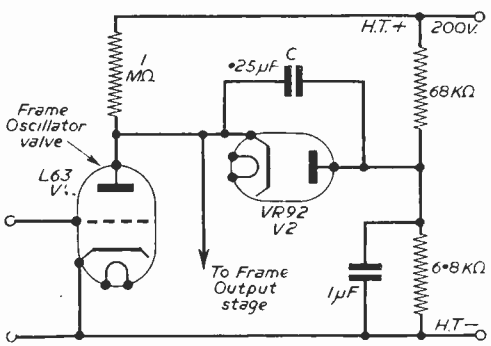


Fig. 66.—Method of ensuring that C is completely discharged during each frame period.

Phase Sensitive Detector

Generally the pulses supplied by the sync pulse separator are applied to a phase detector instead of direct to the line oscillator. The detector compares the relative phase between the incoming pulses and the sawtooth voltage. If the sawtooth voltage is not in phase with that of the pulses the detector supplies a direct voltage which can be used for correcting the oscillator frequency. A commonly-used phase detector is shown in Fig. 67, and consists of two diodes D1 and D2. The sync pulses are applied to the transformer T and appear in push-pull at the secondary winding. The anode of D1 receives a positive pulse, whilst the cathode of D2 receives a negative-going pulse. At the same time a sawtooth voltage produced by the timebase generator is applied via the transformer centre-tap to appear at the anode of D1 and cathode of D2 in the same polarity (see Fig. 68). In Fig. 68 the sync pulse occurs correctly in the centre of the sawtooth flyback, both diodes conducting equally and point X remains at earth potential. Where the relative phase between sync pulse and sawtooth is other than this, then during the pulse duration the anode D1 and cathode D2 will become more positive than

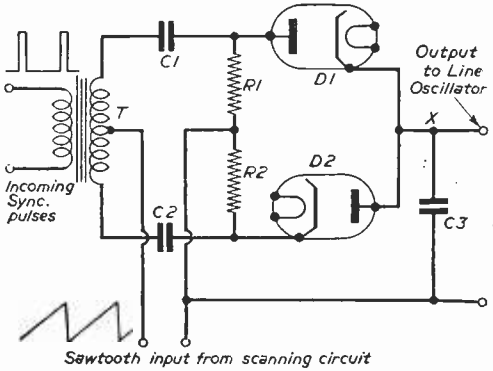


Fig. 67.—A phase-sensitive detector for flywheel sync circuits

before and only D1 will conduct. This diode will charge C3 to a positive potential of an amplitude proportional to the amount of phase difference present. Similarly if an opposite phase-shift takes place then only D2 will conduct and a negative potential is produced across C3. This direct potential is used to control the frequency of an oscillator, very often a multivibrator, as shown in Fig. 69. The frequency stability of the oscillator circuit is considerably improved by including a tuned circuit, resonant at line frequency, in one anode of the multivibrator. This will then give a "flywheel" action to the circuit. The pulse voltage existing across the deflection coils is integrated by network C5R3 to produce a sawtooth waveform to feed into the transformer centre-tap. Since overall feedback takes place via C5R3 then instability or "hunting" of the timebase is possible and to avoid this R4C4 has been added. These tend to smooth out rapid variations of voltage across C3 and allow control of V1 to take place only relatively slowly.

Reactance Valve Circuit

Another type of flywheel circuit is shown in Fig. 70. This is similar to the automatic frequency control (A.F.C.) found in some early radio

receivers. A sine-wave oscillator V1 supplies a push-pull signal to the cathodes of the phase detector V2 and V3. The sync pulses are applied in phase to both cathodes via the tranformer T centre-tap as shown. Operation of the detector is similar to that previously described and a D.C. controlling potential is available

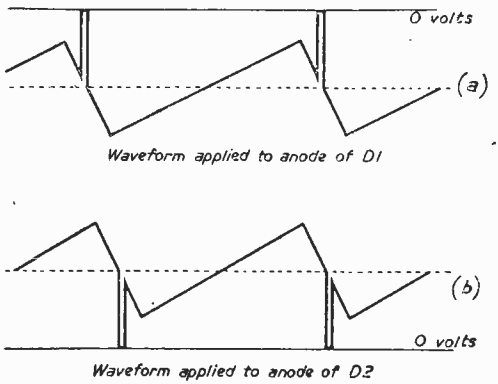


Fig. 68.—Waveforms in phase-sensitive detector circuit.

across diode loads R1R2. Valve V4 forms part of a reactance valve circuit, where the output impedance asumes a capacitive reactive form, the value of which is dependent on the controlling grid voltage. A simplified version is shown in Fig. 71, Z1 and Z2 act as a potentiometer which steps down and phase-shifts by 90 deg. the voltage appearing at the anode and applies this to the grid. Z1 and Z2 can be combinations of RC or LC. but we will consider the case where Z1 = C and Z2 = R. The value of R is made much smaller than the reactance of C, so that the current I leads by 90 deg. on the anode voltage and therefore the voltage across the tuned circuit LC. This leading voltage is

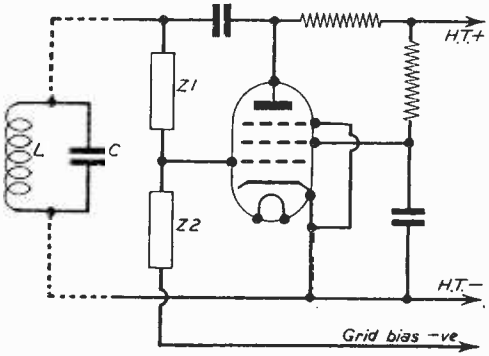


Fig. 71.—Effect of reactance valve circuit on tuning of circuit LC.

applied to the grid and as the current through the valve (ia) is in phase with the grid volts. this too leads by 90 deg. on Va, and consequently the valve behaves as a capacitance shunted across the tuned circuit LC. The value of this "capacitance" C1. can be varied by altering the value of ia by the controlling grid bias and the

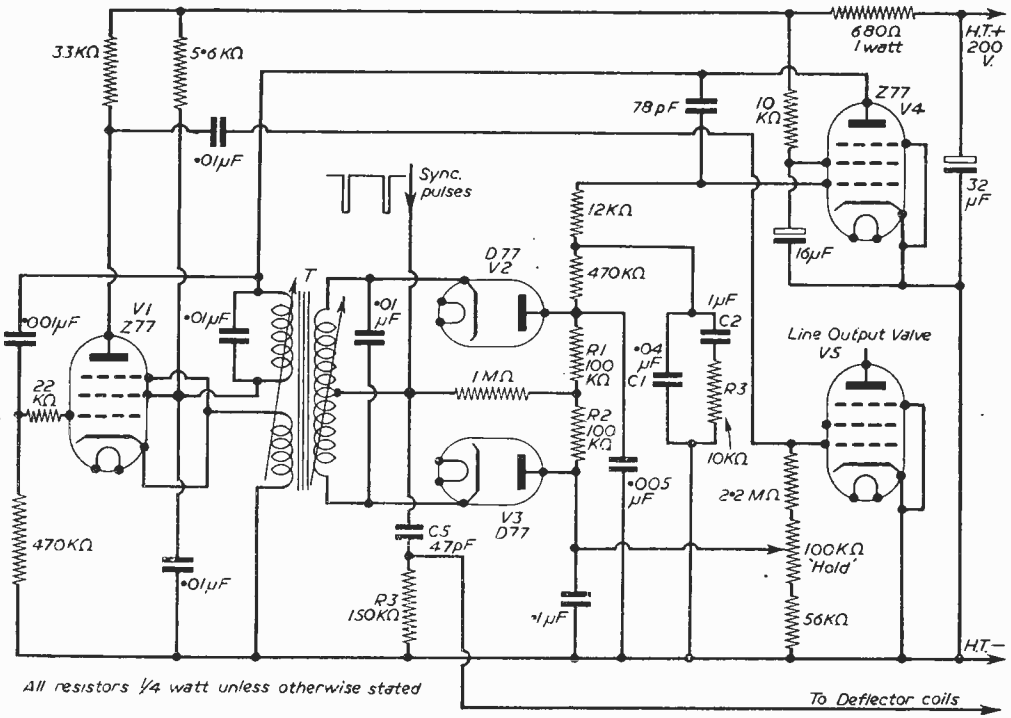


Fig. 70.—Reactance-valve flywheel sync circuit.

resonant frequency of the combination LCC1. The tuned circuit in our sync circuit forms the anode winding of the oscillator valve V1 and the phase-controlled anode waveform is used as the drive to the line output valve V5. It was mentioned in an earlier article that a saw-tooth waveform is not essential to control the operation of the efficiency-diode scanning circuit, the only requirement being a rapid negative change of potential once per cycle. This is achieved in this circuit by suitable distortion of the oscillations derived from V1 circuit. The remainder of the output circuit it identical to that of Fig. 42 in No. 6 of this series, although of course it may be incorporated in other efficiency-diode circuits.

As in the previous flywheel circuit a long time-constant is included in the controlling circuit to V2 in order to prevent instability and is formed by C1C2 and R3. Some adjustment to the value of C2 may be necessary in order to obtain a satisfactory compromise between good flywheel action and absence of instability, which will often show itself as a stationary sinusoidally varying edge to the picture. Manual control of line frequency can also be obtained in the circuit by variation of V2 grid bias and is obtained here by returning the diode load R2, not to earth, but to a potentiometer included in the grid circuit of V4, where a negative bias is set up by grid current during the normal action of this circuit.

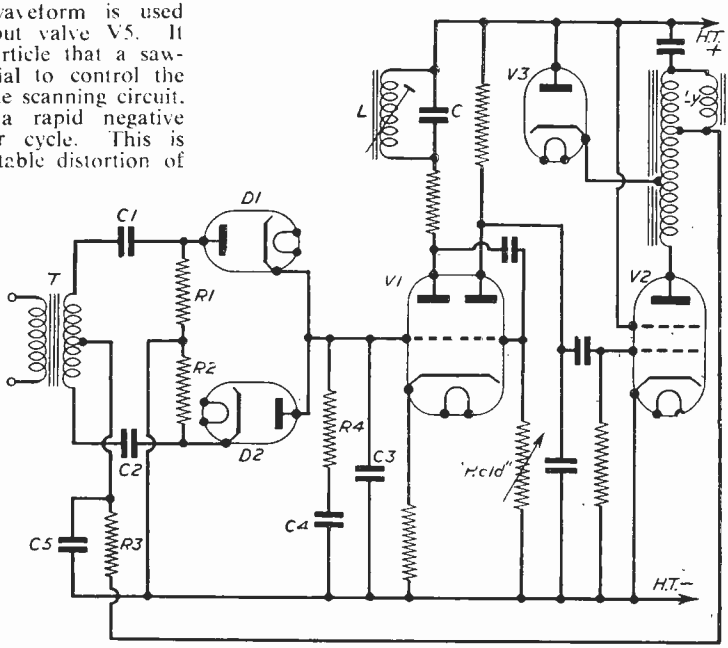


Fig. 69.—A complete flywheel sync circuit.

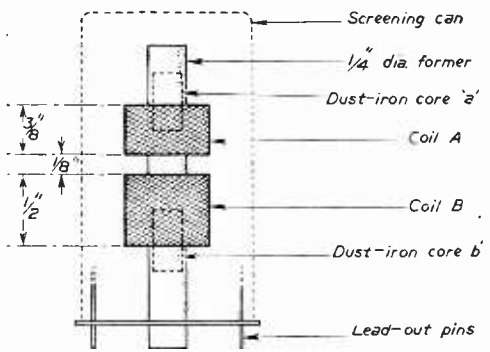


Fig. 72.—Details of flywheel sync oscillator and discriminator transformer.

WINDING DETAILS

Coil A	Bifilar wound, 970 turns each, 42 s.w.g. Lewmex enamelled wire. Inductance of each coil, 5.6 mH.
Coil B	Inner winding (cathode winding) 430 turns 42 s.w.g. enamelled wire. Inductance of each coil, 1.64 mH.
	Outer winding (screen-grid winding) 1,800 turns 42 s.w.g. enamelled wire. Inductance 20 mH.
	Pile-winding between cheeks cemented on to former.

Transformer Details

A diagram of the sync and oscillator transformer is shown in Fig. 72. A small I.F. transformer former and can (Aladdin type) is used with iron-dust cores threaded from either end of the former. Two sets of windings are employed (a) which consists of a bifilar-wound coil, i.e., a single winding operation only with two wires instead of one, to form the detector coils L3 and L4, and (b), which consists of two windings, first L2 and then over this winding, L1, both of which form the oscillator transformer for V1.

Inductance figures have been quoted for these coils and to allow for differences in former size, method of winding, and permeability of dust cores, it is advisable to adjust the winding until these figures are obtained, with the dust-cores half inserted, rather than rely entirely on the winding figures given for the writer's transformer.

The coils are adjusted by the dust-cores and it will be found that core B affects the oscillatory frequency and is set to give correct line frequency, with the hold control at its mid-setting. Core A is then set to give good "lock" by adjustment to the amplitude of controlling waveform applied to V2 and V3.

A Skeleton Slot Aerial

A READER'S SUGGESTION FOR MAKING AN UNUSUAL BAND III AERIAL

By M. G. Person

HAVING little success in receiving I.T.A. using a commercial four element. folded dipole aerial. I decided to experiment with a skeleton slot aerial. following hints in previous issues of PRACTICAL TELEVISION.

Here are details of a skeleton slot aerial which gives a good picture both indoors and out.

All tubing used is ½in. diameter aluminium. except the mast. which is 1¼in. diameter.

Fig. 1 gives a general view of the aerial assembly.

Fig. 2 gives dimensions of the slot.

Fig. 3 gives dimensions of matching stub and centre-pieces which are bent as shown.

Fig. 4 shows brackets securing centrepieces to mast.

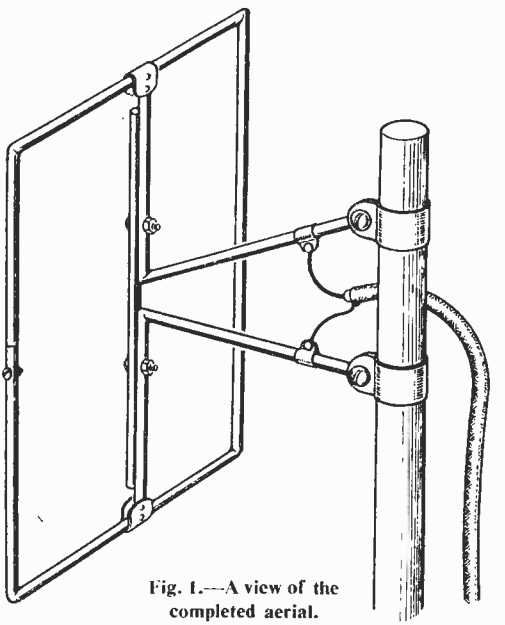


Fig. 1.—A view of the completed aerial.

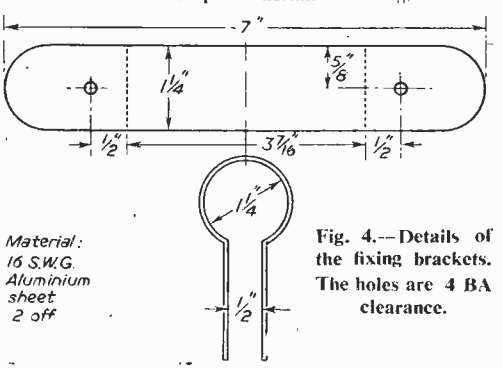


Fig. 4.—Details of the fixing brackets. The holes are 4 BA clearance.

Fig. 5 shows top and bottom brackets securing centrepieces to slot. They should be bent as shown.

Fig. 7 shows cut-away view of part of matching stub and centrepieces.

It will be seen that the rubber grommets in the centrepieces insulate them from the matching stub. and the 4 BA bolts. which screw into the stub. give adjustment of matching which is effected by varying the distance between centrepieces and stub. The distance in the prototype is approximately 3/16in.

The coax cable should be cut as shown in Fig. 6. and the inner conductor secured to the upper centrepiece approximately 7in. from the mast.

The outer is connected to the bottom centrepiece approximately 3½in. from the mast. both secured with clips made from aluminium strip and secured with 6 BA nuts and bolts.

Final adjustments were made in the same room as the TV set using the I.T.A. picture.

The aerial was connected to the set with coax

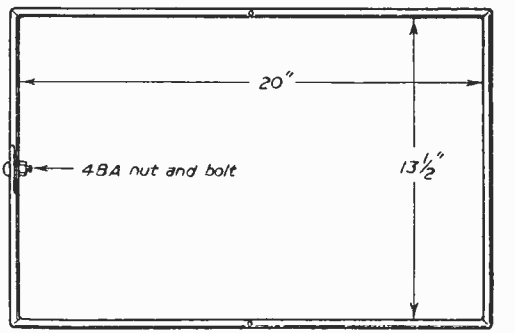


Fig. 2.—Dimensions of the actual slot.

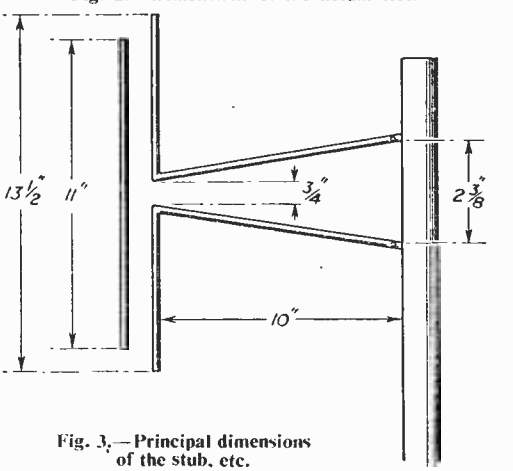


Fig. 3.—Principal dimensions of the stub, etc.

cable long enough to reach the point where the aerial was finally erected.

There were three or four positions in the room where a picture could be received, and in the best position the matching stub was adjusted to give the best picture. The clips at the end of the coax cable may also be moved along the centrepieces to get the best results.

Incidentally, I am situated about 15 miles from the St. Hilary transmitter, at sea level, and with hills over half way round. There are a number of eight element aerials in this district, which seems to imply that this is not a particularly good reception area.

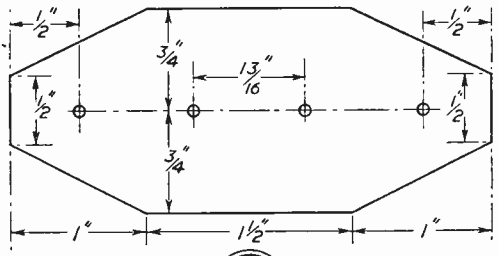


Fig. 5. — Details of top and bottom brackets. The holes are 4 BA clearance.

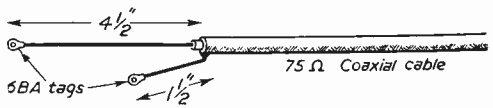


Fig. 6.—How the coaxial cable is treated.

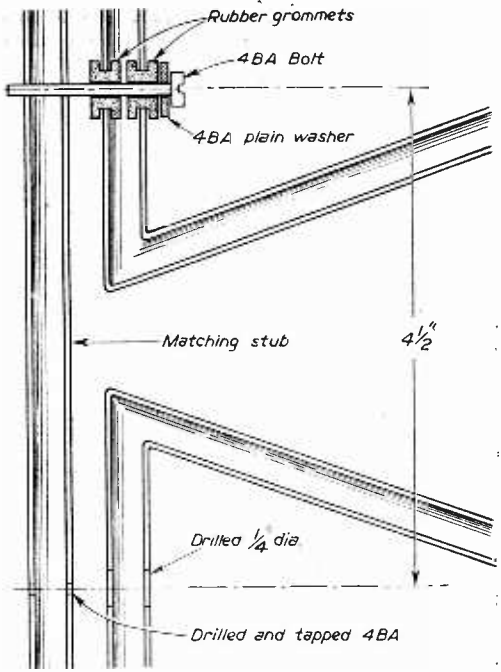


Fig. 7.—Cut-away view of part of matching stub and centrepieces.

BBC TV for Dover and Folkestone

THE BBC announces that, with the approval of the Postmaster-General, low-power television stations are to be installed at Swingate, near Dover, and in Folkestone. The difficulties that had arisen in finding wavelength channels on which these stations can operate without causing interference elsewhere have now been overcome, and both stations will be put into service as quickly as possible.

