LINING-UP TV SETS

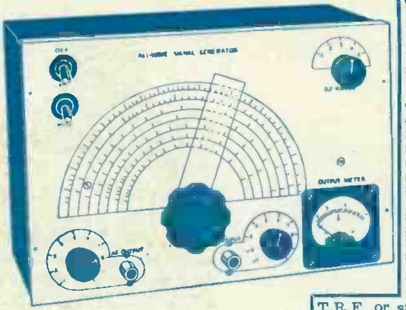
Practical Television

1/-

AND TELEVISION TIMES

NOVEMBER 1955

EDITOR: F.J. CAMM



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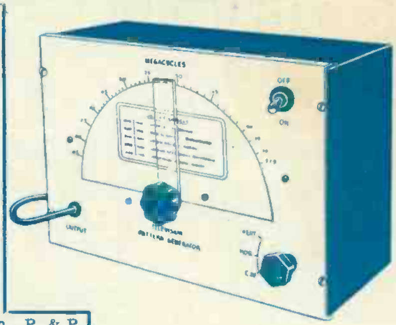

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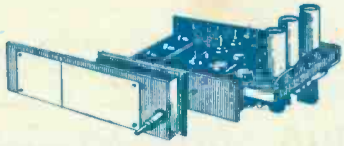

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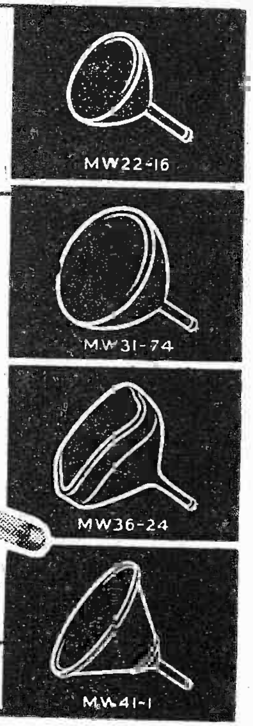

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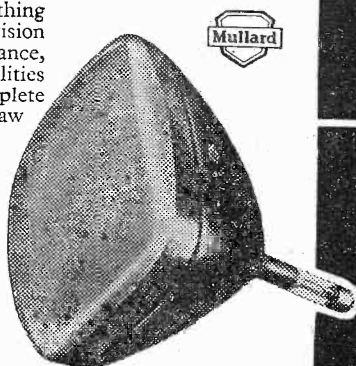

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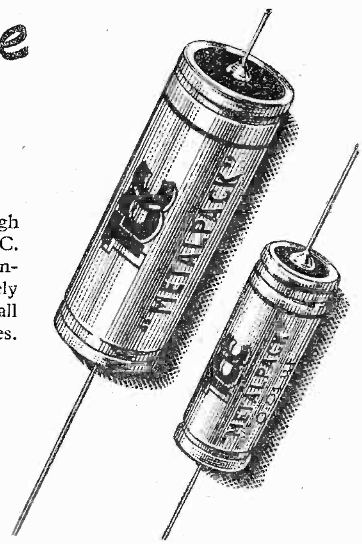

Cap. μF	Wkg. Volts D.C.		Dimns. inches		Type No.	List Price Each
	At 70°C.	At 100°C.	L	D		
·005	1,000	750	$1\frac{1}{2}$	$\frac{1}{2}$	CP45W	1/10
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·02	750	600	$1\frac{1}{2}$	$\frac{1}{2}$	CP45U	1/10
·05	500	350	$1\frac{1}{2}$	$\frac{1}{2}$	CP45S	2/1
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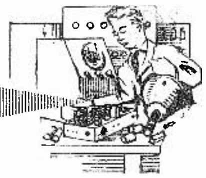

& TELEVISION TIMES

Editor : F. J. CAMM

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Vol. 6 No. 66 EVERY MONTH NOVEMBER, 1955

The Birth of I.T.A.

ON September 22nd a new era in TV entertainment was born—the first commercial TV programme to be broadcast in this country signalising the end of the BBC monopoly. Bearing in mind the technical excellence of the programme and what had been accomplished in the short space of nine months, it would be unfair adversely to criticise the maiden effort. The pictures were out of focus for part of the programme, and the introduction was altogether too lengthy, boring and ill-conceived. The selection of the Hallé Orchestra to play the new programme in was a mistake. If an orchestra was necessary at all, that was not the orchestra to pick, and the piece of music selected —Elgar's "Cockaigne"—was incongruous to the excitement of a first night. As an aside, we would say that the day of mass orchestras producing a volume of sound which could be equalled by an octet has passed. The Victorian vanity of a conductor ruling his empire has gone. The speeches also were not particularly brilliant for the occasion, and the guests at the Guildhall were obviously waiting for their dinner !

There can be no doubt that viewers generally appreciate this second choice of programme, notwithstanding the time occupied in drawing attention to commercial products. The quality of the advertising was poor and it was quite obvious that the firms concerned were anxious not to give offence by too blatantly hawking their wares. One could almost perceive the restraining hand behind the scenes, as if publicity were an unclean thing. Bearing in mind the high costs of programme time it is difficult at this stage to see how advertisers will get their money back, considering the transient nature of this form of publicity, as compared with more permanent forms of advertising such as the printed word. The advertising section of the programme was well below the standard of ordinary cinema screen publicity.

All new ventures, however, have their teething troubles, and we have no doubt that the I.T.A. will analyse the criticisms and improve the programmes as time goes on. The first year is a critical one, because if advertisers try the experiment and find that it does not pay, what then ? Certainly, commercial programmes have had the effect of gingering up the BBC, and we may expect, with their longer experience, a great improvement in the quality of their programmes, and an elimination of fifth-rate matter served up to viewers on the take-it-or-leave-it principle. Perhaps we may also see in specialist programmes specialists instead of showmen, and a variety of them too, not just one man in charge of a particular subject in perpetuity. We do not think that the I.T.A. will make the mistake of presuming that all the housewives in this country should receive their instructions at the hands of one chef, excellent though he may be. There are dozens of ways of preparing a particular dish, or of doing a particular job, and viewers are entitled to this variety of experience. We hope the I.T.A. will avoid too many dance bands and concentrate only on the top notchers.

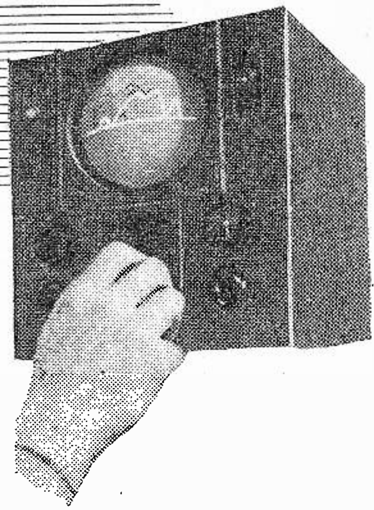
Last month's issue of this journal which contained a free gift blueprint for an I.T.A. adaptor rapidly went out of print, providing evidence that viewers are interested in receiving the alternative programmes, which are good for the trade, good for the BBC, and, therefore, good for viewers.

SITUATION VACANT

THERE is an opening on the editorial staff of this journal and our associated journal, *Practical Wireless*, for an enthusiastic young man aged 21 or thereabouts, with a knowledge of radio and television, who is interested in journalism and in making a career in it. His education must be of at least matriculation standard, he must have a fair knowledge of elementary electricity and magnetism, and be able to use tools.

Letters of application should be addressed to the Editor, PRACTICAL TELEVISION, Tower House, Southampton Street, Strand, and be marked in the top left-hand corner "Vacancy."—F. J. C.

ALIGNMENT OF TV RECEIVERS



MAXIMUM PERFORMANCE IS ONLY OBTAINED WHEN A SET IS PROPERLY LINED-UP. THE PRINCIPLES ARE DEALT WITH HERE

THE desirability of obtaining alignment instructions for any particular receiver is intensified from the television point of view. Indeed, we would go so far as to say that if 100 per cent. performance is to be expected, particularly on a receiver which is designed for single sideband (sometimes known as vestigial sideband) working, full details of the types of tuned circuits and their mode of alignment must be obtained before alignment is attempted.