In order to provide a service in the Dover area without delay, a temporary station is being installed at the Swingate site. This will come into service towards the end of April and will remain in service until it can be replaced by a permanent station. The station will be on Channel 2 (vision 51.75 Mc/s, sound 48.25 Mc/s) and will use vertical polarisation; receivers must therefore be tuned to Channel 2 and receiving aerials should be mounted vertically. In some cases it may be found possible to use existing aerials designed for receiving the signals from the Crystal Palace station in Channel 1, but it is better to use aerials specially designed for Channel 2 and directed towards Swingate.

The coverage of the Dover station when in its permanent form is expected to include Deal and Ramsgate. The effective radiated power will vary between 0.25 kW and 1 kW, with a maximum towards those towns. In its temporary form a simpler aerial will be used, so that the signal strength towards Deal and Ramsgate will be less, but in other directions will be roughly the same as for the permanent station.

The station in Folkestone will use a satellite transmitter of a new type developed by the BBC. The equipment is designed to be mounted out of doors. It incorporates a receiver to pick up the signals from another station and rebroadcasts them on a different channel in Band I. In this case the station will work in Channel 4 (vision 61.75 Mc/s, sound 58.25 Mc/s) with horizontal polarisation. The effective radiated power will be 10 watts in the direction of the town of Folkestone and should give satisfactory reception throughout the borough except possibly at a few points heavily screened by the cliffs. The station is expected to be ready for service within a few months. As the transmissions from the Crystal Palace station will continue as at present, viewers in Folkestone who obtain satisfactory reception from that station need make no change in their aerials or receivers. Most viewers in Folkestone will, however, find it worth while to use receivers tuned to Channel 4 and to change their existing aerials for others designed to receive Channel 4 and mounted horizontally.

A Mismatch Distributor

A DISTRIBUTION SYSTEM WHICH HAS A PERMANENT MISMATCH

By H. Peters

THE system about to be described was evolved to meet a special need. As it involved a large amount of trial and error and the resultant network defies most of the laws of matching it is not surprising to find that it works very well and has been in continual daily use for over two years.

It was required to feed a soak bench and two work benches each with three points—a total of nine points in all, from a three-rod aerial in a fringe area without introducing any noticeable grain.

Before going into the chosen system in detail the two types which were tried and rejected are analysed, as the reasons for their rejection point the way to the ultimate design.

The first system tried used a two valve amplifier and a long single coaxial outlet which terminated in a 120 ohm resistor. Junction boxes were connected in parallel along the lead, each with a 1,000 ohm series resistor and an 80 ohm resistor between inner and outer. This system was extremely grainy with both valves used, but with one of them by-passed overall gain was considerably less than 1 and few sets would hold a picture locked.

The second system used employed one amplifying valve and a double triode which was used as a cathode follower, splitting the output two ways. Each of these two outputs was divided to four outputs in a junction box containing five 50 ohm resistors connected in star. This system involved the fitting of 80 ohm stubs to points that were not in use and this was cumbersome in practice. If a long coaxial lead was left in one of them it upset the whole system, including strangely enough the four points fed by the other half of the double triode cathode follower.

The double triode was by-passed and its two inputs were paralleled up and connected to a two turn secondary winding on the anode coil of the amplifier, and although this arrangement gave an overall gain of .8 it showed promise and was developed into the unit in use to-day.

The Circuit

The circuit of the unit is shown in Fig. 1. It is quite conventional and was adapted from the original two valve proprietary amplifier, using the power unit as it was and building up the amplifier on the old chassis. The gain of the amplifier to one point is about 13 db, and when split in the manner suggested gives a gain of about 1.5 to each point. This variation depends on the number of points in use and does not appear to exceed 1.7 or drop below 1.2. Signal-to-noise ratio is good and the system introduces no noticeable "snow." In the one in use the valve is an EF91, not because it is the most sensitive, but simply that we have a supply of them in an old television set which is beyond repair. Because it is in continual use its pins are cleaned every six months and a new valve is fitted every year. To make the unit a more versatile proposition for readers various popular valves were also tried in it and their relative gains are tabulated in Table 1. It will be seen that the EF80 is superior to the EF91, but that the EF85 and 30F5 gave disappointing results. This was mainly due, in the case of the EF85, to our reluctance to change the circuit values apart from varying the bias. The 30F5 was plugged into the holder previously occupied by the EF80 and the difference in gain is almost certainly due to the under-running of the 30F5's heater which should of course be 7.3 volts, and not 6.3 volts.

The coils are wound on standard ¼in. formers with 36 s.w.g. double cotton covered wire close wound on the bottom of the core. L1 is 9 turns tapped 2 turns up from the bottom and L2 is 10 turns tapped 2½ turns up from the bottom. With these turns the coils tune from Channel 1 to Channel 3 by using iron dust or brass

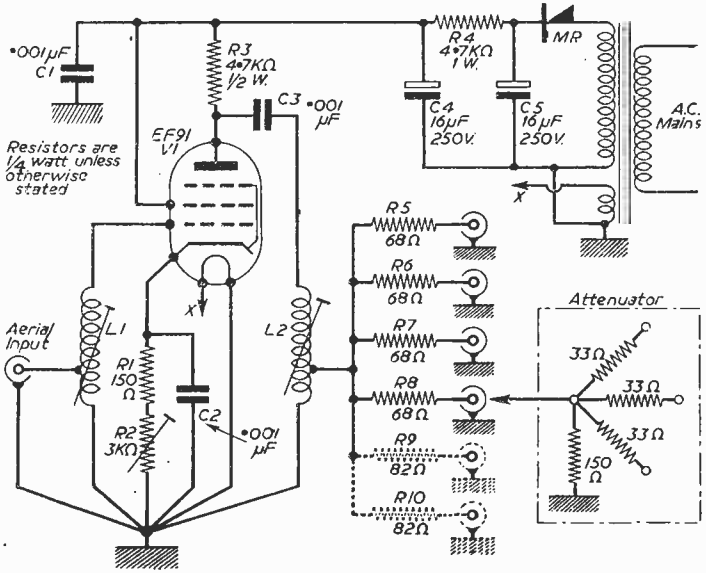


Fig. 1.—Circuit employed in the unit described in this article.

coils. For Channels 4 and 5 reduce the total turns by one or two respectively, and for Channel 5 L2 tapping should be 2 turns up.

Layout

Fig. 2 shows a suggested layout for the amplifier. Only one chassis point is used and the metal plate which forms the chassis is fitted sideways into the finished box to screen the input from the output sockets. Apart from observing that the anode and grid wiring never crosses, no special precautions need be taken in wiring.

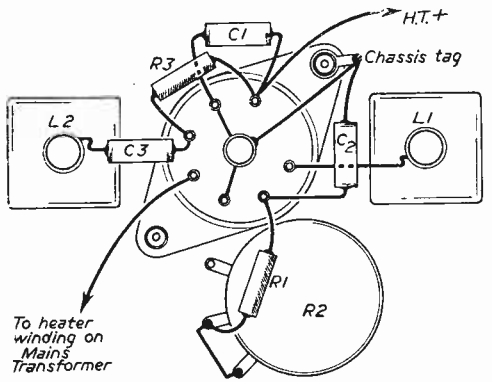


Fig. 2.—Suggested layout for the unit.

The output side—where the "permanent mismatch" occurs—comprises four standard coaxial outlet sockets mounted in a group on the valve side of the chassis. In our case two extra ones, shown in ghost form on the circuit, were fitted just in case they were needed (which they were). They are arranged in two rows of three, but can if desired be grouped in a star around a common earth point to save drilling. If this is done the centre fixing bolt must be securely locknutted as some funny effects occur if it works loose. The four working sockets are connected to the output of coil L2 by a 68 ohm ¼ watt resistor each, whilst the two spares are fitted with 82 ohms.

The wattage of these resistors was kept low as it was visualised that at some time in the future a set may come into the workshops with a live aerial socket, in which case the resistor would immediately burn out giving a clear indication of a fault somewhere. We did not, however, expect that the first set to use the system would have such a fault, but it did and effectively tested the "protection device."

Table 2.—Voltage Readings EF91.

Electrode	Voltage
Anode	115
Screen	120
Grid	0
Cathode	2–5*

* Varied by control.

From the four main outlets leads are taken to a central point on each bench where the output is split three ways via three 33 ohm resistors and a 150 ohm loading resistor (see Fig. 1). The leads from this junction box (which is an ordinary bakelite electrical one) are all substantially the same length and over 6ft. They are terminated in standard coaxial outlet boxes around the bench edges, and the sets are connected by odd lengths of coax with standard plugs on one end and various types of termination at the other. As can be seen the system in theory is a hopeless mismatch when unloaded, but the matching improves the more that it is loaded up with sets.

Opposed to this the micro-voltage at each of the outlet sockets on the amplifier is highest when there is only one set on that particular outlet. It it probably for this reason that the system is fairly self compensating.

In the district in which the amplifier is used the London Channel 1 signal is received as well as the normal Channel 3 (Norwich). The workshop has to work on either channel, and this explains the two spare outlets. Into one is fed the Channel 1 signal, suitably amplified, and into the other the pattern generator (usually on Channel 2 unless the transmitters are off the air).

These signals find their way around the system in the same way as the main Channel 3 picture and in addition a usable V.H.F. signal is available at each point, due to stray coupling. The fact that any set can therefore be working on any of four channels makes the possibility of mismatch even more likely, but the system doesn't seem to mind. An I.T.A. signal has been introduced through one of the spare outlets but this is a definite failure.

VALVE DATA

Table 1.—Relative gains of preamp alone with various valves.

Valve	db gain	1	2	3	4	5	6	7	8	9
EF91	13 db	g1	K	H	H	A	g3s	g2	—	—
EF80	15 db	K	g1	K	H	H	S	A	g2	g3
EF85	8 db	K	g1	K	H	H	S	A	g2	g3
30F5 (on 6.3v.)	12 db	K	g1	K	H	H	S	A	g2	g3

a = Anode. K = Cathode.
g1 = Control grid. S = Shield.
g2 = Screen grid. H = Heater.
g3 = Suppressor Grid.

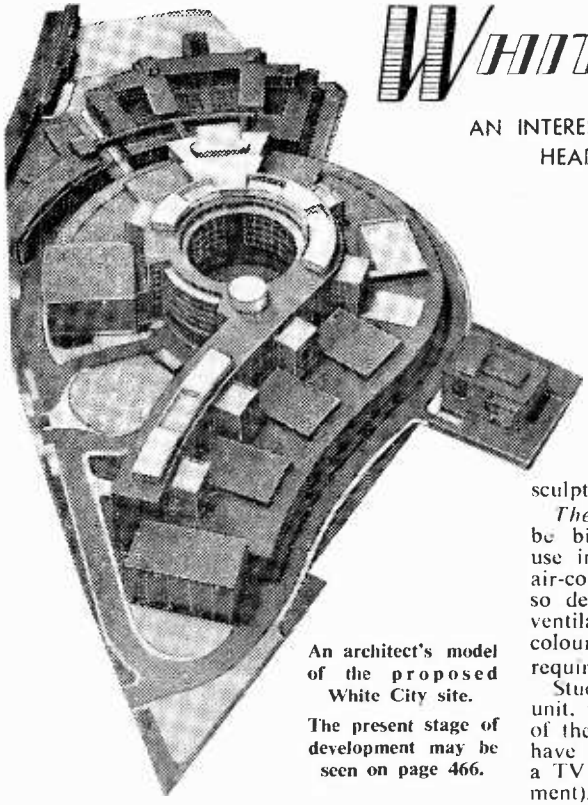
Ringing

The switching of any one set to Channel 9 has a drastic effect on all the others in the group, and so separate I.T.A. points are being provided on a similar basis.

Apart from this only one peculiar effect has been noticed, when a number of sets showed bad "ringing." It was discovered that a long coaxial lead had been run from the showroom aerial into the workshop, and some tidy minded engineer had plugged its free end into a vacant socket causing re-radiation of the amplified signal.

WHITE CITY TV

AN INTERESTING ACCOUNT OF THE NEW BBC TV HEADQUARTERS AT SHEPHERD'S BUSH



An architect's model of the proposed White City site.

The present stage of development may be seen on page 466.

THE BBC Television Centre is the first of its kind in the United Kingdom to be planned and built for the express purpose of producing television programmes, and the combination of the new studios with the scenery production unit and scenery storage facilities all on the same site will be of great benefit. It occupies a site covering 13 acres.

The design and planning of the Centre makes use of all the technical experience gained by the BBC in television broadcasting during the past 21 years and has been very much influenced by the recent experience gained from experimental equipment and techniques, particularly at the Riverside Studios.

The Timetable

The scenery block is in service; the restaurant block is in temporary use for rehearsals and for offices; the main block is now in course of construction and will be brought into use in stages starting early in 1960; the works block will not be built until restrictions on capital investment are eased; no detailed planning of the "spur" has yet been done.

The cost of building the main block and works block and completing the restaurant block will be of the order of £6 million, excluding technical plant and wiring. Of this sum, £1½ million has been spent, leaving £4½ million to be spread over the next four years.

The Main Block

General: This block is now framed to roof level. It is a circular building covering 3½ acres, nearly twice the area covered by St. Paul's Cathedral. It has an inner ring going up to the seventh floor, and outside this ring and radiating from it are the studios and the "central wedge." The ring encloses a circular garden 150ft. in diameter (about the size of Piccadilly Circus), in the centre of which will be a fountain and sculpture. Scale models, submitted by various sculptors, are now being judged.

The Studios: Four of the seven studios will be bigger than any television studio now in use in Britain. Each studio will have its own air-conditioning plant. The lay-out has been so designed that the additional requirements in ventilation, lighting, power supply, etc., for colour television can be accommodated when required.

Studios 2, 3, 4 and 5 form the first operational unit, which will be in service in 1961. Thirty of the most advanced television camera channels have already been ordered (a camera channel is a TV camera plus its associated electronic equipment). In each of the two larger studios (8,000 square ft. each, compared with 6,000 square ft. in the larger studio at Riverside, Hammersmith) there will be four working channels and one spare.

Studio 1. This is the largest and is 108ft. × 100ft. × 54ft. high. It will have a pit 7ft. 6in. deep into which part of the floor (50ft. × 30ft.) can be lowered. The pit will be capable of being filled with water for possible use in programmes of an aquatic nature. The floor is designed to carry, for instance, the loads of double-decker buses and "a line of elephants each with its forelegs resting on the hindquarters of the one in front." The studio will be used for light entertainment and musical programmes, and it will be possible to accommodate an audience of 600.

Studio 2.	70ft. × 50ft. × 33ft. high. for general purposes.	First operational unit. In service 1961.
Studio 3.	100ft. × 80ft. × 44ft. high. for dramatic productions.	
Studio 4.	100ft. × 80ft. × 44ft. high. for light entertainment, music and children's programmes.	
Studio 5.	70ft. × 50ft. × 33ft. high. for schools broadcasts and training.	

Studio 6. 100ft. × 80ft. × 44ft. high. This will be used for general purposes. It will be so constructed that if experience shows that two small studios will be more useful, it can be divided.

Studio 7. 70ft. × 50ft. × 33ft. high. for talks.

The Performers

On the ground floor and the basement there will be about 120 dressing-rooms, with accommodation for about 550 people. These rooms are all arranged around or under the central ring, and entry to the studios is therefore through doors at their inner end. There are three assembly areas, serving different groups of studios, each with its own Green Room, tea bar and other services.

Scenery

At their outer end, the studios are linked by an internal runway, 20ft. wide. Along this, properties and scenery will be conveyed to the studios. These will come direct from the scenery block, which adjoins the main block.

Engineering

The first and second floors of the building accommodate the technical areas. The studio control rooms, at first floor level in the ring, look down into each of the seven studios radiating from it. The "central wedge," between Studios 3 and 4, houses technical areas at all levels, including telecine, presentation suites, and central apparatus room.

The fourth floor of the "central wedge" will contain two identical presentation suites. One will be equipped for use with the existing television programme; the other will remain unequipped initially, but will be available for use later if required for a second programme, or as a reserve for this vital link in the television transmission chain. The basic elements and functions of a presentation suite are :

(a) A presentation studio, with its associated technical control area, from which announcements and other small items may be originated as required.

(b) A central control room which serves as the focal point to which all programme items from studios within the building, and those received from other London studios, outside broadcast points, regional studios, and incoming or outgoing Eurovision programmes, are fed. At this point the necessary switching and mixing facilities are provided to enable the complete television programme to be built up for distribution over the national network.

On the third floor of the "central wedge" there will be a central apparatus room which will contain a large amount of technical equipment which it is convenient to locate in one central area.

The continental control point, which is the main control centre for Eurovision programmes in the United Kingdom, and which is at present situated in Broadcasting House, will be transferred to the Television Centre.

Transmission of Film

Sufficient telecine equipment for the transmission of films will be installed in the telecine areas.

Recording of Television Programmes

Areas are allocated in the basement for equipment to enable television programmes to be recorded as required for subsequent transmission and other purposes.

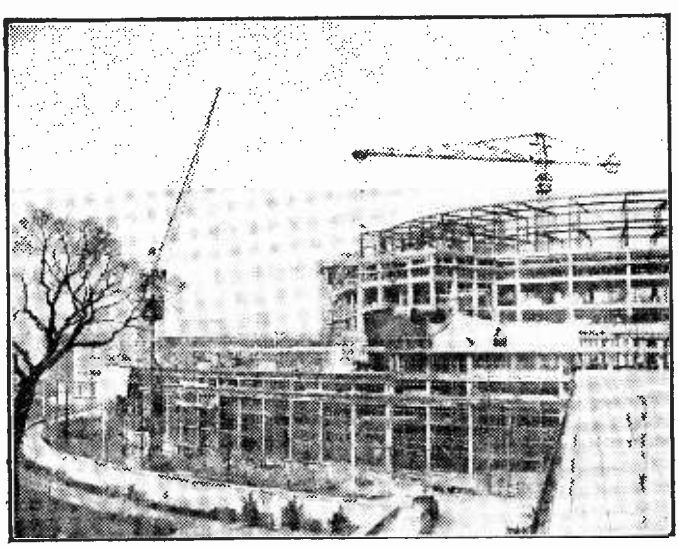
Possible Future Introduction of Colour Television

In planning studios the possibility that colour transmissions may one day be required has been borne in mind. The lay-out of the various areas and the provisions for ventilation, lighting, power supply and so on have all been designed so that the additional requirements which colour television may impose could be conveniently accommodated.

Fire Precautions

From the initial inception of the scheme very close collaboration has been maintained with the L.C.C. in relation to means of escape, protection of the fabric and structure, forming of fire barriers, and the provision of sprinklers, hydrants, etc.

The whole building is covered by a general alarm signal system, and emergency lighting is provided on all escape staircases and routes. These items have been devised and planned by the BBC's Engineering Division.



A general view of the main block in course of construction at the White City.

THE BOOSTER DIODE

WHY THIS VALVE IS USED, AND HOW TO OVERCOME THE DISTORTION IT INTRODUCES

PRACTICALLY all television sets are nowadays A.C./D.C. where, owing to the mains volts and the fact that a transformer cannot be used, the booster diode has become a necessity. This is mainly because full line scanning amplitude, especially for the larger tubes, would be unobtainable, owing to the limited mains volts. The booster diode sometimes called the "efficiency" diode and "damping" diode, was originally designed to damp out the "ringing" or oscillations of the inductive charge in the anode circuit of the line output valve, when it collapsed during the fly-back period. This was when sets were A.C. only and there was no lack of H.T. available. However, at present the booster diode now performs three very useful functions in a set.

(1) It provides a means of raising H.T. volts.
(2) It damps out unwanted oscillations.
(3) It provides for the use of what would be wasted fly-back energy, in producing the initial part of the scan.

Types of Booster Diode Circuits

Fig. 1 gives a simple booster diode circuit in which all three functions are performed. Here C1 is the reservoir capacity. The action is the valve conducts whenever its anode becomes positive with respect to its cathode. C1 then becomes charged and when its potential is as high as that applied to the anode, the diode ceases to conduct. Now, when the inductive field collapses at the scan sweep, the fly-back stroke, unless damped, would continue to oscillate during the next scan drive. This would cause striations to appear on left-hand side of picture. When, however, a damping diode is used, as soon as the end of the scan is reached, the damping diode commences to conduct, absorbing the energy by passing the oscillation to its reservoir capacitor, causing the current to fall to zero. It will be noticed that the energy stored in C1, which has its positive side connected to the line output transformer primary, and its negative to the H.T. line, is actually in series with the H.T. line. Therefore, the H.T. supplied to the transformer primary is higher than that of the H.T. line thus giving boost volts. Now the charge in C1 also helps to drive the deflector coil current during the first part of the scan, thus acting as an "efficiency" diode. It will be seen from Fig. 1 that all the anode current for the line output valves flows through the boost diode, and also that it must be able to withstand the high peak voltages that occur. That is why ordinary rectifiers are not used as boost diodes. Special types are made with high cathode/heater insulation. Typical types are PY81 and U329.