In view of this, therefore, this article can only be of a general nature, though, nevertheless, in order to provide the experimenter with an insight as to how alignment of a commercial television receiver is tackled, we shall briefly consider the alignment process related to a typical receiver of modern styling.

Before we start considering the practical approach to the problem let us first get clear in our minds the overall response which is expected of a correctly aligned receiver. From the vision aspect the tuned circuits must be adjusted so that the overall response of the receiver embraces a frequency spectrum of sufficient width to avoid attenuation of the higher frequency picture signals. In the case of the British 405-line system the highest frequency picture signals fall in the region of 3 Mc/s. Therefore, if both sidebands are radiated by the transmitter they will extend to plus and minus 3 Mc/s, about the carrier frequency as illustrated in Fig. 1.

Clearly, then, in order for a receiver to respond properly to a vision signal of this kind (double sideband) it is essential for the tuned circuits to be aligned so that an overall vision response curve of the kind shown in Fig. 2—full line—is produced. The main characteristics, as will be seen, are (1) a substantially level response within the vision passband,

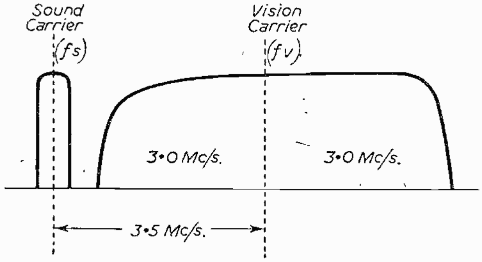


Fig. 1.—A double sideband transmission in which the sidebands extend to plus and minus 3 Mc/s about the carrier frequency (fv). Showing also the sound transmission about the sound carrier (fs).

and (2) the limitation of response within the passband coupled with the response falling to a low level at the sound carrier frequency.

Such characteristics can be achieved in several ways so far as the arrangement of the tuned circuits is concerned. With T.R.F. receivers a popular method is to "stagger-tune" the inter-valve coupling circuits. This method consists of arranging the tuning point and response characteristic of each tuned circuit about the vision carrier frequency so that a substantially flat overall response curve is produced. The fall off in response at the sound carrier frequency is catered for by means of rejector circuits which, being tuned accurately to the sound frequency, attenuate the response at the desired point. The overall response curve so formed by this method is shown in Fig. 3.

Less complex circuits simply make use of excessive damping of the tuned circuits, each being tuned on or near the vision carrier frequency. Excessive damping, of course, limits the response and widens the top of the response curve. It is for this reason that receivers using this method and employing a given number of valves are somewhat less sensitive than their stagger-tuned counterparts.

Moreover, although rejector circuits are employed to cause a fall in the response at the sound carrier frequency, the high-frequency end of the vision response tails off gradually. Therefore, receivers of this type are more prone to respond to interference which falls slightly outside the vision passband—such as sound interference from an adjacent television channel.

Nevertheless, receivers of this simple kind present few problems so far as alignment is concerned; generally speaking, it being necessary only to adjust the vision coils for maximum picture brightness, the sound coils for maximum sound output and the rejector coils for minimum sound interference on vision.

The Sound Response

The sound channel response (broken line) is also shown on the diagram of Fig. 2. The flat-top characteristic is less important here than in the vision section and, of course, the bandwidth is considerably less. Even so, compared with bandwidths of broadcast receivers, bandwidths in the region of plus and minus 0.5 Mc/s are often used for television sound channels.

Bandwidths of this magnitude are desirable for two reasons: first, if impulsive interference is permitted to pass through the R.F. section with the minimum of distortion it is considerably easier to suppress when it arrives at the detector end, and distortion of the interference pulses is introduced in a channel of limited bandwidth (the reader can obtain further information in this respect by referring to "Interference Suppression," Gordon J. King, PRACTICAL TELEVISION, November, 1951). Secondly, a wide sound bandwidth permits a certain tolerance of the oscillator frequency before distortion becomes evident. This, of course, applies only to superhet receivers, it being quite normal for the oscillator frequency to drift before the receiver has reached a reasonably stable operating temperature. A narrow sound bandwidth would show up such an effect in the form of sound distortion, something after the style of distortion produced on a broadcast receiver when it is tuned slightly to the side of a modulated carrier—this is often known as "sideband screech."

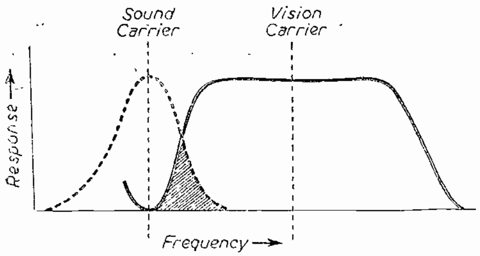


Fig. 2.—The overall response curve of a typical receiver. The vision response full line, and the sound response broken line. The shaded area shows the sound response curve embracing the vision channel passband.

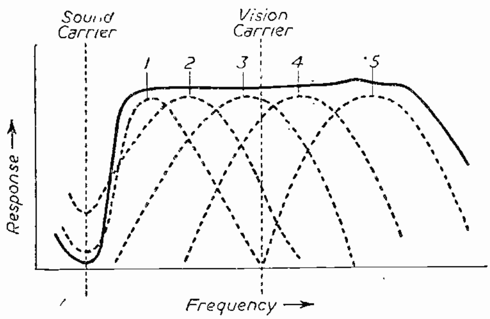


Fig. 3.—Showing how stagger-tuning in the vision channel can produce a substantially flat response curve. This is due to the added effect of five tuned circuits resonating about the vision carrier frequency.

A conflicting factor in this respect is unfortunately that a wide sound bandwidth causes a section of the sound response curve to fall in the vicinity of the low-frequency end of the vision signal; this is shown by the shaded area on Fig. 2. If an excessive response within the vision passband is registered on the sound response curve, some of the vision signal is obviously going to get into the sound R.F. circuits and arrive at the loudspeaker with the normal sound modulation. This is characterised by a buzzing or hum superimposed on the sound and which alters in intensity as the white-level content of the picture changes. The effect is referred to as "vision interference on sound."

For this reason it is essential to tune the sound circuits spot on frequency, for if there is any tendency for the response to rise towards the high-frequency side of the sound carrier an even greater area of the sound response curve will fall within the vision passband. In practice the problem is further facilitated by reducing slightly the response towards the low frequency side of the vision curve—this normally falls off between 2.0 and 2.5 Mc/s without seriously detracting from the quality of the picture.

The Alignment of Double Sideband T.R.F. Receivers

Now that we have in mind the overall response curves necessary for good television reception, and the factors which determine their shape, little difficulty should be experienced in aligning the less involved T.R.F. receiver.

To do the job properly we shall, of course, require a reliable signal generator which is capable of tuning into the television band, a means of indicating R.F. signal in the vision channel and an indicator for determining either sound output or R.F. signal in the sound channel. Methods by which a multimeter can perform the last two functions were described in previous issues.

It will be remembered that we can either use an A.C. meter connected to the load of the sound output valve or we can obtain an indication of R.F. voltage in the sound channel by the use of a sensitive D.C. milliammeter connected in the detector load circuit. In the former case it is necessary to modulate the signal from the generator, though this is not essential with the latter method.

From the vision channel point of view an unmodulated signal is always used, and the output reading is taken from the detector load or, in certain cases, from the video amplifier. The alignment data supplied by the manufacturer concerned stipulate the most reliable method of obtaining an output indication, and, where possible, this should be followed; in cases of doubt, however, a current or voltage indication should be taken from the detector load. If it is desired to use as an indication the voltage across the load the meter should possess a resistance of at least 20,000 ohms per volt.

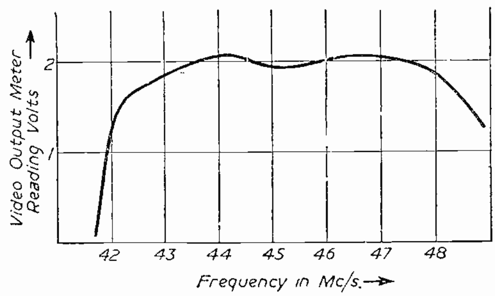


Fig. 4.—Showing how a graphic representation of an overall response curve can be obtained by plotting the generator frequency within the vision passband against the reading given on the video output indicator.