Another method of using a booster is shown in Fig. 2. Here the negative of C1 goes to chassis so that the voltage across it is the total H.T. to the line output valve.

An Alternative Position

Now it is not necessary for the booster to be in the positive side of the H.T. supply. Fig. 3 shows it in the negative side. Here the cathode of the output valve is taken to the negative side of the reservoir capacitor, and the anode has a voltage the same as the H.T. line, and the cathode a voltage more negative than the negative H.T. line. The voltage across C1 is added to the normal H.T. by the fact that the positive side of it is connected to the H.T. negative.

The arrangements shown so far have applied to circuits where the heater/cathode voltages are not very high, but the practice now is to use the auto-transformer method of coupling between the output valve and the deflector coils. Fig. 4 shows a typical arrangement. The booster diode cathode now goes to the high potential side of

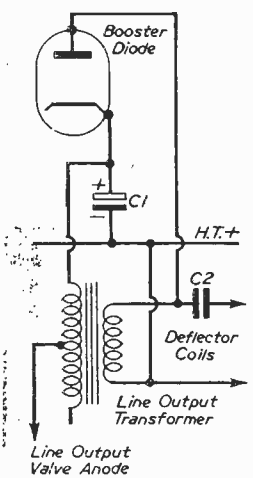


Fig. 1.—The simple Booster Diode circuit.

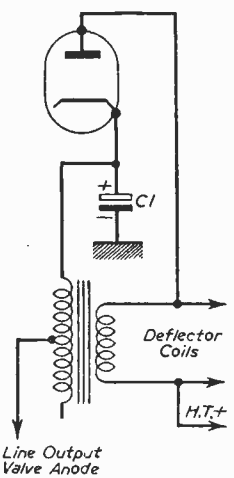


Fig. 2.—Another circuit using the Booster Diode.

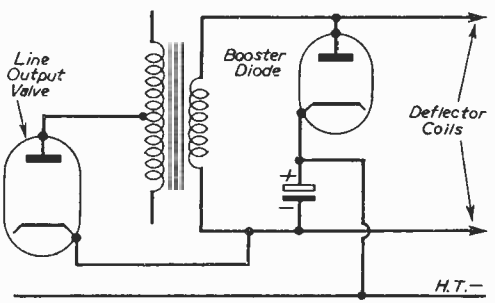


Fig. 3.—In this circuit the diode takes up a different position.

the damping circuit and its anode to H.T. positive. It will be seen that the diode, with its capacitor in series, is directly across the line output circuit. H.T. positive is connected to the junction of valve and capacitor. The charge in C1 is thus in series with the H.T. circuit and C2 to supply a boosted H.T. voltage to the line output valve via the line output transformer. Now the cathode of the booster diode is earthy, being in the heater chain, and the cathode varies with the voltage. This is high, generally several KVs, due to the circuit impedance. Here is a

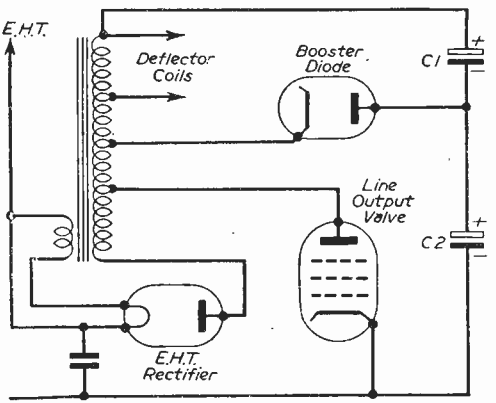


Fig. 4.—Circuit using an auto-transformer.

case for the special valves mentioned, i.e., high heater/cathode insulation.

Linear Distortion

It will probably be realised that adding this stored charge in C1 introduces some distortion to the linearity of the line scan. Methods adopted to overcome this are generally the use of the tapped choke type, which is connected to the line output transformer. Fig. 5 shows one

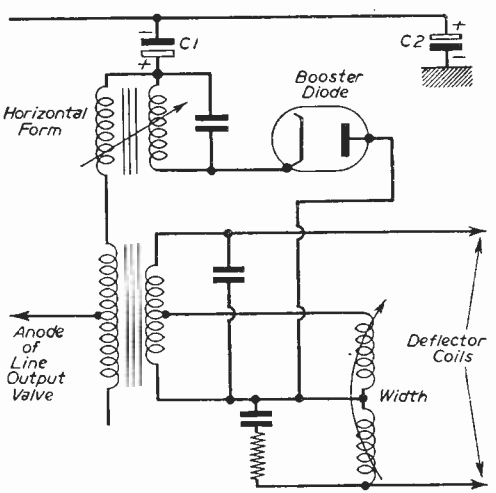


Fig. 6.—Another form of correction circuit.

method. Here the correction is done by a winding on the line output transformer.

Fig. 6 shows another method where the choke is separate. The booster here is fed from an isolated secondary winding. Its cathode current flows through one winding of the choke to C1, whilst the anode current to the line output valve flows through the other winding. Adjustment of core affects both coils, increasing or decreasing their inductance.

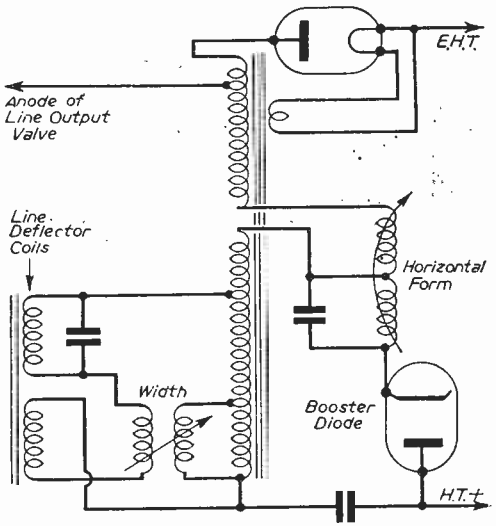


Fig. 5.—A separate winding is used here for correcting distortion.

Servicing TELEVISION RECEIVERS

No. 37.—KOLSTER-BRANDES LFT50, LFT60

By L. Lawry-Johns

FOR A.C. mains only, these receivers are both 17in. consoles, the LFT60 with doors, the LFT 50 without. They are normally fitted with a turret tuner with coils for BBC channels 1-5 and I.T.V. channels 8 and 9. Channel 10 and 11 coils are available and only need clipping into the turret in the required positions. An average-value A.G.C. (vision automatic gain control) circuit is used with the contrast varying its effective operation. Thus the contrast will appear to have little effect upon weak signals. There is no doubt that the most likely faults to be encountered are due to defective valves and without further "ado," we will examine the "usual" effects due to valve failure so that these can be more speedily recognised and thus rectified.

Fault condition: No vision or sound signals, raster displayed on screen when brilliance is advanced and a certain amount of valve noise, hiss, etc., on sound when volume control is turned to maximum. This condition, of course, immediately directs attention to the early stages—V1, V2 and V3. At first sight it would appear that all valve heaters are parallel fed so that once the valve which is "out" has been located, the job is practically done. This is so in the case of V3 onward—and if any of the valves 3 to 17 do not light up, they should be replaced—but in the case of the tuner unit (V1 and V2) only, the heaters are in series. Now this leads us to an interesting and very common fault which presents a pitfall to the unwary. Assuming that V3 does light up—and this is not always easy to ascertain since it is surrounded by coil cans—the heaters of the tuner unit valves should be examined. Remove the screening covers and ponder awhile. PCF82 glowing brightly? PCC84 dead? The impulse to replace the latter valve should be resisted as in actual fact it is receiving no heater current at all and therefore cannot light up. This is due to the PCF82 developing a heater-cathode short, resulting in the 16.5v. supply—which should be shared between the two—being dropped across this valve's heater only. Thus the bright glow. Therefore, if the PCF82 glows brightly and the PCC84 glows not at all, replace the PCF82, *not* the PCC84.

As has already been said, this is a common fault, easily rectified but one which may mislead the beginner.

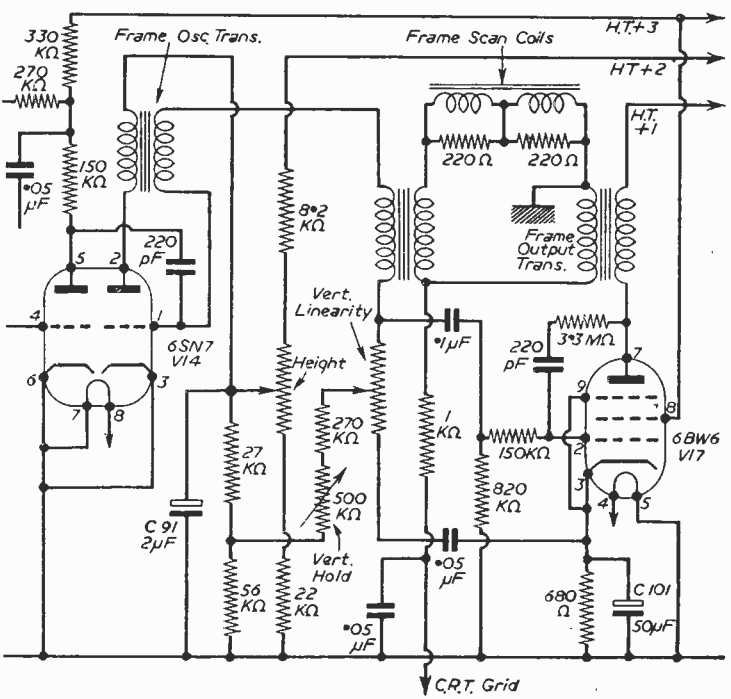


Fig. 1.—The frame timebase.

In the unfortunate event of V1, V2 and V3 proving faultless, the H.T. supply should be checked. For this purpose we include a sketch which shows the various decoupling resistors and capacitors. If one particular resistor is overheating, check the following circuit for short circuits, suspecting mainly a defective .001 μF or .003 μF capacitor. Remember, however, before launching into what may prove to be a perfectly innocent circuit, that valve can be defective even though their heaters are bravely glowing. In this connection it is always good policy to keep a standby PCC84, PCF82 and an 8D3 (6AM6, EF91, etc.), to try, as even the best of valve testers are not infallible.

Check Aerial Connection

If the valves are in order, the H.T. supplies present, do make sure the aerial plug (which you checked in the first place) is properly connected and the aerial in order. If in doubt, dismantle the plug and apply the inner conductor only to the socket, and then outer braiding only to prove whether the cable is at fault, the aerial connections, or that whisker of wire touching where it shouldn't in the Diplexer!

Fault condition: Sound, no vision signal, raster O.K. Check valves V4, V6 and V8, then the H.T. feed to these and then the GD3 vision detector crystal diode situated in the final I.F. coil can as indicated in Fig. 1.

Weak Vision Signal

Check as above but include V1, V2 and V3, V8 anode and cathode components and bear in mind the following :

If V8 has been replaced due to an internal short —screen-to-control grid—the GD3 diode will have suffered some damage as well as the more obviously damaged resistors. Therefore, check the following: 3.3 kΩ (V8 grid) and 8.2 KΩ (detector load—V8 grid leak) resistors, GD3 crystal diode and V8 cathode components 1200Ω and 150Ω resistors, 50 μF capacitor.

Fault condition: Vision O.K., no sound.

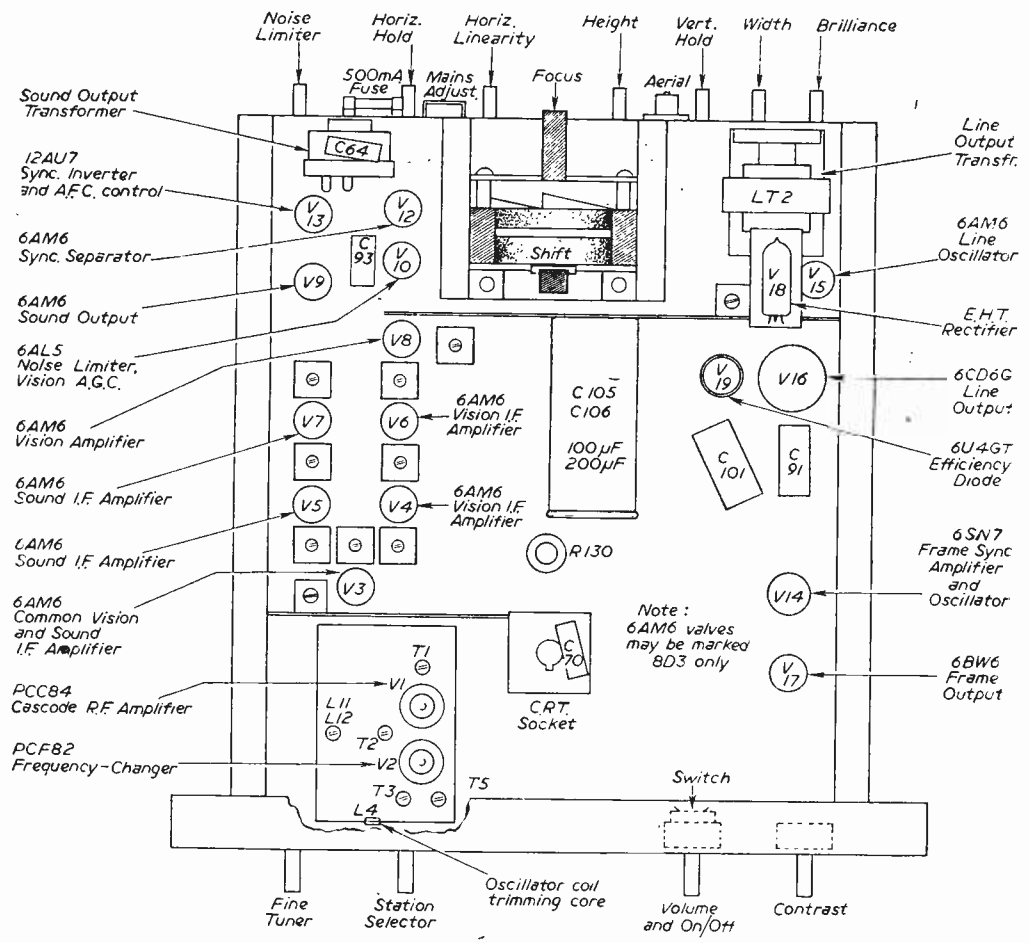


Fig. 3.—The main layout and identification of valves, etc.

Check valves V5. V7 and V9. If there is no hum or sound of any kind check continuity of sound output transformer primary winding (H.T. to V9 anode—pin 5). If the valves are in order. check H.T. to V5 and V7 anodes and then check sound detector crystal diode GD3 and similar noise limiter diode. The former is inside the final sound I.F. coil can, the latter under the chassis to the rear of the V7 valve base.

Fault condition: Sound O.K., no vision. no raster.

This means that although the sound is in order. no raster can be seen on the screen at all. This probably means that the vision signal is quite in order but that the tube is not being supplied. The first test is for EHT. Can the line timebase whistle be heard? If not. check V15. 6AM6 (8D3) line oscillator. V16. 6CD6G line output and 6U4GT. V19 efficiency diode. If line whistle can be heard check R12 EHT rectifier on top of line output transformer : If it is not lighting up. check for spark at the single wire end. If a nice fat spark sizzles to the blade of a reasonably sized screwdriver (with a well insulated handle. of course), replace the R12 (EY51. U151. U43. etc.).

If the EHT is in order the R12 lights up and a thin spark can be coaxed from the anode cap of the C.R.T., check the *ion trap magnet.* This may have slipped or otherwise have been dislodged. This is of little account if the Ferranti tube is fitted. as the magnet only acts as a beam shift. and of course. the actual position does not affect the brilliance. However. since Brimar C17FM tubes are fitted in the majority of cases. the position of the trap magnet is critical. and only a small movement will cause the raster to be lost completely. Finding the correct position when this position has been lost is not as easy as it may appear for this reason. When the correct position is achieved the screen does not always illuminate immediately due to slight dampness on the tube face. Therefore. if a line is visible on the tube neck. align the magnet with this with the arrow facing the front or the etchings (circular ring magnet) coincident. Now advance or retard along the line until some sort of illumination is observed. adjust for maximum brilliance from this point whether this means moving from the line or not.

(To be continued)

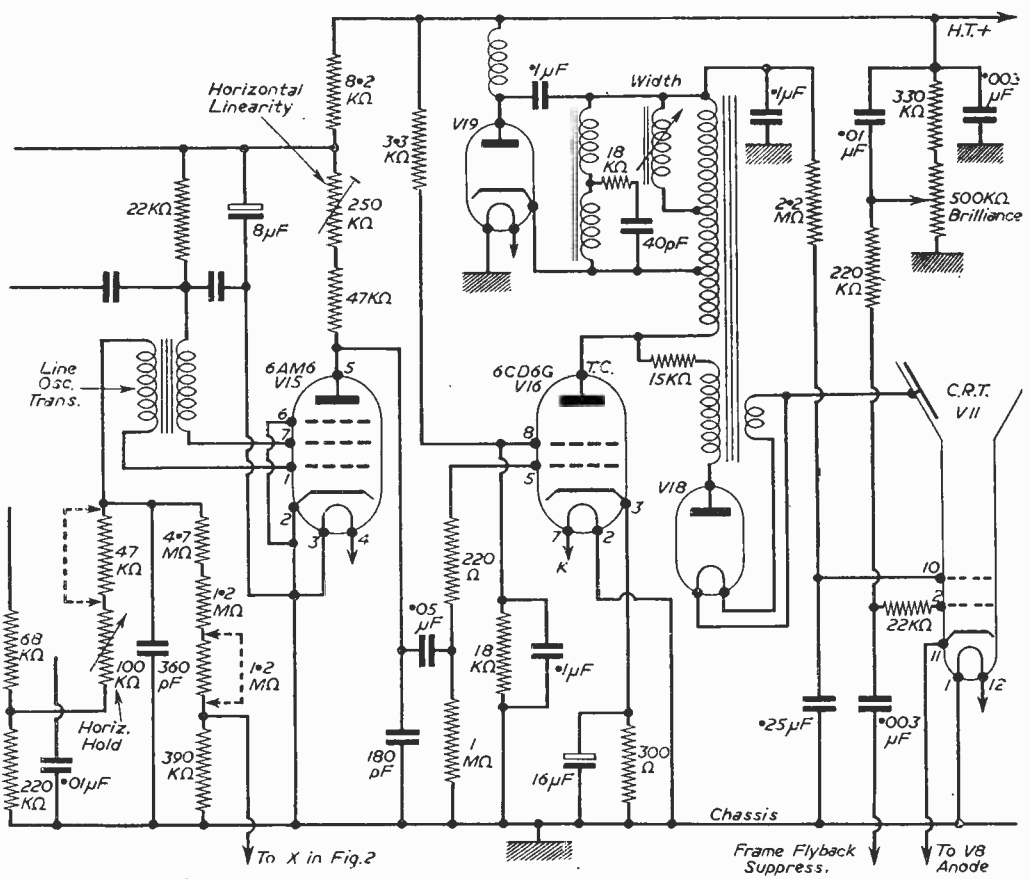


Fig. 2.—The line timebase.

IMPROVED FRAME SYNC

A SUGGESTION FOR OBTAINING IMPROVED INTERLACING

By A. M. St. Clair

A FRIEND recently asked me to have a look at his television set. It was, he explained, working quite well really, only the picture sometimes seemed to have an annoying and ill-defined "jitter." Also, the definition occasionally seemed rather poor.

I carefully refrained from making a hasty diagnosis, and went along to see the thing. Erratic interlace. Sometimes the lines were clear, distinct and equally spaced. But on other occasions, the lines of one half-frame were not spaced evenly between those of the other, and sometimes the two sets of lines were virtually superposed. When this happened, there was a coarse raster, and poor definition. The jumping about between one condition and the other gave a very annoying jitter. The set concerned was home constructed, from a kit of parts supplied by a reputable stockist. It had been well built, and no obvious faults had developed. If fact, a thorough check showed that there were no faults at all, obvious or otherwise. What was to be done?