The actual output levels given on the sound and vision meters should be limited to avoid overloading of the valves, and as each individual circuit is brought into alignment the output of the signal generator should be reduced to keep the indicated output level substantially constant.

Generally speaking, it is desirable to align the vision before the sound channel, and this being the case a high resistance multimeter can first be connected as a vision output indicator and then finally used as sound output indicator.

It should be mentioned that for all alignment procedures in which a signal generator is used—as opposed to a wobbulator and oscilloscope, which, incidentally, will be considered later in this series—the vision and sound output indicators are always connected as described above. The difference in alignment procedure between receivers lies solely in the mode of tuned circuit adjustment.

In a receiver which employs stagger-tuning it is general practice to align the tuned circuits, working back from the detector to the aerial. Each circuit is tuned to a given frequency, and that signal given by the generator is injected into the control grid of the associated valve and the relevant coil adjusted (generally by means of an iron-dust core) for maximum output on the vision indicator.

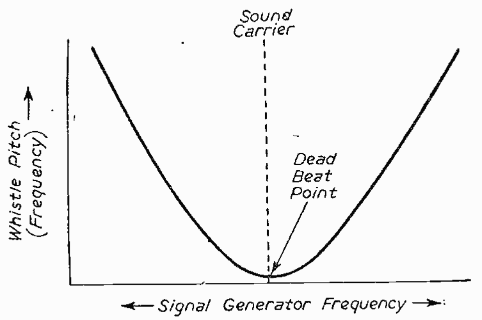


Fig. 5.—A diagrammatic illustration of the dead-beat point.

The alignment frequency for each tuned circuit is normally given by the maker in the receiver's service data. It is not possible to offer any precise information in this respect, as the tuning frequencies vary from model to model. If alignment data seem non-existent, however, it is often possible to obtain a fairly linear response curve after experimenting, by tuning the circuits to various frequencies in an endeavour to get their individual responses to merge into the shape of Fig. 2.

It is often best to do this by tuning each circuit to the vision carrier frequency (45 Mc/s in the case of London) and then altering the generator frequency, say, to 44 Mc/s and using this as a peaking frequency for one of the coils. The remaining coils should, of course, be detuned by a small frequency plus or minus 45 Mc/s in the same way until the desired response curve is achieved.

The characteristics of the overall response curve can be fairly accurately assessed by connecting the signal generator to the aerial input terminal and observing the degree of rise and fall of the output indicator as the generator is tuned over the passband range of the vision channel. An excessive peak within the passband can often be flattened out by slightly altering the tuning of one or more of the coils. To give one an idea as to how the response curve looks on paper a graph can be readily resolved by plotting the frequency at, say, 0.25 Mc/s intervals within the passband against the reading given on the output indicator (see Fig. 4).

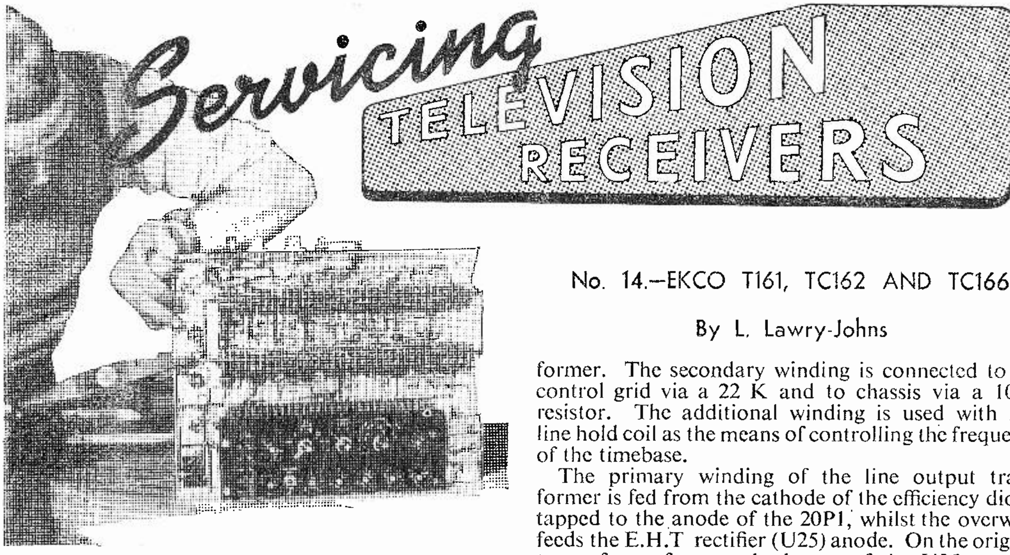
The alignment process must be concluded before making graphic measurements of this kind. To conclude, we have yet the sound rejector circuits and the sound tuned circuits to deal with. In some T.R.F. receivers the sound rejectors or sound traps operate in direct association with a tuned signal circuit, and in receivers of this kind it is often essential to adjust the rejectors before the signal circuits in order to avoid instability.

The rejectors are easily adjusted, however, by injecting a generator signal at the sound-carrier frequency (41.5 Mc/s London) into the control grid of the associated valve, and then adjusting the core of the rejector coil for minimum reading on the video output indicator. It is essential that the generator frequency is spot on 41.5 Mc/s for this adjustment. To be absolutely certain on this point it is a good idea loosely to couple the output of the generator to the aerial coil in the receiver, and then, with the receiver switched on and receiving sound, tune the generator very slowly in the region of the sound frequency, as indicated on the scale, until a whistle is heard from the loudspeaker. If the generator is very carefully and slowly tuned over this point the pitch (frequency) of the whistle will be heard gradually to fall until it becomes inaudible; if the tuning is slowly continued over this point the whistle will be heard gradually to rise again in pitch until it goes outside the range of hearing.

This is known as heterodyning the generator signal with the sound signal, and when the generator is set to the position of inaudibility between the two whistles (the dead-beat point) the output of the signal generator is of exactly the same frequency as the sound signal —41.5 Mc/s in the case of London. This is illustrated diagrammatically in Fig. 5.

For alignment of the sound channel it is necessary to disconnect the video output indicator, reconnect it in suitable form to the sound detector or output stage, inject a signal from the generator to correspond to the frequency of the sound channel into the aerial terminal, and adjust the cores in the associated coils, working back from the detector, for maximum deflection on the output indicator.

(*To be continued.*)



No. 14.—EKCO T161, TC162 AND TC166

By L. Lawry-Johns

THESE receivers employ a 12in. tube and are five channel superhets. The differences are in the cabinet presentation and the type of tube fitted. The T161 and TC162 employ a Mazda CRM121B, whilst the TC166 is fitted with a CRM123, which is an aluminised tube.

A very similar model is the TU169 which is an A.C./D.C. receiver, the tube heater being series connected in the valve chain instead of being separately heated from a small mains transformer as in the other models. Whilst on the subject of this transformer it may be of interest to note that an additional secondary winding supplies the heater sockets of the preamplifier panel. Also the primary is tapped, the two series heater chains being taken from the lower voltage tapping. Fig. 2 shows the arrangement, and it will be noted that both heater chains are taken to chassis through the V13 6L18 frame output valve heater. Thus a .1 amp. chain and a .2 amp. chain combine to make the heater current of .3 amp., which is required by the 6L18.

The method of using the U801 rectifier V16 is of interest. One section is used as an H.T. rectifier with two anodes connected to the high voltage tapping of the transformer via two 50 ohm surge limiting resistors, whilst the other section is utilised as the efficiency diode with its two anodes strapped and connected to a winding on the line output transformer. This section supplies the H.T. to the line and frame timebases at approximately 255 volts.

Line Timebase

This is of the economical single valve type in that the 20P1 V14 is used as the line oscillator and amplifier output as shown in Fig. 3. It will be noted that tappings are provided on the line hold winding to enable the control to be set at the centre of its travel. On earlier models a different arrangement was provided whereby the winding was optionally chassis connected. These coarse adjustments are to provide for variation in characteristics which may occur between various 20P1 valves. It will also be seen that the screen grid is fed via the line scan coils, a 3.3 K resistor, and the primary winding of the line oscillator transformer. The secondary winding is connected to the control grid via a 22 K and to chassis via a 10 K resistor. The additional winding is used with L19 line hold coil as the means of controlling the frequency of the timebase.