The case is a common one. It is probable that more than half of the television receivers in use do not really synchronise perfectly. In many cases, it passes without notice. The non-technical viewer speedily accustoms himself to it, and accepts it as normal. But even the keen amateur, while he may feel annoyed by such a state of affairs, does not always succeed in finding a solution, particularly if he resides in a weak-signal area. Let us, therefore, look at the causes of relatively poor sync in a reasonably well-designed set.

One half-frame occupies 0.02 seconds, and contains 202.5 lines. In order to interlace correctly it must be positioned on the C.R.T. accurately to very much less than half the distance between lines. Actually, something like one-tenth of the interline distance is required for good steady interlace. The distance between lines corresponds, in time, to about 0.0001 seconds; so the frame-start must be initiated with an accuracy of about 0.00001 seconds, or *one-hundreth of a milli-second!* This is only one-twentieth of 1 per cent. of the total time for the half-frame, and the normal sync-separator just cannot be expected to live up to such standards in any except really strong-signal areas, where the sync pulses are big enough to load the stage, and produce practically vertical leading edges in the wave-form fed to the frame timebase.

The Solution

The solution, then, must lie in some kind of sync pulse amplifier, preferably with "trigger" characteristics, with the property of producing from the output of the normal sync-separator a chain of frame-sync pulses whose leading edges have a rise-time of not more than ten microseconds. It must be simple, and cheap, and use for preference not more than one valve.

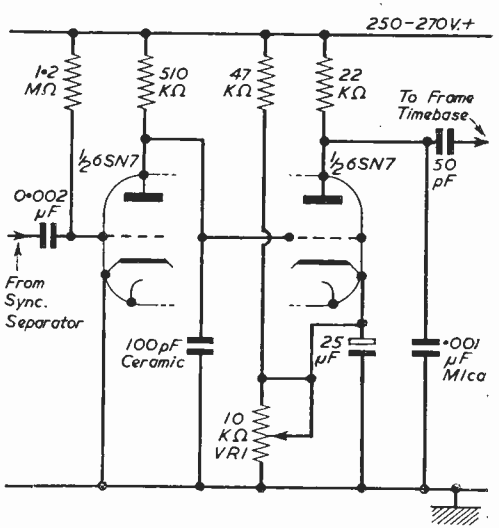
Some years ago I had devised a circuit for ameliorating such effects, which had never seen the light of day because the manufacturer for whom I was working did not think that the use of an extra valve was justifiable. Here are the details.

The Circuit

The circuit is shown below. Only one valve is used, a double triode. The valve actually employed was a 6SN7, since that was the popular D-T at the time. Any double triode of similar characteristics will serve, however. The connection of the grid of the first section to H.T. makes this vave conduct hard. Negative pulses applied to this grid cut the valve off, and produce pulses at the anode whose shape is controlled by the values of C and R used. These positive pulses are applied to the second grid directly, and produce in turn extremely fast-rising pulses, negative-going, at the second anode. These pulses are used to trigger the timebase.

With the values given, and about 250-270 volts on the H.T. line, there is an output pulse of over 50 volts, with a rise-time of about 5-10 microseconds, depending on the grid-base of the second triode section. The effective grid-base may be varied by means of RV.1; which acts as a fine control on interlace.

This circuit is extremely simple, and there is nothing critical about it in operation.



The circuit recommended by the author.

Tracing Obscure Faults—1

THE FIRST ARTICLE IN A SHORT SERIES SHOWING HOW TO LOCATE SOME OF THE MORE DIFFICULT TYPES OF FAULT

By F. E. Apps

TO the service engineer and the more enlightened of set owners the tracing of ordinary faults in a television set is not a too difficult or long job, but there are other faults that may at times have the best of us beaten for a time. As I know only too well, when one runs across an obscure fault in a set, and a certain amount of time is spent trying to locate the trouble, you are liable to get in a rut, get a fixed idea in your head where the trouble is and consequently miss the true cause which, as often happens, is not perhaps obvious but quite possible. The idea of this article is to show how to tackle these tricky faults without spending too much time on them, and to track them down.

Methods

A methodical system of checking is absolutely essential if one wishes to trace an obscure fault. Good test instruments are necessary and in some cases an oscilloscope is required. In all cases under review, it is presumed that valves have been checked or replaced by known good ones. It is not expected that *all* components have been checked, as this, in a present day 13 channel receiver, is a very long job indeed. In any case, most obscure faults are inclined to be intermittent in nature, and the odds are against your checking a component when it decides to be intermittent. I have, myself, checked a picofarad condenser of low value that I suspected, and found it O.K. on a bridge, although it was actually the culprit. In my view the sections of a television receiver most likely to suffer from obscure faults are:

(1) The tuner unit.
(2) The oscillator section where not in tuner unit.
(3) The video amplifier stage or stages.
(4) The sync section including flywheel and autosync.
(5) Timebases.

I propose to deal with each section in turn giving examples of obscure faults, and the methods adopted to trace them.

Tuner Units

These units can be the source of some difficult but interesting faults. We will take it that, by deduction, we have decided that the trouble lies in the tuner unit. This could be, for instance, a fault affecting both sound and vision, and the intermediate frequency stages have been cleared of suspicion. It will be necessary now to open up the unit for investigation. Most manufacturers fit a tuner unit which has a cover that can be removed for this purpose. Now if the fault occurs only on one band the trouble-shooting is simplified, but if on all bands then the whole of the tuner unit circuitry must be checked.

Example

A set with a 13 channel tuner unit was intermittent on all bands. Inspection of turret switching was first carried out. This was then cleaned with switch cleaner and after checking, passed O.K. for contacting. The set was tried again, but intermittency was still apparent. Care was then taken to note if there was any untoward movement of components due to switch movement. None could be observed. Both valve sockets were checked for dry joints and to ensure that valve pins were making good contact. Then using a 20,000 ohm per volt meter components were individually checked for leakage, etc.

Finally, heater and H.T. volts were checked. Heater volts O.K., no signs of fault. On checking H.T. volts, however, we got the first clue. It was found that they varied, especially on tapping set. The H.T. supply in the set in question was passed to the tuner unit via lead-in capacitors (two). These immediately came under suspicion. H.T. was therefore disconnected from these lead-in capacitors at either end, and instead fed directly to the tuner unit from the set. The set was now tried. Intermittency had

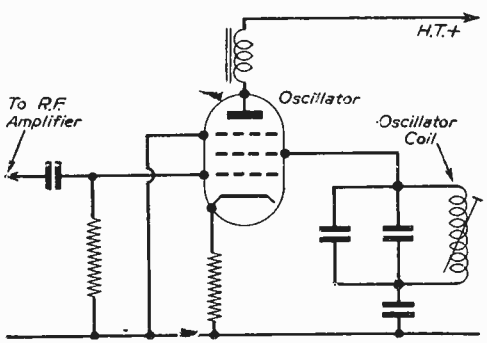


Fig. 1.—The oscillator circuit referred to on page 476.

vanished. The fault therefore was due to an intermittent leakage across one lead-in capacitor. Replacement of this was carried out and the set passed O.K.

It will be noticed that this checking was done methodically. The order in which each check is done does not matter. The idea is to check everything. It is in this way the obscure fault can be found.

Another Example

This case had the same type of fault and was traced to a tuner unit. All tests given in the previous case were carried out, but without result. Now all we had left was the input and output circuits of the tuner unit. The input

was cleared of suspicion and the fault was then found to be in the output. All these tuner units have a coaxial lead from the output of tuner to the grid of the first I.F. valve. It was this lead that was faulty. A single strand of the screening was intermittently touching the tuner at one end. Clearing this removed the fault.

The Oscillator

Obscure faults in this part of the receiver are often of the type where sound on vision and vision on sound keep appearing after a period of good viewing. In a case of this kind we can deduce that it is due to alteration of frequency of oscillator or what is known as oscillator drift.

The procedure adopted here is first of all to check that the frequency changer or oscillator valve (if a separate oscillator is used), is a good stable valve. This can be checked in another set; testing on a valve tester will not suffice. Having removed this from the parts under suspicion, we now proceed to check anything that will cause frequency drift. Fig. 1 shows these components. Now H.T. supply and heater volts can, if varying, cause this drift. We therefore carefully check this before looking elsewhere. We will presume that they are O.K. Now on looking at Fig. 1 we noticed that the frequency of oscillation is controlled by the position of a slug inside the coil. In the type of set referred to, this is roughly adjustable to any of the five channels of Band I. Sometimes across the coil is a small fixed condenser, generally of the negative coefficient type. Again, in another set, there may be two of these condensers wired across the coil. One will be an ordinary type condenser and the other a negative coefficient type. They act against each other with alteration of temperature, and thus keep the capacity correct and prevent oscillator drift. In the case in question a check was made by placing a soldering iron near these two condensers and a large amount of drift was noticed. On inspection it was found that on a previous service, the negative coefficient condenser had been replaced but not with one of the same type. This accounted for the oscillator drift. A correct replacement did the trick. By the way it is generally advisable to obtain the correct replacement from the service department of the manufacturers, quoting the model number and part number if possible. These condensers are generally of a very close tolerance.

Frequency Drift in Tuner Unit

This case rarely occurs on both bands unless the frequency changer valve is at fault. It is mostly either trouble on Band I or Band III. When the trouble is on Band III, suspect the frequency changer. Valves of this type will often work quite well on Band I, but will be erratic on the higher frequencies of Band III. If you have eliminated the valve from suspicion, then components in the unit itself must be checked. In the example given here it was found that the trouble was due to the switching on the oscillator section. On examining the circuit it showed that on Band I the fine tuning condenser was not in circuit, but it was so on Band III. A further search on these lines showed a dry joint on the switch that switched in fine tuner on Band III. This accounted for the frequency drift. Unfortunately a further fault then appeared. This was lack of sensitivity on Band III. Again this was switch trouble. In the model under check the coupling between the cascode amplifier and the pentode section of the frequency changer was switched to allow for a different capacity coupling for Band I and Band III. This is done to prevent heavy damping on the frequency changer at high frequencies. It was found that poor contact on switch was the cause of trouble.

BBC Schools' TV

IN its second year, which begins in September, 1958, BBC School Television will be increased to five programmes each week instead of, as at present, four programmes and a telerecorded repeat of the Science series. This is announced by the School Broadcasting Council for the United Kingdom at the end of the second term in the BBC's experimental Television Service for schools, inaugurated last September.

The provisional timetable for 1958-59 introduces several new subjects for the various age groups, including Visual Arts, Mathematics and "Looking at Britain," and continues earlier series such as "Science and Life," the topical programme such as "Spotlight," English Literature, which has already been seen in "Characters in Action" and "Fact in Fiction," and "Career," one of the earliest programmes, which has already covered a wide and variegated field from bakery to building.

Meanwhile the third term of the 1957-58 year opens again on Tuesday, April 22, when "Living in the Commonwealth" starts a new series on the West Indies to coincide with the visit of Princess Margaret and the declaration of Federation. It will be followed by a series on British Africa. On Wednesday, April 23, "Science and Life" starts a new series on stresses and strains dealing with the problems encountered by the engineer in designing such structures as tunnels, bridges, skyscrapers and aircraft. In the second half of the term, "Living in Water" will be a biological unit showing how the physical properties of water are made use of—or overcome—by creatures which spend the whole or part of their lives beneath the surface.

"Spotlight" continues on Thursdays, and on Fridays a new series on birds follows the literature series "Fact in Fiction." "Birds" is an experimental series for younger children of eleven and twelve, and it is hoped will encourage children in both town and country to observe and record the local bird population. The first School Television booklet has been issued for this series which deals with such general subjects as the mechanics of bird flight, the use of building materials, migration and navigation, and shows many common and lesser known species.

Modernising Old Receivers

HOW CERTAIN OLDER MODEL SETS CAN BE BROUGHT UP TO DATE

MANY readers are using receivers which are several years old, simply because of sentimental reasons, or because the results are so good that they do not feel justified in buying a more up-to-date set. The type of receiver we have in mind is that in which the tuning circuits are of the straight type or in which some other tuning arrangement is used, but which in any case does not afford good adaptation to the reception of Band III signals. Many of these old receivers utilise the 9in. tube and although these are available as replacements, the picture is generally regarded as too small for modern needs.

From the queries we receive it is obvious that many viewers would prefer to modernise one of these old receivers, but it may be regarded as almost certain that larger tubes cannot, as a rule, be fitted. Readers are reminded that the scanning angle of tubes up to 12in. is what is known as narrow angle, but 14in. and upwards has a wider angle, as a result of which the length of the tube is kept down and bulky cabinets are not thereby introduced. If the set employs one of the narrow angle tubes, you can take it as a general rule that a larger tube cannot be fitted. In addition to calling for new scanning components, these in turn call for new line and frame transformers and increased H.T. and the modifications are thus rather drastic. If the set is of the wide angle type, however, it may be possible to use a larger tube, provided one can be found which is rated to operate at the EHT which the set provides. If the EHT in the receiver is lower than that for which a proposed new tube is rated, it may be possible to use it provided it is borne in mind that the picture will not be as brilliant as with the correct voltage, and also that the amplitude controls on line and frame are able to cope with what might be an oversize picture. Remember that as a general rule the width and height of a picture is tied up with the EHT and if this is low the picture tends to be oversize.

These are, of course, general rules and as with all such rules there are bound to be exceptions. It will serve to remind you, however, of the points which have to be considered if you are thinking of modernising an old set.

Modern Tuning

There is one direction, however, in which it may be possible to bring an old set up to date, and that is in the tuning circuits. In recent years an I.F. has been generally adopted which provides freedom from various forms of interference, and to which practically all manufacturers now work. This is 34.65 Mc/s for vision and 38.15 Mc/s for sound.

Regular readers will remember that some time ago the Viewmaster was modified by changing it into a superhet, in which the old vision and sound section was changed into an I.F. strip having these frequencies and a separate three station tuner added. This is a form of modernisation which can be carried out on many old type receivers, although each set will need individual attention. It is not possible to lay down any definite instructions as there are so many receivers in existence, but there is one line of attack which may be adopted with old sets and which is recommended for several reasons.

The Family Receiver

In most homes the television set is regarded as part of the home and the reader dare not

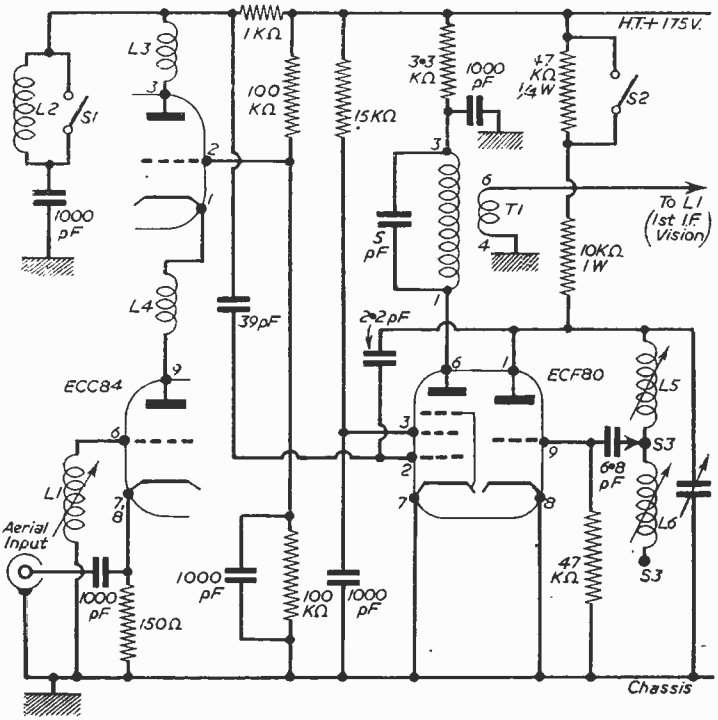


Fig. 4.—A two-station, Band I—Band III tuner.

touch it, so that to try and carry out a major modification which would mean putting the set out of commission for several days may be ruled out. There is no reason, however, why a new sound and vision strip should not be made up and afterwards mounted inside the existing cabinet and connected up, a procedure which would only take an evening or two. There is only one point about such a scheme which has to be borne in mind and that is that the receiver which is being attended to must have cathode modulation of the tube, when a circuit such as that shown in Fig. 1 may be employed.

Fortunately coils are now available on the market, and these are of a type which provide very high quality definition, and in the case of most really old sets the resultant picture will undoubtedly be much better than the original.

The New I.F. Strip

The accompanying circuits show the sections of a vision and sound I.F. strip using the new frequencies which has been tried out and found very satisfactory in two different home-constructor sets and three commercial ones. In the case of the commercial receivers, without any other change the resulting picture was of much greater definition than when the sets were new, and, in one case, the picture was infinitely brighter, due to the fact that the signal strength was much better.

Fig. 1 shows the first two stages of the new strip from which it will be seen that there is an input coil which forms part of an input transformer where the other section is in the output of a tuner. Wide-band couplings are used following the two valves in this section, and the output goes to the video stage in Fig. 2. Here it will be seen are germanium diodes used as rectifier, interference limiter and A.G.C. clamp, and an H.T. line of between 180 and 210 volts has been used successfully with these stages. A round figure of 200 volts may therefore be regarded as successful and should be aimed at.

The sound section is fed from the coupling between V1 and V2 in Fig. 1, and there are two I.F. sound stages before the metal germanium diode and a further

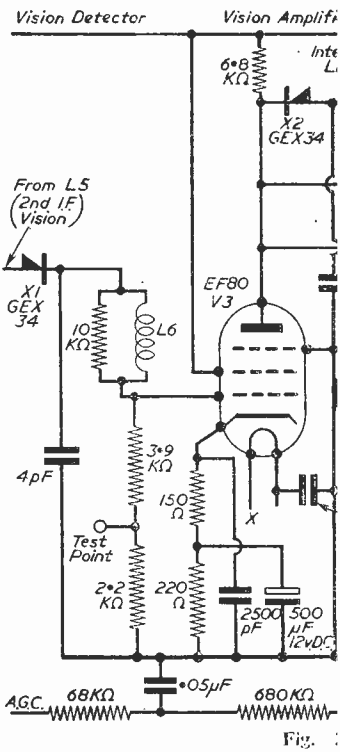


Fig.

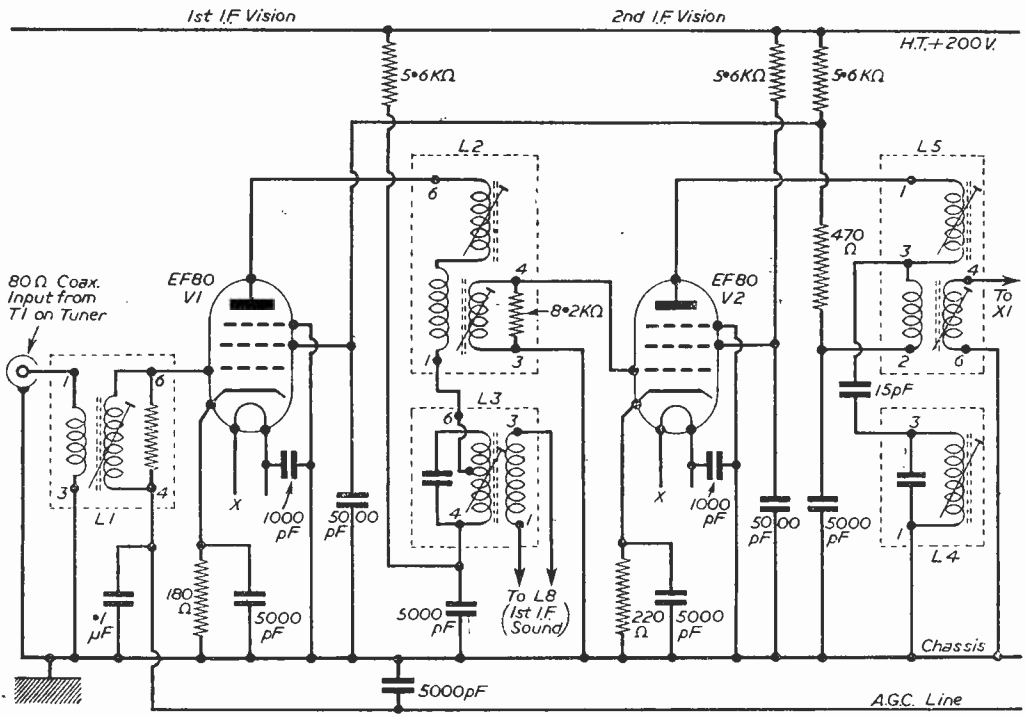
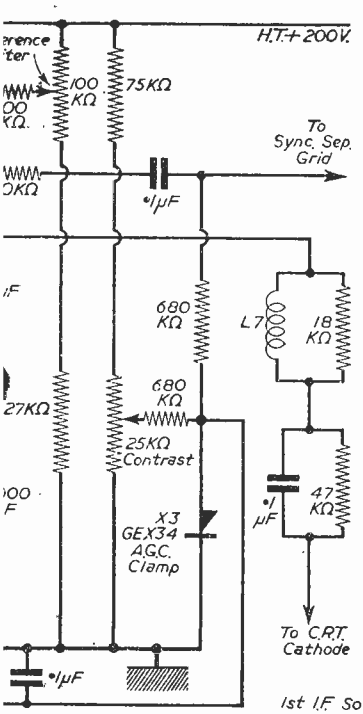


Fig. 1.—The first two video I.F. stages.



-The video detector and output stage.

similar rectifier as noise limiter. It will be seen, therefore, that the circuits are very comprehensive and embody all the latest ideas, with very little in the way of a critical layout.

Layout

The illustrations on our cover this month show one form of the I.F. strip which was built, and the makers of the coils Messrs. Osmor, can supply a chassis for another type. The smaller unit is a two-station tuner which goes with the I.F. strip, and the circuit for this is shown on page 577. This, as can be seen, is quite standard except for the switched tuning, and unlike most modern tuners this switch is of the two-position type giving BBC or I.T.A. without any intervening blank positions. To give an idea of the band width which is obtained, the output of the tuner is 36 Mc/s with the same frequency for L1. L2 is adjusted to 35 Mc/s and 37.15 Mc/s, and L5 to 34 Mc/s and 37.15 Mc/s and L3, L4, L8, L9 and L10 to 38.15 Mc/s. It will be seen that eight screened coils will be needed, together with two small peaking coils. The coils are Osmor QTV17, 18, 19, 20, 21, 24, 25 and 26, with the two peaking coils numbers QTV22 and 23.

The Tuner

The tuner, Fig. 4, will cover all channels on Band I and Band III, and in addition to the two-pole switch there is a small single-plate condenser (oscillator trimmer) which has to be mounted on the conrtol panel.

Connections

To connect the new I.F. strip into an existing receiver, the leads at present joined between the video section and the picture tube and the sync separator should be disconnected. The existing video section may be left as it is. The existing sound output stage may be used, and the circuits show the points to which the receiver is joined. Most old receivers employ parallel heaters, but should it be desired to modernise a receiver which has series heaters an alternative arrangement will have to be used, with other valves, and the heater current will have to be very carefully checked.

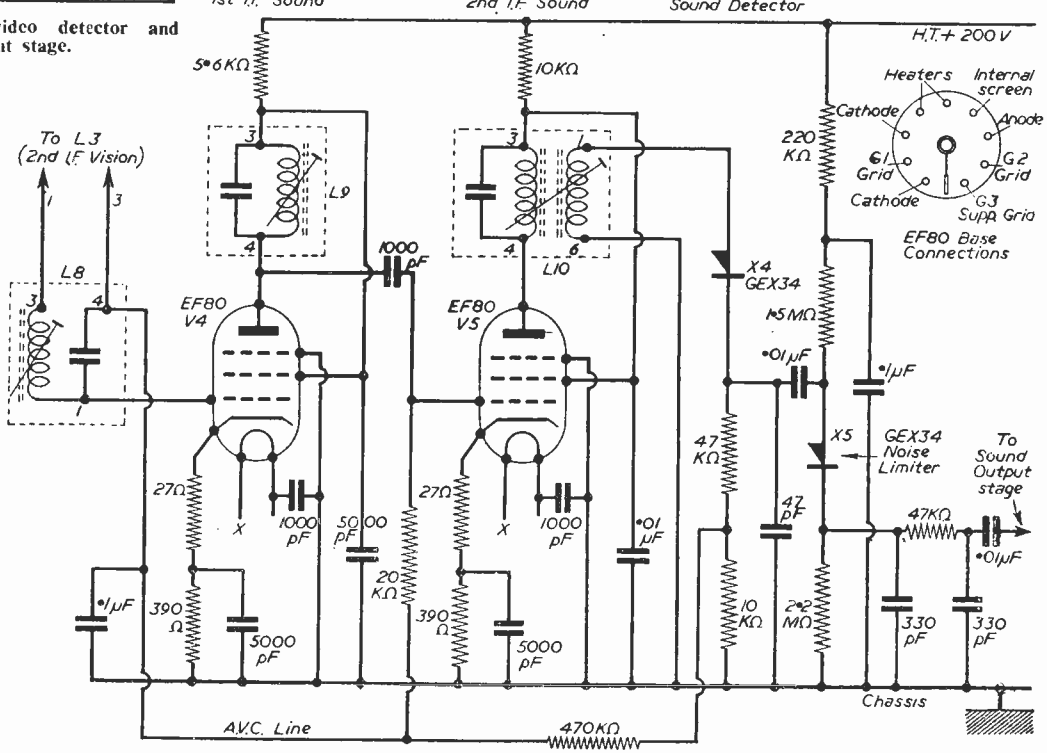


Fig. 3.—The sound section.

Servicing the G.E.C. 1746

FINAL NOTES ON THE RECEIVER WHICH WAS DEALT WITH IN THE APRIL ISSUE

Flyback

SUPPRESSION of frame flyback is effected by the negative waveform from the anode of V16 with C89. R50. providing a negative going pulse at C.R.T. modulator.

Dismantling the Receiver for Service

First remove back. Spring the sides to clear control knobs. Be careful of focus control lever. To remove cabinet first detach internal screening lead (right-hand side). Remove upper two of four screws located at each bottom corner of wooden frame. The cabinet can now be slid forwards as far as possible. When the front of cabinet becomes disengaged. it can be lifted away from chassis. If the cabinet is kept close handy it will not be necessary to disconnect loudspeaker. To remove subdeck. first release video lead. unplug octal plug and plug to tuner unit. Release the two screws holding subdeck to main chassis. Subdeck can then be slid out. Be careful how you handle it. to avoid trimmer alteration or damage. To remove tuner unit. after releasing plug to subdeck. remove inner and outer knobs (pull-off type). remove aerial socket

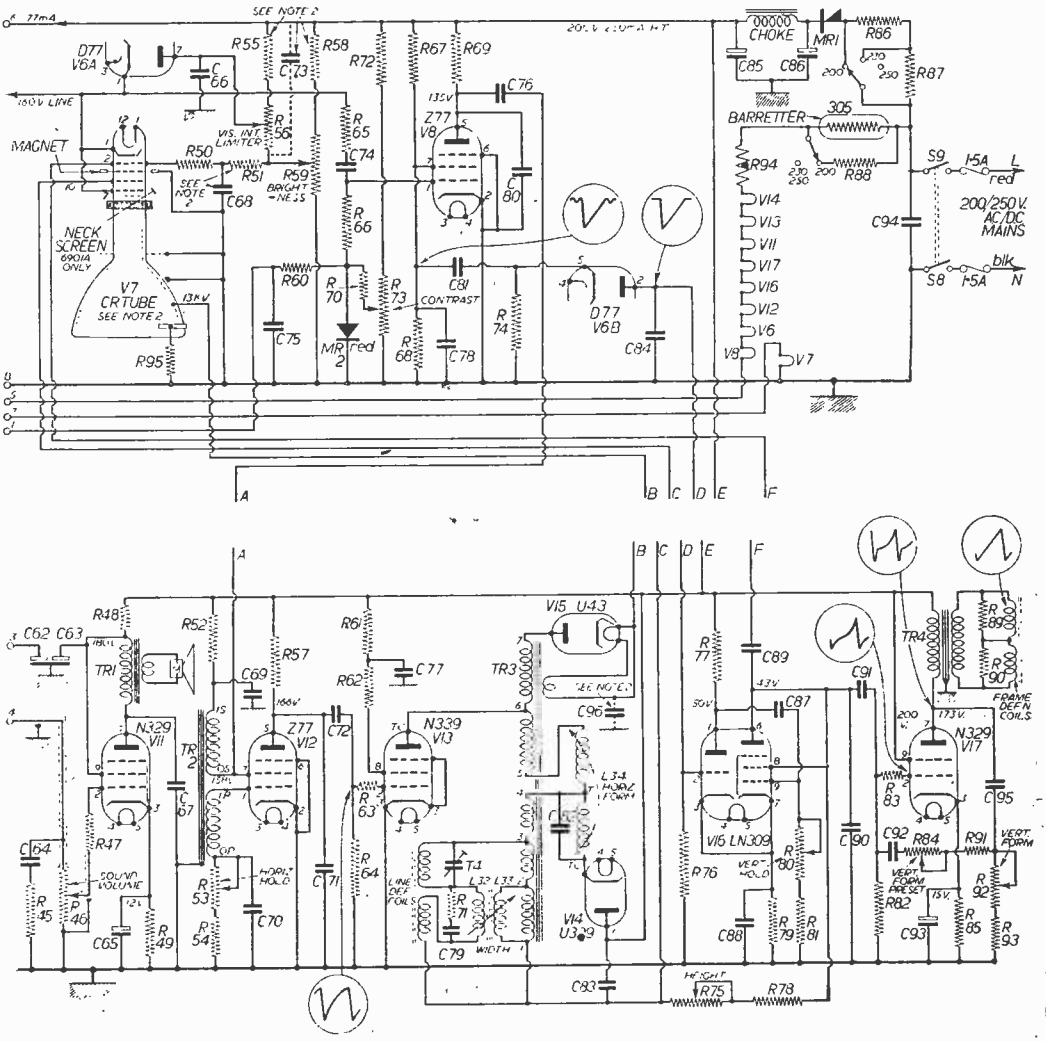


Fig. 6.—Circuit of the main deck section.

fixing screws, detach bonding lead, and finally remove the three fixing screws.

Servicing Notes

It should be noted that this set is liable to be erratic if H.T. is low. The smoothed H.T. should be 200 volts at 250 mA, taken at C85. A replacement metal rectifier would be an RM4. The heater circuit which has a barretter and thermistor in series, will naturally be open should valves or tube go o/c. If faults occur through inter-electrode shorts in valves, the barretter and/or thermistor will go. Horizontal form will be found adjustable to maximum picture brightness. Should it be necessary to replace V17 frame output valve, R84 internal pre-set control may require adjustment for good vertical linearity. In case of ringing, T4 can be adjusted to eliminate or reduce this fault. In the case of excessive white after black, adjustment of L23 can be made on a test card, noting the 2.5 and 3.0 Mc/s bars. R33, R36 on subdeck, 2, 12K ohms in parallel will burn out should C.R.T. go heater/cathode. Should it become necessary to fit new germanium crystals GEX34 and GEX35, be careful to keep heat away from the crystal when soldering.

The Band V Test Transmissions

AS existing channels are used, services are forced on to higher frequencies. With the future in view, the BBC began propagation tests (using square-wave modulation) in the U.H.F. bands in 1955.

In November, 1957, the BBC started experimental picture transmissions from Crystal Palace in Band V (610 Mc/s to 960 Mc/s) on the 405 line standard, with an E.R.P. of about 125 kW.

These tests are to assess the suitability of the U.H.F. bands for television under the conditions peculiar to this country, to allow interested bodies and persons to obtain an idea of the problems involved, and to compare the picture quality given by the 405 line standard with that afforded by the 625 line European standard.

Why Yagi Arrays?

Until an object reaches at least a significant proportion of a wavelength the amount of energy collected from the wave front and re-radiated is small.

Because Band V embraces wavelengths from approximately 30 to 50 cms, it it evident that many objects are likely to cause reflections—even domestic ironmongery! Thus "ghosting" will be the rule, rather than the exception.

The "catchment" of a Band V aerial is minute compared with that of low band aerials, and thus the output from a Band V dipole is far less than the output from, say, a Band I dipole, field strengths being equal. Atmospheric attenuation at Band V is also more severe than at the lower frequencies.

Therefore, the aerial should have high gain and a polar diagram with the smallest possible subsidiary lobes, whilst the main lobe must be broad enough to allow the aerial to be offset from the transmitter without losing gain. "Short back and sides" has become the slogan on Band III—it is even more necessary on Band V.

A Yagi array, with an aperiodic reflector screen rather than a resonant reflector, can be expected to fulfil these requirements. There is an economic limit to the increase of gain obtainable by adding parasitic elements, but Band V arrays are so physically small that mounting them as co-linear or stacked arrays is a simple matter.

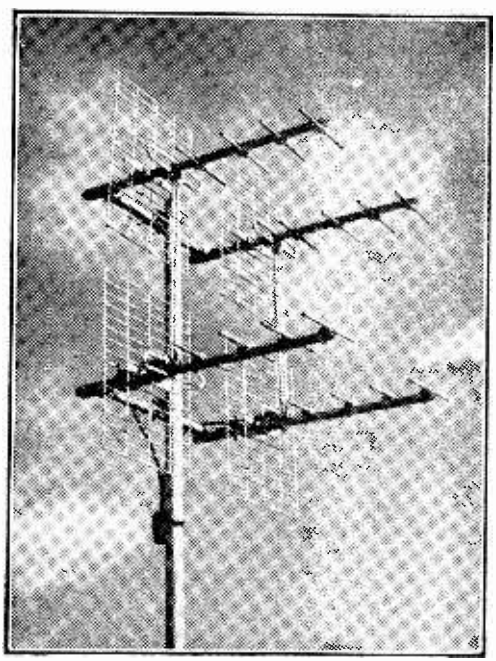
Another point is the use of a "balun"—whether it is economically worth while to fit an "unbalance to balance" transformer at the aerial.

Asymmetry of polar diagram in the plane of the elements is caused by connecting an unbalanced feeder to a balanced aerial. Obviously this effect is most noticeable with a horizontally polarised aerial. The user must decide just how serious this is. The change of polar diagram caused by the connection of co-axial cable direct to the aerial has been found to be of little significance compared to one fitted with a "balun."

Belling-Lee Field Strength Tests

From the start of the Band V picture transmissions the Belling-Lee mobile laboratory has been "on the road," taking measurements of field strength on the frequency used by the BBC. This is 654.25 Mc/s and 650.75 Mc/s.

At the time of writing much work remains to be done, but the general indication is that the service area will be larger than was expected.



This is a Belling-Lee Double six element Yagi.

CORRESPONDENCE

The Editor does not necessarily agree with the opinions expressed by his correspondents. All letters must be accompanied by the name and address of the sender (not necessarily for publication).

Printed Circuits

SIR,—Referring to the letter on printed circuit servicing (April issue). May I. after nearly two years on their design. manufacture and servicing problems express my opinion that whilst printed circuiting can be made a godsend to the serviceman. it is being made a nightmare because manufacturers following the age-old tradition are only interested in the costing and rarely consider the service department.

A printed circuit can be produced automatically. without being touched after the master has been produced on the drawing board. so that an I.F. strip or sound strip or complete radio circuit can be produced without the expense of wiremen. This is. of course. being done by various firms. but the service department now holds the baby.

My own opinion is that each transistorised stage (or valve stage) could be made to plug in to the strip so that the serviceman can eliminate. stage by stage. by substitution. A faulty stage can be returned to the manufacturer who has all the test equipment "laid on" to rectify the fault (this could operate the same as the return of faulty valves).

Now hints for the serviceman. Assuming the printed circuit follows the normal pattern of *no* helpful component references. suspected components can be "read" in the normal service manner and by cutting one end of the component. a replacement can be made by simply leaving the original component wires in the board and using them as "solder tags" for the replacement. To simplify reading the circuit it is possible to see the printed circuit through the board by looking on the component side and holding up to a bright light.

I.F. cans and valveholders are usually dip-soldered in with every other component and replacement of these really presents a tremendous problem.

All in all I believe that manufacturers should look on this new technique from a differennt angle by producing "stage" printed circuits. those having proved their worth can be perpetuated into newer models say with only one other stage modified.

Most stages need only six connections. and. with transistors which are soldered in. the number of pins and sockets used is less than the conventional valveholder.

Golden rule: *Never* try to service on the printed side, keep on the component side.—R. A. HIRST (Leics.).

Peculiar Faults

SIR,—Reading Mr. Whiteley's remarks in last month's issue on Strange Faults I would like to point out that many constructors fail to get results from published sets because they use ex-Govt. apparatus. and I myself have had two or three strange troubles which were traced to the use of this type of apparatus. I believe some of the apparatus is obtained from "stores" sections in the various services before being sold. and it would appear from one or two of my experiences that some of the staff in these stores may have been having a joke at someone's expense. For instance. I once had a failure which eventually was found to be due to the fact that the "condenser" (in tubular metal case) contained absolutely nothing. The two wires were hooked round a small piece of cork inside. Another item was an H.F. metal rectifier in which there was no element. Therefore. always test properly every piece of stuff used in your sets. bridging all condensers. etc.—H. G. WRIGHT (N.W.).

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.

Line Whistle

SIR,—In your March issue Mr. Redmayne complained he had been unable to cure the whistle from the line timebase. I know at least two people who could not bear a television set in the house because of this. and I did hear that one of your readers was unable to visit the Radio Show because the hall was full of whistles and he just could not tolerate it. I was in the same position. but have overcome it in a very simple manner. A small piece of cotton wool is plugged into each ear. It damps the high frequencies sufficient to cut out the whistle entirely. and does not spoil music or speech. I can at least, listen now in comfort.—G. H. WATTS (Rugby).

Unboxing Murphy V320

SIR,—A number of queries appear to have been raised concerning the best way to unbox the above receiver. The best way to do this is to remove aerial and mains plugs. lay set on its face (on a cloth). Remove four large hexagonal bolts from cabinet bottom and lift cabinet complete with speaker off the set. (No unsoldering needed.) Do this with the speaker lid shut. You can run the set (without speaker) out of its box if you turn the volume down.

Turn the set sideways and plug in aerial and mains. Out of its box the set is permanently switched on so observe the usual "live chassis" safety precautions. The picture tilt control is the brass hexagon bolt in the slot over the focus coil. and must be used jointly with the focus dome.

Adjust on a test card as the BBC habitually transmit roller captions tilted to reduce interlace "crawling line" effect.—H. PETERS (Thetford).

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1L4	6/6	6BA6	7/6	6SA7GT	8/6	12BA6	9/-	35Z5GT	9/-	DF33	11/-	ECH35	9/6	H30	5/-	PEN46	7/6	UCH81	11/6
1LD5	5/-	6BE6	7/6	6SC7	10/6	12BE6	10/-	41MTL	8/-	DF91	7/-	ECH42	11/-	H63	12/6	PL82	10/-	UCL82	15/6
1LN5	5/-	6BJ6	8/-	6SG7GT	8/-	12E1	30/-	50C5	12/6	DF96	10/-	ECH81	9/-	HABC80		PL83	11/6	UF41	9/-
1N5	11/-	6BR7	11/6	6SH7	8/-	12J5GT	4/6	50L6	10/6	DH63	10/-	ECL80	14/-		13/6	PM2B	12/6	UF80	10/6
1R5	8/6	6BW6	9/6	6SJ7	8/-	12J7GT	10/6	72	4/6	DH76	7/6	ECL82	14/-	HK90	10/-	PM12	6/6	UF85	10/6
1S5	8/-	6BW7	12/6	6SK7GT	8/-	12K7GT	7/6	77	8/-	DH77	8/6	EF36	6/-	HL23	10/6	PM12M	6/6	UF89	10/6
1T4	7/-	6BX6	12/6	6SL7GT	8/-	12K8GT		78	8/6	DK32	15/-	EF37A	9/-	HL41	12/6	PY80	9/-	UL41	11/-
1U5	10/-	6C4	7/-	6SN7GT	7/6		14/-	80	9/-	DK91	8/6	EF39	6/-	HL133DD		PY81	9/-	UL46	15/-
2A7	10/6	6C5	6/6	6SS7	8/-	12Q7GT	7/6	83V	12/6	DK92	12/6	EF40	15/-		12/6	PY82	9/-	UL84	11/6
2C26	4/-	6C6	6/6	6U4GT	14/-	12SA7	8/6	85A2	15/-	DK96	10/-	EF41	9/6	HVR2	20/-	PY83	9/6	UY41	8/6
2D13C	7/6	6C8	12/6	6U5G	7/6	12SC7	8/6	150B2	15/-	DL2	15/-	EF42	12/6	HVR2A	6/-	QP21	7/-	UY85	10/6
2X2	4/6	6C9	12/6	6U7G	8/6	12SG7	8/6	220P	10/6	DL33	9/6	EF50(A)	7/-	KL35	8/6	QP25	15/-	V1507	5/-
3A4	7/-	6C10	12/6	6V6G	7/-	12SH7	8/6	807	7/6	DL66	15/-	EF50(E)	5/-	KT2	5/-	QS150/15		VLS492A	£3
3A5	12/6	6CH6	12/6	6V6GT	8/-	12SJ7	8/6	956	3/-	DL92	8/-	EF54	5/-	KT33C	10/-		10/6	VMP4G	15/-
3B7	12/6	6D6	6/6	6X4	7/-	12SK7	8/6	1203	7/-	DL94	9/-	EF73	10/6	KT44	15/-	QVO4/7		VP2(7)	12/6
3D6	5/-	6E5	12/6	6X5GT	6/6	12SQ7	8/6	4033L	12/6	DL96	10/-	EF80	8/6	KT63	7/-		15/-	VP4(7)	15/-
3Q4	9/-	6F6G	7/-	6Z4/84	12/6	12SR7	8/6	5763	12/6	DLS10	10/6	EF85	9/-	KTW61	8/-	R12	12/6	VP13C	7/-
3Q5GT	9/6	6F6GT	8/-	6Z5	12/6	12Y4	10/6	7193	5/-	DM70	8/6	EF86	17/6	KTW62	8/-	SD6	12/7	VP41	7/6
3S4	8/-	6F8	12/6	6/30L2	12/6	14R7	10/6	7475	7/6	EA50	2/-	EF89	10/-	KTW63	8/-	SP4(7)	15/-	VR105/30	
3V4	9/-	6F12	9/-	7A7	12/6	14S7	17/-	9002	5/6	EA76	9/6	EF91	9/-	KTZ41	8/-	SP41	3/6		9/-
5U4	8/6	6F13	13/-	7B7	9/-	19AQ5	11/-	9003	5/6	EABC80	9/-	EF92	6/6	KTZ63	10/6	SP42	12/6	VR150/30	
5V4	12/6	6F16	9/6	7C5	8/-	19H1	10/-	9006	6/-	EAC91	7/6	EL32	5/6	L63	6/-	SP61	3/6		9/-
5X4	12/6	6F17	12/6	7C6	8/-	20D1	16/-	AC6PEN	7/6	EAF42	10/6	EL41	11/-	LN152	14/-	SU61	12/6	VT61A	5/-
5Y3G	8/-	6F32	10/6	7H7	8/-	25L6GT	10/-	AC/HL/ DDD	15/-	EB34	2/6	EL42	11/6	LZ319	14/-	TP22	15/-	VT501	5/-
5Y3GT	8/6	6F33	7/6	7Q7	9/-	25Y5	10/6			EB41	8/6	EL81	15/-	MH4	7/-	U16	12/-	W76	7/6
5Y4	12/6	6G6	6/6	7S7	10/6	25Y5G	10/-	AC/P4	8/-	EB91	6/6	EL84	10/6	MHL4	7/6	U18/20	12/6	W81	6/-
5Z3	12/6	6H6G	3/-	7V7	8/6	25Z5	10/6	AC/VP1	15/-	EBC33	7/6	EL91	5/-	MHLD6	12/6	U22	8/-	X61	12/6
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6AB7	8/-	6J5GTM	6/-	9D2	4/-	30	7/6	AZ31	12/6	EC52	5/6	EY51		OA10	12/6	U50	5/-	XD(1.5)	6/6
6AB8	14/-	6J6	5/6	10C1	15/-	30C1	14/-	BL63	7/6	EC54	6/-	(Small)	12/6	OA70	5/-	U52	8/6	XFW10	6/6
6AC7	6/6	6J7G	6/-	10F1	19/6	30F5	12/6	CK505	6/6	EC70	12/6	EY51		OA71	5/-	U76	8/-	XFY12	6/6
6AG5	6/6	6J7GT	10/6	10F9	11/6	30FL1	12/6	CK506	6/6	ECC31	15/-	(Large)	12/6	OC72	30/-	U78	7/-	XH(1.5)	6/6
6AJ8	9/-	6K6GT	8/-	10F18	12/6	30L1	12/6	CK523	6/6	ECC32	10/6	EY86	17/6	P61	3/6	U107	11/10	XSG(1.5)	6/6
6AK5	8/-	6K7G	5/-	10LD3	9/6	30P12	13/6	CV63	10/6	ECC33	8/6	EZ35	6/6	P215	10/6	U251	15/-	Y63	7/6
6AL5	6/6	6K7GT	6/-	10LD11	16/9	30P16	10/-	CV85	12/6	ECC35	8/6	EZ40	8/-	PABC80	15/-	U404	10/6	Z63	10/6
6AM5	5/-	6K8G	8/-	10P13	17/6	31	7/6	CV271	10/6	ECC40	24/4	EZ41	10/6	PCC84	10/-	UABC80		Z66	20/-
6AM6	9/-	6K8GT/G		11E3	15/-	33A/158M		CV428	30/-	ECC81	9/-	EZ80	9/6	PCC85	12/6		10/6	Z77	9/-
6AQ5	8/6		11/-	12A6	6/6		30/-	D1	3/-	ECC82	8/-			PCF80	14/-	UAF42	10/6	Z719	12/6
6AT6	8/6	6L6G	9/6	12AH7	8/-	35/51	12/6	D42	10/6	ECC83	9/-	EZ81	10/-	PCF82	12/6	UB41	12/7	Z729	17/6

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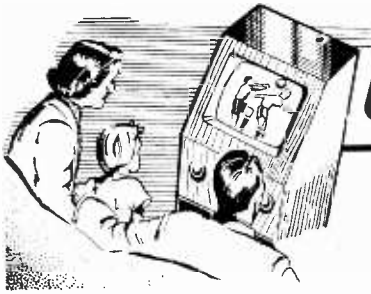


UNDERNEATH THE DIPOLE

TELEVISION PICK-UPS AND REFLECTIONS

By Iconos

EVER since the I.T.A. programme companies commenced operations and the public opinion polls have been checking on the viewers' reactions, the BBC TV offerings have been taking second—or rather, eleventh—place in popularity. The two most important specialist polls, Neilson's and T.A.M., have both been regularly returning I.T.A. programmes in the "top ten" each week. A-TV's *Sunday Night at the Palladium* has frequently come top or near the top and Granada's *The Army Game* has also scored, while Rediffusion's *Take Your Pick* and A-TV's *Emergency Ward 10* have secured high ratings. These returns have been more or less the same for all the areas at present served by both BBC and I.T.A. networks.

Shocks in Wales

IT has come as a shock to discover that reactions from Wales and West have not taken the same pattern. In one recent week, viewers in that area who can receive the alternate programmes voted BBC's *Wells Fargo* into the top place with a 73 per cent. rating, and BBC's *Dixon of Dock Green*, with Jack Warner, in second place at 71 per cent. The BBC also captured third and fourth positions with the old R.K.O. film *Born to be Bad* and *The Ted Ray Show* respectively. A-TV's *Sunday Night at the Palladium* was fifth and Rediffusion's *Take Your Pick* sixth.

When I heard these results I felt sure that this preference for BBC TV in the Wales and West area must be due to technical shortcomings in the local I.T.A. transmissions. However, I understand that the transmitter is now working on full power and that the aerial system has been rearranged to give an improved radiation. Nevertheless, the hills and valleys of South Wales must present many difficulties for reception in screened areas, causing disappointment to individual viewers and local dealers, who have been doing a brisk trade with converters. Whatever the cause for dissatisfaction, these high ratings for BBC programmes in that area must be quite a tonic for the hard-worked BBC television executives, who have regarded the poll results with baleful eyes.

Changing the Background

THE format of a regular television feature such as *Double Your Money*, *This Is Your Life* or *Picture Parade* is usually part and parcel of the original scripted idea. When a feature of this type becomes really popular and runs on for months instead of weeks, there is a risk of the idea degenerating into a fixed routine. The announcers have to think up new ways of saying virtually the same thing each week and the producers to vary the presentations by new settings, new camera angles and new music. The producers of the BBC feature *This Is Your Life* have been particularly successful in keeping this rather embarrassing programme fresh by making a major shift of locale. No longer anchored to the studio, its background for one programme shifted to Edinburgh, where the pantomime *Babes in the Wood* at the King's Theatre was interrupted for Eamonn Andrews to question the principal girl of the show, Louie Ramsey. This edition of *This Is Your Life* was good "theatre" in every sense of the word. Another unexpected background was that of a film studio, when Anna Neagle was the victim. Anna had thought that she was to rehearse for a special edition of *Picture Parade*, when Eamonn Andrews suddenly appeared and took command in the name of *This Is Your Life*. The delightful Anna was reduced to tears by memories of early films, especially one in which she acted with Jack Buchanan. Many viewers feel rather uncomfortable at watching the spontaneous reactions and emotions of families reunited after many years, a regular feature of these programmes, but nevertheless, they switch on again to see the programme the following Monday. I would say that the success of this programme with the public is largely due to the sympathetic guidance of Eamonn Andrews as Master of Ceremonies.

Tony Hancock

THE day of the patter comedian has ended—for the time being. Cross-talk and wisecracks have now to be backed up by characterisation, and the former high-speed patter comics are now seen in character parts in both high comedy and the craziest of goon shows. Frankie Howerd has turned to Shakespeare and Tony Hancock to Gogol. The BBC presentation of the Nikolai Gogol comedy *The Government Inspector* was an experiment of great interest, especially to those viewers who have watched the steady progress of Tony Hancock in his own recent situation-comedy series. This light-as-a-feather playlet had been smoothly translated into English and expertly dramatised into a television play under the direction of Alan Bromly. Mounted with excellent settings by Stephen Taylor, it turned out to be a very polished and amusing tale of mistaken identity which gave Tony Hancock wonderful oppor-

tunities for displaying his fruity comic characterisations. Most comedians are at their best with a good "feed," and in this case the "straight" part was the Mayor of a provincial Russian town (in the Czar's time, by the way), who was excellently played by John Phillips. The Mayor mistakes Tony Hancock for that most important man in those Czarist days, the Government Inspector—a situation which Mr. Hancock exploited in his most amusing manner.

A-TV's Painting

SOME months ago Mr. Charles Cundall, the distinguished R.A., expressed the desire to paint his impression of the scene of restless activity that characterises a television show in production. After taking a look at various studios in action, he asked for permission to paint a television show being staged at the Wood Green Empire studios, an admirable choice for a spectator to see the maximum activity from the front of the gallery. When the painting was exhibited at the Royal Academy, Mr. Leslie Lewis, A-TV's Administration Controller, was so impressed with the picture that he spoke to Mr. Val Parnell, his chief, about it. The ultimate result was that at the end of the exhibition A-TV purchased the picture, together with the copyright, and it is now hanging in their Board Room. The picture (which incidentally was reproduced in colour on the official A-TV Christmas card) has attracted much attention and admiration. It certainly conveys the atmosphere of tremendous activity and tension which the spectator feels when he is sitting in the actual theatre watching a show. This high-pressure tension is something that an ordinary still photograph seems unable to capture. It must be the first time a television organisation has purchased an exhibited painting. However, it does follow a music hall tradition. Emile Littler has bought valuable pictures which are now hung in the entrance of the Palace Theatre, and many years ago both Sir Oswald Stoll and Charles Morton acquired pictures for the London Coliseum and the old Canterbury Music Hall in Westminster Bridge Road respectively. Sir Alfred Butt, another music hall magnate, was also a patron of the arts when he controlled the Palace Theatre.

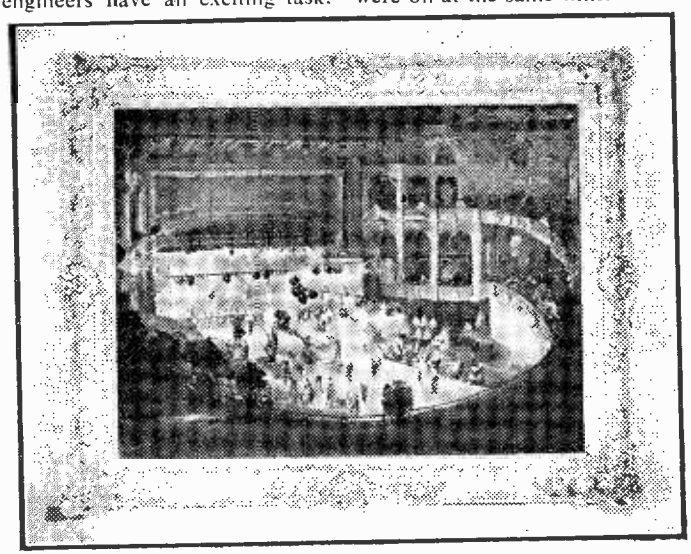
Standardisation or Lack of It!

THE BBC policy on its own filmed subjects is to photograph them on 35 mm. film, with synchronised magnetic sound, if possible. 16 mm. film is used by BBC for newsreels and for foreign assignments and expeditions, where compactness of equipment is an important requirement. The BBC does import a number of regular American features which are photographed or printed on 16 mm. film, with reduced optical sound track on the same film. As mentioned in a previous issue, these 16 mm. American presentations are well below the normal BBC quality both for picture and sound.

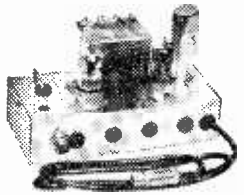
The I.T.A companies are even more confused on standardisation of filmed picture and sound. Separate magnetic track on 16 mm. film is sometimes used, but the recorded sound track varies in width and location. Optical sound tracks also vary in their form, sometimes (with reversal film) being on the "wrong" side of the film base, and consequently slightly out of focus and woolly. The control engineers have an exciting task, changing track locations, type of sound playoff, frequency characteristic and volume. The time has come when a more definite standard should be laid down and agreed. As a viewer with an ordinary commercial TV receiver, I have been astonished by the variations in quality of both sound and picture of the film transmissions. I have made enquiries regarding those transmissions which have been of specially good quality. In every case the source material has been photographed on 35 mm. picture negative, with a separate sound negative. The reproducer has also, in every case, been of one type—a flying spot scanner. Thus, equipment and film stock for both photography and reproduction is expensive.

Alternative Programmes

VIEWERS are entitled to enquire if the I.T.A. programme is really an alternative to the BBC programme. The BBC started the television parlour game craze—borrowed from U.S.A.—but lately, there have been many occasions when there have been very similar types of parlour game on each channel. I refer for example to *Double Your Money*, the filmed feature with Hughie Green as Compère on I.T.A., and to *Get Ahead*, the new competitive feature on BBC, both of which were on at the same time.



A reproduction of the painting by Charles Cundall, R.A., which was exhibited at the Royal Academy. It now hangs in the Board Room of A-TV.



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£3.19.6. Carr. & Pkg. 2/6.

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3 W BAND COIL PACK. 2½in. x 2½in. x 1¾in. depth. 4-position switching I, M, S and Gram. Dust cored coils, pre-aligned, 465 kc/s C with trimmers and circuit. **Bargain Offer 27/6.**

CONVERTER ACCESSORIES. Band 1 Band 3 Cross-over Unit, **7/6.** Var. Attenuators 6db-36db, **6/9.** BBC Pattern Filter, **8/6.** Band 3 Aerials outside single dipole with 4 yds. coax., **13/9.** 3 element Beam, **27/6.** 5 element, **35/-**, etc., etc.

Volume Controls

Log. ratio, 10,000 ohms to 2 Megohms. Long spindles. 1 year guarantee. Midget Ediswan type.

No. S.W. S.P. S.W. D.P. S.W.
3/- 4/- 4/9

Linear Ratio, 10,000 ohms — 2 Megohms. Less switch, 3/- each.

Coax plugs, 1/2. **Coax sockets** 1/-. **Couplers** 1/3. **Outlet boxes,** 4/6.

80 ohm CABLE COAX

STANDARD ½in. diam. Polythene insulated. GRADE "A" ONLY.

8d. yd.

SPECIAL — Semi-air spaced polythene, 80 ohm **Coax,** ½in. diam. Stranded core. Losses cut 50%. Ideal Band 3. **9d. yd.**

TWIN FEEDER, 30 ohms, **6d.** yd.; 300 ohms, 8d. yd.

TWIN SCREEN FEEDER, 80 ohms, 1/3 yd.

50 OHM CABLE, 8d. per yd., ½in. dia.

TRIMMERS, Ceramic, 4 pf.-70 pf., **9d.** 100 pf., 150 pf., **1/3**; 250 pf., **1/6**; 600 pf., **1/9. PHILIPS** Beehive Type 2 to 8 pf. or 3 to 30 pf., **1/-** each

RESISTORS. —Pref. values 10 ohms to 10 Megohms.

CARBON		WIRE WOUND	
20% Type, ¼ w.,	3d.;	5w., 25 ohms—	1/3
½ w.,	5d.;	10w., 10,000	1/6
1 w.,	9d.	15w., ohms	2/-
10% Type, ½ w.,	9d.;	5w., 15,000—	1/9
5% Type, ½ w.,	1/-;	33,000	
1% Hi-Stab., ¼ w.,	2/-.	10w., ohms	2/3

WIRE-WOUND POTS. Pre-Set Min. T.V. Type Knurled Slotted Knob. All values 25 ohms to 30 K., 3/- ea. 50 K., 4/-. Ditto Carbon Track, 50 K. to 2 Meg., 3/-.

3w. LAB. COLVERN, etc. Standard Size Pots, 2¼in. Spindle. High Grade. All Values. 100 ohms to 50 K., **5/6**; 100 K., **6/6. W.W. EXT. SPEAKER CONTROL** 10Ω, 3/-.

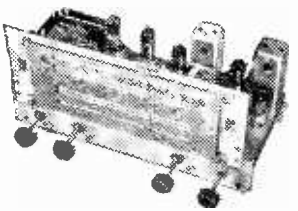
SOLON SOLDERING IRONS (200/220 v. or 230/250 v.), 25 watt Instrument Type, **21/6**; 65 watt Pencil Bit Type, **26/8**; 65 watt Oval Bit Type, **25/-**. Comprehensive stock of spares available.

SPEAKER FRET—Expanded Bronze anodised metal 8 x 5in., **2/3**; 12 x 5in., **3/-**; 12 x 12in., **4/6**; 12 x 16 in., **6/-**; 24 x 12in., **9/-**, etc.

TYGAN FRET (Murphy pattern) 12in. x 12 in., **2/-**; 12 x 18in., **3/-**; 12 x 24in., **4/-**, etc.

8" P.M. SPEAKER (3 ohms)

Ex Mfrs. Unit: Rola, W.B., Celestion, etc. All reconditioned and guaranteed. Ideal Ext. Unit. Bargain, **7/6.** Carr. 1/6. Ditto with O/P Trans., **9/6.**



ALL WAVE RADIOGRAM CHASSIS
3 WAVEBANDS 5 VALVES
LATEST MIDGET

S.W. 16 m. 50 m. BVA
M.W. 200 m. 550 m. SERIES
L.W. 800 m.—2,000 m.

Brand new and guar. A.C. 200/250 v. 4 pos. W.C. sw. Short-Medium-Long-Gram. P.U. socket. High Q dust core coils. Latest circuit technique, delayed AVC and neg. feedback. O/P 4 watts. Chassis size, 13½ x 5½ x 2½in. Dial, 10in. x 4½in. Hor. or vert. station names. Walnut or ivory knobs to choice. Aligned and calibrated ready for use. **Sensitivity and Quality at Low Cost.**

Double wound mains trans. **BARGAIN PRICE 9½ gns.** Carr. and ins., 4/6.

8 or 10in. speaker to match, **20/-** and **25/-**.

7 Valve De Luxe, push-pull EL41 version. 7 watt output with H Duty Trans. **£12.10.0.** Carr. & ins. 5/-.

RECORD PLAYER BARGAINS
SINGLE PLAYERS—LATEST MODELS.

4 Speed BSR (Model T.U.9), **92/6.**
4 Speed COLLARO (Junior), **£4.10.0.**
4 Speed GARRARD (4SP), **£7.15.0.**
Carriage and Insurance, 3/6.

AUTOCHANGERS—LATEST MODELS.

4 speed BSR (Model UA8), **£8.10.0.**
4 speed COLLARO (Conquest), **£8.15.0.**
4 speed GARRARD (RC120 H Mk. II), **£10.5.0.**
Carriage and Insurance, 5/-.

All above models Brand New and Guar. Fitted latest style Pweight Xtal. P.U. with turnover head and twin sapphire stylii.

RECORD PLAYER CABINETS

Contemporary style texine covered cabinet in mottled red with cream interior. Size 18¼ x 13¾ x ht. 9¼in., fitted with all accessories, including speaker baffle board and plastic fret. Space available for all modern amplifiers and autochangers, etc. Uncut record player mounting board 14 x 13in. Cut mounting boards available.

Cabinet Price, £3.3.0. Carr. and ins. 3/6

2 VALVE AMPLIFIER (to fit above cabinet), modern circuit with EL84 output, ready built, with 6in. speaker and output transformer. **£3.12.6,** carr. and ins. 2/6.

SCOTCH BOY, EMITAPE, etc., 1,200ft., **27/-**. Long playing, 1,800ft. reels, **45/-**. Paper tape, good quality, 1,200ft., **12/6.** Reels only, 30in., **3/-**; 5in. **3/8**; 5½in., **4/-**, 7in., **4/3.**

I.F. TRANSFORMER—465 kc/s.

Brand new ex-manufacturer's midget I.F.T. size 2¾in. x 1in. x 1in. dust core tuning. Litz wound coils, High Q. Bargain offer, **7/6** pair.

CONDENSERS. —Mica or S. Mica. All pref. values, 2 pf. to 680 pf., **6d.** ea. Ceramic types, 2.2 pf. to 5,000 pf., **9d.** each. **Tubulars.** 450 v., Hunts and T.C.C. .0005, .001, .005, .01 and .1, 350 v., **9d.** .02, .5, .1 500 v., Hunts, T.C.C., 1/-. .25 Hunts, **1/6**. .5 Hunts, **1/9**. .1, 1,500 v., T.C.C. (Simplex), **3/6**. .001 6 kV. T.C.C., **5/6**. .001 20 kV. T.C.C., **9/6.**

SILVER MICA CONDENSERS—
10%, 2 pf. to 500 pf., **1/-**. 600 pf. to 3,000 pf., **1/3**. 1%, 1.5 pf. to 500 pf., **1/9**. 515 pf. to 5,000 pf., **2/-**.

SPEAKERS.—PM 3 ohm, 2½ in. Elac., **16/6**; 3½in. Goodmans, **18/6**; 5in. R.A., **17/6**; 6½in. Celestion, **18/6**; 7 x 4 Goodmans, **18/6**; 8in. Elac, **20/-**; 10in. R.A., **25/-**; 12in. Plessey, **35/-**.

JASON F.M. TUNER UNIT (87 Mc/s-105 Mc/s). As described in Radio Constructor. Designer Approved Kit of parts to build this modern highly successful unit, drilled chassis and superior type illuminated glass dial, coils cans and all quality components, etc., for only **5 gns.**, post free. Set of 4 Specified Miniature Valves, **30/-**, post free. Illustrated handbook with full details, **2/-**, post free.

2-DAY ALIGNMENT SERVICE NOW AVAILABLE.

NEW BOXED VALVES ALL GUARANTEED

1R5, 1T4	7/6	DAF96	9/-	ECL80	10/6
1S5, 1S4	7/6	DF96	9/-	EF41	10/6
3S4, 3V4	8/-	DK96	9/-	EF80	10/6
5Z4	9/6	DL96	9/-	EF84	12/6
6AT6	8/6	35L6	10/6	EF91	8/8
6K7	6/6	EABC80	9/6	EL41	10/6
6K8	8/6	EB91	6/6	EL81	11/6
6Q7	8/6	EBC41	10/6	EY51	12/6
6SN7	8/6	ECC83	9/6	EZ40	8/6
6V6	7/6	ECC84	12/6	EZ80	8/6
6X4	7/6	ECF80	12/6	MU14	9/6
6X5	7/6	ECF82	12/6	PCC84	10/6
7C5	9/-	ECH42	10/6	PCF80	10/6
7Y4	8/6	ECH81	10/6	PCF82	10/6

PL36	12/6				
PL82	10/-				
PL83	11/6				
PY80	9/6				
PY81	9/6				
PY82	8/6				
UCH81	10/6				
U22	8/6				
U25	12/6				
UBC41	9/6				
UCH42	10/6				
UF41	10/-				
UL41	10/6				
UY41	8/6				

SPECIAL PRICE PER SET

1R5, 1T4, 1S5, 1S4 or 3S4 ... ... 27/3
DK96, DF96, DAF96, DL96 ... ... 35/-
6K8, 6K7, 6Q7, 6V6, 5Z4, or 6X5 ... ... 35/-

ELECTROLYTICS ALL TYPES NEW STOCK

Tubular Wire Ends		Can. Type, Clips 3d. ea.	
25 25 v., 50 12 v.	1/9	8 450 v.	2/6
50 50 v., 4 500 v.	2/-	8+8 450 v. T.C.C.	4/6
100 25 v., 2 450 v.	2/-	8+16/450 v. Hunts.	5/-
8 450 v. B.E.C.	2/3	16+16 450 v. T.C.C.	5/6
8 500 v. Dub.	2/9	32/350 v.	4/-
8+8 500 v. Dub.	4/6	32+32/275 v. Hunts	4/6
8+16 450 v. T.C.C.	5/-	32+32/450 v. T.C.C.	6/6
16 450 v. B.E.C.	3/6	250/350 v. B.E.C.	8/6
16 500 v. Dub.	4/-	60/350 v. T.C.C.	6/6
16+16 450 v. T.C.C.	5/6	60+100/350 v.	11/6
32/350 v. Dub.	4/-	64+120/275 v.	11/6
32+32/450 v. Dub.	5/-	60+250/275 v.	12/6
50+50/350 v. B.E.C.	6/6	100+200/275 v.	12/6
32+32/500 v. B.E.C.	5/6	3,000 mfd. 6 v.	3/6

TRANSISTOR.—Midget electrolytics, 2 mfd., 4 mfd., 8 mfd., 6 v., **3/6**, 6 mfd., 10 mfd., 16 mfd., 3 v., **3/6**. 32 mfd., 14 v., **3/6.**

SENTERCEL RECTIFIERS. E.H.T. TYPE FLYBACK VOLTAGES. K3/25 2 kV., **5/-**; K3/40 3.2 kV., **6/9**; K3/45 3.6 kV., **7/3**; K3/50 4 kV., **7/9**; K3/100 8 kV., **13/6**, etc.

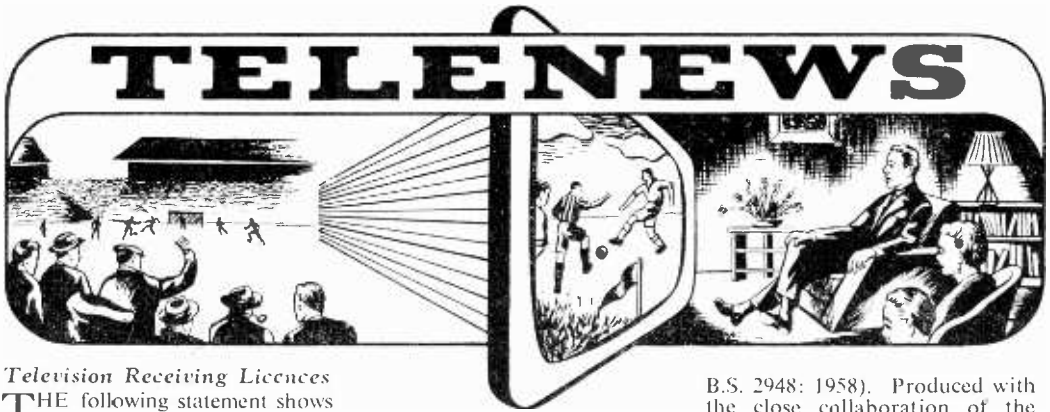
MAINS TYPES. RM1 125 v., 60 mA., **4/9**; RM2 125 v., 100 mA., **5/6**; RM3 125 v. 120 mA., **7/6**; RM4 250 v., 250 mA., **16/-**; RM1B Type 250 mA, **17/6.** RM5, 250 v., 300 mA., **21/-.**

MAINS TRANSFORMERS. Made in our own Workshops to Top Grade spec. Fully interleaved and Impregnated. **RADIO AND AMPLIFIER TYPE.** 250 v., 60 mA., F.W. sec. 5 v. or 6.3 v., 1 a. post, 6.3 v., 2.5 a., set Htrs., **22/6**, etc., **C.R.T. HTR. ISOLATION TYPE.** Low leakage with or without 2½ v. sec., boost voltage. Ratio 1:1 or 1.25, 2 v., **10/6**; 4 v., **10/6**; 6.3 v., **10/6**; 13.5 v., **10/6.** Ditto with mains primaries 200/250 v., **12/6.**

SPECIAL TRANS.—Wound to your requirements.

TRANSISTORS

Min. surplus PNP Junction type.
Audio Type, 800 kc/s, 250 m.w., **9/6.**
R.F. and L.O. Mixer Type. 2.5 Mc/s, **19/6.**
All tested and guaranteed.
Transistor Components. Midget I.F. transf. 315 kc/s, **5/-**; Ferrite Slab Aerial (Med. range), **13/6**; M. and L.W. Osc. and 1st I.F., **11/6**; Push Pull interstage transf., **8/6**; Push Pull output transf., **8/-.**
M Coil Earpiece, 2in. diam., 150 ohm, **4/9.**
Bal. Arm. Phone Inserts, 1½in., 50 ohm, **3/9.**



Television Receiving Licences

THE following statement shows the approximate number of Television Receiving Licences in force at the end of February, 1958, in respect of receiving stations situated within the various Postal Regions of England, Wales, Scotland and Northern Ireland.

Region	*Total*
London Postal	1,572,686
Home Counties	979,358
Midland	1,289,079
North Eastern	1,283,271
North Western	1,121,777
South Western	614,685
Wales and Border Counties ...	458,040
Total England and Wales ...	7,318,896
Scotland	592,194
Northern Ireland	83,633
Grand Total	7,994,723

TV Sales in January

SALES of television receivers in January, 132,000, were 11 per cent. higher than in January, 1957, according to the monthly retail survey, published recently, of the British Radio Equipment Manufacturers' Association.

Thee proportion of hire purchase and credit sales fell for television receivers from 52 per cent. in December to 49 per cent. in January.

Southern Television

THE illustration on the right shows riggers working on the new I.T.A. low-power transmitter aerial on Chillerton Down, Isle of Wight.

This Belling-Lee aerial array is a four stacked folded dipole with a radiation pattern looking due north but wide to the east and west. It will be mounted on a temporary 75ft. mast.

The one kilowatt signal for testing purposes is designed to enable dealers in the area to align aerials and adjust sets, but with such a low power, reception will vary considerably throughout the service region.

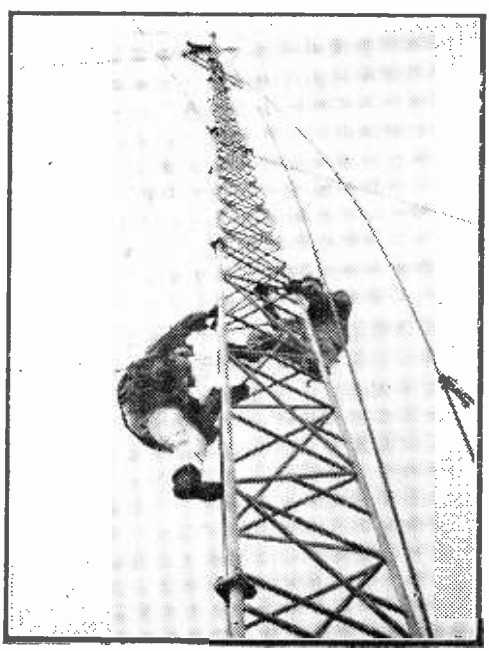
In the summer the main I.T.A. aerial mounted on a 700ft. mast reaching 1,250ft. above sea level will be completed for transmitting the new independent programmes from Southern Television at their Southampton studios.

New British Standards

IN the transmission and reception by television of films, slides and opaques it is necessary to allow for possible inaccuracies in the scanning of the image. Allowance has also to be made for possible inaccuracies (which may be appreciable) in the adjustment of domestic television receivers. Not all the available area on the film, slide or opaque can be used. If all essential pictorial and written matter is to be reproduced on a television screen, it must be contained within a restricted area at the centre of the image area.

Hence the importance of two new British Standards (B.S. 2962: 1958 and B.S. 2948: 1958). Produced with the close collaboration of the BBC and the I.T.A., they define in respect of films, slides and opaques to be transmitted the dimensions and locations of areas scanned, recorded and subsequently reproduced on the average receiver, the aim being to minimise cropping and to prevent the appearance of an undesirable edge band.

The standard for films relates to both 35 mm. and 16 mm. film, and that for slides and opaques relates both to 2in. square and 3¼in. square slides, to two sizes of opaques, and to roller captions.

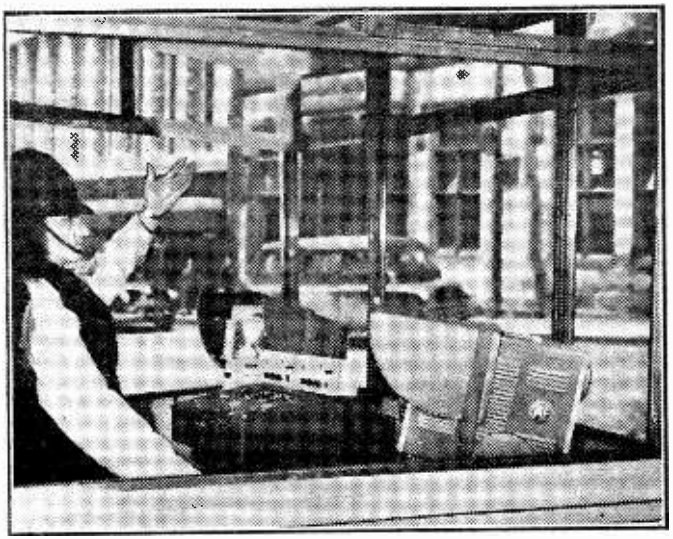


Riggers at work on the new I.T.A. aerial at Chillerton Down, Isle of Wight.

Copies of these British Standards may be obtained from British Standards Institution, Sales Branch. 2. Park Street. London. W.1. B.S. 2962 price 4s.. and B.S. 2948 price 3s.

London Power Increase

VIEWERS are reminded that the effective power of the London television station at the Crystal Palace has been increased to 200 kilowatts. The effective power is thus approximately doubled and the signal strength increased by about 40 per cent. This increase, though not important to viewers already receiving a good service. benefits those in the fringes of the service area where reception is liable to suffer from interference. A large proportion of the 15 million people within range of the Crystal Palace station are getting better pictures as a result of this change.



The operational point at Durham. where a traffic control policeman uses TV to regulate the flow of traffic.

Hungary's New Station

HUNGARY'S new 30 kilowatt television transmitter on Liberty Hill. overlooking Budapest, has begun experimental operations. Mr. István Kóssa, Minister of Transport and Postal Affairs told Budapest newspapers.

"The new station will transmit between eight and 12 o'clock in the mornings and two evenings a week," he said. "It will continue experimental relays until the quality of its transmission surpasses that of the present 1kW transmitter."

The introduction of the new transmitter means that people living within a radius of 60-75 miles of the capital can now receive Budapest programmes.

Mr. Kóssa said that television links between Budapest and Vienna and Bratislava are to be established this year. "And by 1960 an exchange of television programmes will be possible with the Soviet Union." he said.

"We are also planning to relay events from the 1960 Rome Olympics." This means in effect that Hungary will be able to receive television programmes from all Europe.

Silver Medal for Cliff Michelmore

THE Television Society's Silver Medal. instituted in 1948 for rewarding outstanding artistic achievement in television. has this year been presented to Mr. Cliff Michelmore. the popular compere of "Tonight."

The award will be made at the Society's annual dinner at the Dorchester Hotel. Park Lane. on May 16th by Sir George Barnes. the President.

Previous winners of the Silver Medal. which bears the inscription "For Outstanding Artistic Achievement" and the Society's badge, include Mr. Peter Scott. Dr. Glyn Daniel. Mr. Eric Robinson and Mr. Alfred Wurmser

More Marginal Gains for BBC

AVERAGE daily viewing figures for February show narrow gains to the BBC. During February. the I.T.A.'s share of daily viewing declined perceptibly in London and Midlands areas from January levels. but hardly significantly in Scotland and the North.

I.T.A. SHARE

	Feb.	*Jan.*	*Dec.*
LONDON	67½%	71%	72½%
MIDLANDS	72½%	75½%	76%
NORTH	69%	70%	69½%
CENTRAL SCOTLAND	67½%	69%	69%

In South Wales and the West. the I.T.A.'s share for February was 54½ per cent.

In London and the North. total average daily viewing was some 8 per cent. higher than during February a year ago: but in the Midlands it was about 5 per cent. lower.

European Television Exhibition

RUSSIAN television films will be shown at the 1st European Television Exhibition at Park Lane House from May 19th to 24th.

They have been made by Finlandia KUVA OY. Finland's leading film company. who will be among the Continental exhibitors.

In recent months Finland has become increasingly popular for making films. and during the summer months the long hours of light enable technicians to work 10 or more hours a day outdoors. This cuts film-making costs considerably as fewer days have to be spent on location.

Several of Europe's leading contractors will also be at the exhibition. Among them are: No. 1 Europe. the new Paris station opening on May 1st. Tele-Saar and Sernsehwerbung Norbert Handiwerk of Munich.

The Television Society

THE Society has changed its address and all future communications should be addressed to 166. Shaftesbury Avenue. W.C.2.

News From the Trade

The Belling-Lee "Golden V"

WITHIN the last two years many BBC and I.T.V. television transmitters have increased their power. Television receiver manufacturers have been able to increase the sensitivity and improve the automatic picture control in their sets with the result that many more viewers reside in what is known as "areas of high signal" and can therefore manage with less sensitive aerials, either in their lofts or even attractively styled aerials for use in the same room as the receiver itself. These indoor aerials are ideal where there is a strong picture uninterrupted by flashes and "snow" caused by local interference.

One of the most popular of these is the Belling-Lee "Golden V" broad band aerial for BBC, I.T.V. and BBC/FM.

True, all is not gold that glitters, but the telescopic elements are genuine gold plated—and look it. Standing up from their highly polished black base and gilt bezel, the overall appearance is one of quality. There is nothing cheap about it, although it is very good value for two guineas.

The "Golden V" is designed to stand on top of the receiver, which is cannot damage because of its non-scratch, non-slip base, or on the corner of a near-by mantelshelf or table, or to hang on the wall.

It will be appreciated that it would be unreasonable to expect such an aerial to give optimum results just by setting it up anywhere, anyhow. It should be moved about, and the angles and length of the elements should be adjusted until the best possible picture is obtained. If the signal is strong enough, and the location relatively free from interference, there should be a combination of element lengths and angles and position to provide a reasonable reception from both BBC and I.T.A.—Belling & Lee Ltd., Great Cambridge Road, Enfield, Middlesex.

Peto Scott Model TV.1422

THIS is a 14in. 19-valve receiver embodying the high standard of workmanship in Peto Scott products. The receiver is designed for easy service and it is possible to replace any component without removing the chassis from the cabinet. Clean layout with tag panel assemblies, the receiver incorporates two special features (1) a delayed A.G.C. system giving optimum picture quality under all conditions and (2) an automatic self-locking synchronisation circuit which prevents line-tearing. A Mullard 14in. electrostatic self-focusing tube type MW.36-20 is fitted. Wrap-round cabinet finished in high-gloss walnut veneer, with front and side controls for easy access, front loudspeaker and maskless tube. Dimensions: height 16¾in., width 17in., depth 16½in. Price 56 gns., with 2 gns. extra for the legs, if required.—Peto Scott Electrical Instruments Ltd., Addlestone Road, Weybridge, Surrey.

G.E.C. Price Reduction

THE price of the G.E.C BT.3251 21in. table model television receiver has been reduced to £97 13s. (£69 10s. 9d. + £28 2s. 3d. P.T.) This represents a total list price reduction of £6 6s.—G.E.C. Ltd., Magnet House, Kingsway, London, W.C.2.

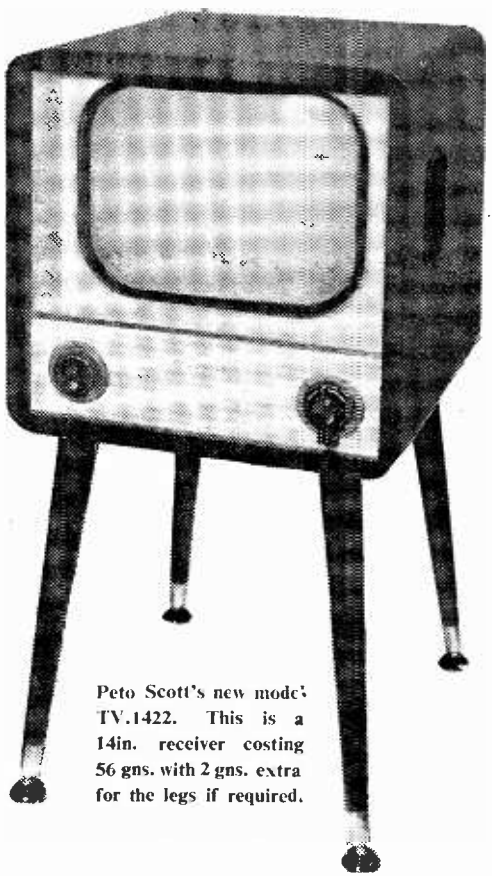
Sharp-cutoff Tetrodes

R.C.A. offer to equipment manufacturers the 2CY5 and 6CY5 sharp-cutoff tetrodes of the 7-pin miniature type. These valves are designed for use as radio-frequency amplifier tubes in V.H.F. tuners of television receivers.

The 2CY5 and 6CY5 feature high transconductance (8,000 microhms) to provide for high gain per stage with corresponding reduction in equivalent noise resistance, and a high ratio of plate current to grid-No. 2 current (7 to 1) to provide good signal-to-noise ratio. In addition, these valves provide excellent performance at relatively low plate and grid-No. 2 voltages.

The 2CY5 and 6CY5 utilise double base-pin connections for the cathode to reduce effective lead resistance and inductance and to facilitate isolation of the input and output circuits.

These valves, which differ only in their heater



Peto Scott's new model TV.1422. This is a 14in. receiver costing 56 gns. with 2 gns. extra for the legs if required.

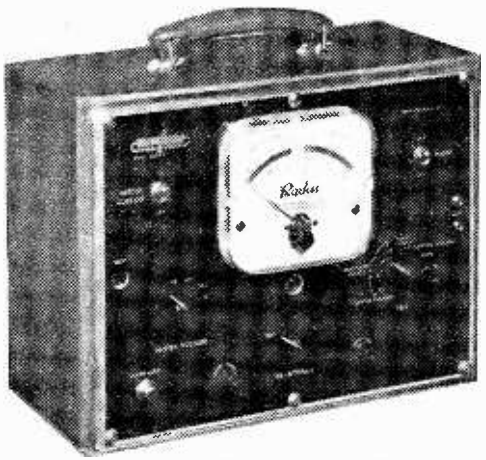
voltage and current. utilise heaters having controlled warm-up time to minimise voltage unbalance during starting in TV receivers employing series heater-string arrangements.—R.C.A. Gt. Britain Ltd., Lincoln Way. Windmill Road. Sunbury-on-Thames.

Tube Tester/Reactivator

A NEW and much improved version of the well-known Radar cathode ray tube tester/reactivator is introduced with many additional important features.

Primarily intended for testing television picture tubes. it also incorporates facilities for reactivation by a new pulsing method which gives a visual indication when the process is complete.

Tests that can be carried out include heater current measurement; inter-electrode leakages and



The new Radar Tube Tester/Reactivator, Model 202.

emission. The latter is achieved by measuring the final anode beam current. thereby giving a true emission reading.

Inter-electrode leakages can also be cleared by a "clear leak" device.

In addition. model 202 contains all the facilities required for a check on the potentials supplied to the tube while operating in the receiver. Selected ranges are available to measure heater current (0-25v. A.C.). gun potentials (0-500v. D.C.) and EHT voltage (0-25 kV).

Resistances up to 100 Megohms can be increased and the instrument therefore constitutes a valuable test set for TV servicing.

Model 202 is supplied with a universal socket unit. test leads and EHT probe at £39 net trade.—Waveforms Ltd., Radar Works, Truro Road. London, N.22.

The Dale "Banner" Aerial

MEADOW-DALE announce a completely new development in aerial design, using "printed circuit" technique, i.e., the elements are thin foil mounted on a tough Kraft Paper support. It is a full 5-element array, having reflector, folded dipole aerial, and three directors. Performance characteristics are equal in sensitivity and directivity to a conventional 5-element array.

Despatched as a roll 2in. diameter × 30in. long. the aerial is ready for immediate use when unrolled. The size when extended is 45in. × 30in. It is intended for inside use only. and can be suspended on cords in a loft, when its full directional properties can be exploited. or it can be used as a temporary or portable aerial for use in a sick-room. or a room not wired for television. In flats or tenements where outside aerials are not permitted it can be pasted to a wall and papered over. The instructions show how to obtain best results in such circumstances. Large eyelet holes pierced along one edge of the aerial act as a cord-grip to prevent the weight of the cable hanging on the connections.

Under test in very adverse conditions of humidity the aerial has shown no deterioration. At the low price of 12s. 6d. retail the Dale "Banner" is an aerial of great possibilities.—Meadow-Dale Manufacturing Co. Ltd., The Dale. Willenhall. Staffs.

Universal Clamp

WOLSEY have developed a universal version of their 360 deg. clamp.

This is now manufactured in one model only and fits all masts from $\frac{3}{8}$in. to 2in. It has a greatly increased area of surface grip that is finely serrated. and provides infinitely variable flexibility for de-ghosting.—Wolsey Electronics Ltd., Cray Avenue. St. Mary Cray. Orpington. Kent.

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AT a time when practically everything is going up in price, Taylor Electrical Instruments have been able to reduce the prices, with immediate effect, of a number of Multirange Meters, i.e.:

Model 71A	reduced from	£13.15.0	to	£12.10.0 List.
Model 77A	,, ,,	£17. 0.0	to	£16. 0.0 ,,
Model 120A	,, ,,	£9.15.0	to	£9. 5.0 ,,
Model 122A	,, ,,	£9.15.0	to	£9. 5.0 ,,

—Tay'or Electrical Instruments Ltd., Montrose Avenue, Slough.

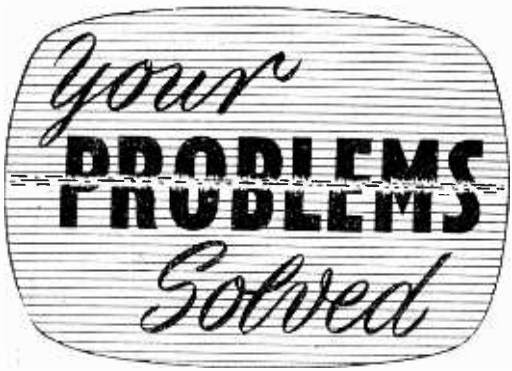
Antiference Free Insurance

ON April 1st Antiference introduced a completely new free insurance scheme which provides 12 months full cover from the date of installation of every one of their aerials. The important new feature of this scheme is that in addition to the free replacement of the damaged aerial or parts. all labour costs are fully covered. Whatever the damage and whatever the cause the owner is fully indemnified against:

1. Damage to his property and/or aerial. including all labour charges up to £250 any one event or occurrence.

2. Liability to third parties up to £50,000.

There is at present no other free insurance scheme to compare with this remarkable new offer which operates entirely without cost to the owner or dealer. It will be particularly attractive to dealers and aerial erection companies as they can guarantee 12 months' complete satisfaction to their customers who can recover any service or labour charges incurred in repairing or replacing an aerial.



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. 501 must be attached to all Queries, and if a postal reply is required a stamped and addressed envelope must be enclosed.

FERRANTI 17T4

The picture often flickers as though it were about to move up. I have cut this down to a minimum by increasing the "height," and also juggling with the vertical hold (increasing the height of the picture still more). The flicker itself seems to lengthen the picture momentarily, then it reverts to its usual size. On first switching on the picture is distorted until a "thick black bar" moves slowly across from right to left, when the picture becomes normal.—M. Coup (Hull).

You should check the ECL80 valve mounted on the rear right side of the main chassis. This should not be confused with the sound output ECL80 with which it may be interchanged. If there is no improvement suspect the frame blocking oscillator transformer.

BUSH TUG24

On switching the set on it takes five minutes for the picture to come into focus. Is this normal or is there a fault which you can name? On examining test card C the edges of all the vertical lines, black and white, are ragged no matter what is the position of the horizontal hold control. What can cure this? It should be stated that the overall gain of the receiver is low since the contrast control needs to be at maximum all the time. —T. D. Weston (Stoke-on-Trent).

You should change the PZ30 valve and then if necessary check the EF91 valves on the lower chassis. If the raggedness remains, check the aerial and feeder connections, also the knob adjustment to the right of the aerial terminals.

MASTERADIO TE7T/3

The picture faded out leaving a white line across the screen, which soon disappeared leaving a blank screen. No EHT. I treated a short to earth on the lead from the frame transformer to the anode of frame amplifier valve, causing the 4.7 KΩ resistor to burn out. I replaced this and EHT has returned but the raster has cramped lines at the bottom of the screen and widely spaced at the top. Also there is a hissing noise from the EHT connection on the tube and a purple discharge from the connector on the tube for about ¼in. all round to the tube itself where the cap it joined on. Also there are only 90 volts on grid 2 of the tube pin 10. Do you think any damage has been caused to the line and frame transformers, causing this?—E. F. Turner (Leeds).

You should apply a coating of silicone grease round the area where the discharge is taking place. The 12BH7 frame output valve should be tested.

FERGUSON MODEL 984T

The set has been giving a perfect picture but has now started giving trouble. Although a fairly good picture is obtainable, it is now impossible to get a picture which will show details clearly. If the contrast control is increased the picture shows loss of detail in the whites together with what appear to be shiny patches. I altered the interference limiter from low to medium but it made no difference except to start a loud hum so I replaced it in original position. As I have not got a service sheet I should be obliged if from this meagre description you could possibly tell me where to look for the fault?—H. Bullimore(East Grinstead).

The symptoms described definitely indicate a tube which is failing. This is the Mullard MW36-24 picture tube.

PHILIPS TUNER No. 423

I should be much obliged if you could help on the following points: (1) What is the I.F. output of this tuner and can it be adapted to my set which is sound 23.25 Mc/s and vision 19.75 Mc/s? (2) What is the best method of connecting it to my set which has a series coil from ECC81 mixer to grid of 1st I.F. valve via a 47 pF?—R. H. Wacrey (Liverpool).

The I.F. output of the tuner is 8-12 Mc/s., therefore considerable modification will be necessary to adapt it to your receiver. The oscillator coils will have to have some two turns removed and the output I.F. about four. If the modification can be effected, input to mixer valve, across cathode bias resistor, removing grid coupling capacitor, or tuned circuit, rendering oscillator section inoperative.

DYNATRON TV30CM

Since the turret tuner was found to be faulty and replaced by my Dynatron dealer under the guarantee, I find that there appears to be more "white after black" effect on the picture quality than there was when the set was new. My Dynatron dealer has since trimmed up the turret tuner exactly to the details given in the Dynatron service instruction manual, yet the picture quality still suffers, in my opinion, from too much "white after black." It seems that if the turret is trimmed to reduce the effect to a minimum on

I.T.A. picture, then when switching to the BBC channel the "white after black" is much more pronounced here. On test card a thick white line following the black can be easily seen several yards away and also "black after white" on the gratings. On the other hand, if the BBC picture is trimmed for minimum "white after black," then the I.T.A. picture is badly affected.—J. Clarke (Worcester).

The symptoms suggest that the receiver I.F. circuits need retuning. The black after white effect is typical of incorrect I.F. alignment, but at the same time the effect may be promoted by a component in the vision detector or video amplifier stage changing value.

PHILIPS 663A

When the set is switched on at first the frame is fully scanned with good linearity, but after about 15 minutes this shrinks just as though it had been turned down deliberately and does not go gradually. The height control will compress the raster further but the shape remains unaltered. I have got the circuit and have changed the following components without any improvement: ECH35 and EL33 valves, C103 10,000 pF, C104 32,000 pF, C105 .47 and R46 1.8 meg. I can only suspect now the scanning coils themselves owing to the raster shape due to shorted turns, but there is no excessive warming up. The focus remains good and the picture remains locked.—C. Frankland (Kempston).

We would advise you to check R107 and C106, the latter being effectively in series with the scanning coils and having a value of 47 μF. It is an upstanding can type electrolytic on top of the chassis: the can is isolated with an insulated band.

BUSH TV36C

I have a lack of width of about ¾in. each side and if I increase the brightness the picture will fill the screen, but then go right off; also very blurred and lack of brightness. If I reduce brightness the picture will return with lack of width.—W. J. Bartlett (Cardiff).

You should check the left side valves, PL81, PY81 and PY82.

EKCOVISION TC208

I have a frame timebase fault. The picture has narrowed down to a horizontal line approximately ¼in. in width. I have had the valves 20L1 and 10P13 tested and found O.K. I have no service sheet, and therefore ask you to help in the correction of this fault. Could you suggest as to what other components might be the cause of this breakdown? Also could you describe where to find the suspect components, as I am not certain as to the placing on the chassis.—Robert V. Hignett (Liverpool).

First of all ascertain if the height and linearity controls have any effect on the size of the frame scan. If they do it is reasonable to assume that the output (10P13) stage is in order. To check the oscillator stage, measure the voltage on the grid of the frame half of the 20L1. If oscillating this will be negative, but if faulty positive. The most likely cause of no oscillations is a faulty frame oscillator transformer, which may read all right cold. This is located on top of the chassis next to the plug carrying the wires to the scancoils.

BUSH TV24

All normal except line scan which shows the picture with a bright centre and overlapped in a very peculiar way. Also it only syncs with control hard anticlockwise whereas normally it syncs with control at centre of travel. Checks made: PL38, line amplifier, O.K.; ECL80, sync separator and line oscillator, O.K.; PZ30, rectifier and efficiency diode, O.K.; TC1, line drive adjusted; resistors connected with above valves checked, O.K.; capacitors checked for leaks, O.K.; resistance of line o/p transformer windings checked, O.K.; deflector coil resistance checked, O.K. Not checked: Tube; EY51; EHT voltage; capacitors for capacitance. Fault developed: for a few hours it was difficult to keep line in sync until over a period of about three minutes picture became as described. Suspect faulty line o/p transformer for shorted turns, although this does not appear to show on resistance check using Avo 7.—G. F. Handley (Lowestoft).

The fault suggests that the line hold control itself is open circuited at one end of the track. Reversing the connections may cure the trouble. The 820 KΩ resistor connected to pin 1 of ECL80 is also suspect, but as you say the line output transformer is undoubtedly to be suspected.

ULTRA VT917

The picture is breaking up and looks the same as when the set is off tune or the line hold control is slightly out of adjustment. On removing the aerial or switching to an alternative channel I get an irregular white pattern on the screen and a faint varying note on the sound. On a steady signal (test card) the black components of the picture seem to be jumping about a quarter of an inch to the right and then back again.—Frank V. Greenleaves (Wigan).

From your description we would say that you have a noisy valve in the turret tuner or common I.F. stage and you may be able to locate the faulty stage by a disturbance test using an insulated probe. The common I.F. stage is the 10F1 nearest the voltage adjustment resistor. If the brightness varies with the jumping you should also look at the A.G.C. circuit and check the tube for heater-cathode leakage.

EKCO TC162N

The picture is very fuzzy and figures are pulled to the right, or should I say parts of the figures, for instance, the mouth of a person is stretched out, the hair appears to flow away from the head, the eyes are in many cases black and pulled. I am using a converter on the set and these conditions apply to both BBC and I.T.A. May I add that these conditions also apply when the converter is removed entirely and the aerial is

(Continued on page 501)

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plugged direct into the set. Also a hum has developed in the sound; this hum does not vary and is on even if the aerial is disconnected.—A. N. Willoughby (Liverpool).

The fault you describe is a heater-cathode leakage on the tube, which can be cured by fitting a low capacity isolating transformer such as the plug-in "Nuray." Other types should be connected to the mains between chassis and the 230 volt tap on the voltage adjuster, whilst the 2 volt secondary should be wired to pins 1 and 8 of the tube after all previous wiring and components have been removed and taped off.

G.E.C. BT5146

This set gives quite a bright picture but with severe cramping at bottom of screen and less pronounced cramping on right-hand (looking at set) of screen. Varying of brightness control also changes the size and focus of picture—G. D. Hughes (Bridgend).

Check H.T. volts at C58 (120 μF). Should be 225v. If low, change metal rectifier. Also check KT36 line oscillator and output valve and C60 (50 μF) in cathode circuit of N37—frame output valve.

MURPHY V114

Picture perfect on switching on except for 16 or so white lines across top third of picture. After two or three hours, picture reduces at top and bottom slightly and slips, but is corrected by adjustment to frame hold. Most of the valves have been replaced.—F. C. Baldwin (Wealdstone).

The frame timebase, in which your trouble is situated, is on the top right-hand side of the inner chassis as you look in from the back. If you have already changed the T41 and Pen 45 check the 8 μF decoupler between screen grid and cathode of the Pen 45, and also the .25 μF coupling condenser between the slider of the frame linearity control and the grid of the Pen 45.

MURPHY V204

My tube failed two weeks ago and I have bought a "regunned" Mazda CRM152A. After installing same I found the picture quality very poor and gave a very small picture. I bought a new EHT rectifier valve but it made no difference. If I use the plug at the back of the set from 250-240 volts to 210-200 volts I get a near perfect picture with a ¼in. black band on the top of the picture. No adjustment can get rid of it. The sound is very good.—James Archibald (Kirkaldy).

You will probaby require a new metal H.T. rectifier and frame output valve. The latter is the 10P14, just behind the height control.

ULTRA V814

It all started by blowing fuses, and the picture started shrinking and getting dark; I got over this trouble by fitting a new rectifying valve U801. This brought the picture back to normal, until after a week, upon switching on the picture seemed to snap in and out of focus for a few minutes, after this everything was normal but this period has been getting longer, and sometimes may last for hours with stripes across the screen, some in and some out of focus. Could you tell me if one of the valves is at fault, and would I have to have them all tested or is there one or two that control this? I might add the sound is perfect.—F. C. Brown (Cardiff).

We suggest you look carefully to see if the picture goes larger or smaller when it defocuses. If it gets larger this points to a faulty U25 EHT rectifier which is soldered into the top of the line output transformer and subsequently bedded in wax. If it gets smaller then suspect the 20P4 line output valve or the U329 efficiency diode next to it. These are in the can on the front of the line output transformer.

EKCO T216

I get a full picture but it pulls to my right as I face the set. The result is a picture with a thick film over it and with the lines broken. Now and again, for no reason at all, I get a horizontal band about 1½in. wide across the screen which is perfectly clear. Recently I changed the 20F2, whose emission was poor, but it hasn't helped.—E. G. Smith (N.W.5).

The fault you describe is a heater-cathode leakage on your tube. The cure for this is an isolating transformer such as the plug-in "Nuray." If a mains type is used it is necessary to remove all existing wiring and components from the tube heater pins 1 and 8.

MURPHY V 114

Lack of width. The picture is approximately 2in. wide. I have renewed the Pen 46 with no improvement. I have also interchanged the T41 and DD41 valves and checked all resistors and condensers in the timebase (line). Would the trouble be in the line transformer? I have checked this for continuity and it appears O.K. but the secondary only shows a few ohms resistance; is this in order? H.T. voltages appear to be in order and smoothing condensers also.—H. S. Garrett (Wallington).

We would confirm that the most likely trouble is a shorted turn on the line output transformer. As this does not normally show on a meter the readings around the stage will be substantially those in the manual. There is unfortunately no simple way of checking other than fitting an exact replacement.

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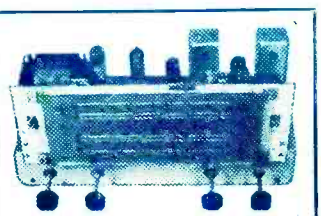

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