The primary winding of the line output transformer is fed from the cathode of the efficiency diode, tapped to the anode of the 20P1, whilst the overwind feeds the E.H.T rectifier (U25) anode. On the original type of transformer, the heater of the U25 was fed from an additional internal winding and more will be said of this in the fault-finding section of this article. The cathode of the U25 is taken to the C.R.T. anode via a 100 K resistor and the voltage is smoothed by a .001 μF 12.5 kV. condenser. The bleeder resistor is of the Metrosil type, which ensures good E.H.T. regulation at 8.2 kV.

Coil L20 is the width control and the normal H.T. line voltage is prevented from reaching the line scan coils by the inclusion of the 50 μF condenser. A leak through this condenser would have the effect of shifting the picture horizontally.

Frame Timebase

This consists of a 6F15 (V12) oscillator, triode connected, i.e., screen grid is strapped to the anode, and the 6L18 triode output. On early models the frame oscillator transformer consisted of two wind-

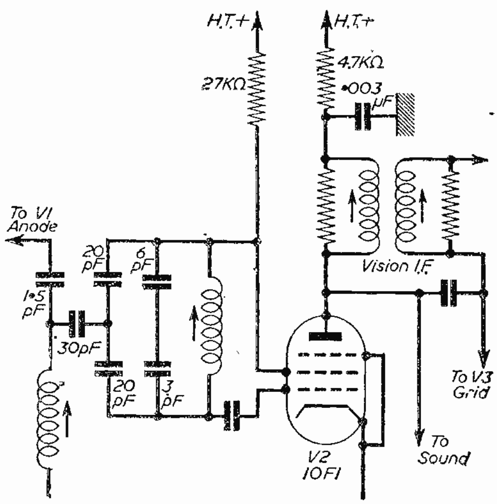


Fig. 1.—The Frequency Changer Stage.

ings only, these being the primary in the anode circuit of V12, whilst the secondary connects the control grid to the frame hold control via a 2.7 MΩ resistor. On later models, however, a third winding is included, this being directly in the anode circuit of the sync separator V11 (20F2). The purpose of this winding is to obtain a better frame lock in weak signal strength areas. The frame output transformer is very straightforward, the primary being in the 6L18 anode circuit, whilst the secondary, shunted by a 470 ohm resistor, feeds the frame scanning coils. The cathode of the 6L18 is taken to chassis by a 1.2 K resistor, shunted by a 500 μF condenser. Linearity control is by varying the feedback from the anode to control grid as shown in Fig. 4. There are several faults which regularly occur and these will be itemised later.

Sync Separation

This stage is of conventional type, the screen voltage being held low by a potential divider consisting of a 220 K and a 33 K resistor from H.T. to chassis, the screen being fed from the junction and being decoupled by a 2 μF electrolytic condenser, line pulses are fed from the anode circuit to the control grid of the 20P1 via a 5 pF condenser, whilst the frame pulses are fed to the frame oscillator transformer as previously described. Picture pulses are prevented by the self biasing action of the .1 μF and 470 K grid components, and the extremely short grid base of the valve occasioned by the low screen voltage.

C.R.T.

This is cathode modulated from the anode of the video amplifier via a choke, resistor and capacitor network. A 100 K resistor joins the cathode to the heater and the purpose of this is to maintain the heater voltage at approximately the same potential as the cathode to minimise the risk of heater/cathode insulation failure. The control grid is maintained at the required voltage by the brightness network which consists of two 100 K resistors, the lower of which is variable; this means that the voltage is variable between approximately 110 volts and zero (chassis).

H.T. Supply

The rectifier arrangement has already been described and the cathode of the H.T. section is smoothed by a 64 by 120 μF condenser and the usual choke. Some 240 volts should be read at the 64 μF, and 220 volts at the 120 μF section, this being the normal H.T. line. The fuses shown in Fig. 2 are 1.5 amp. and this rating should not be exceeded.

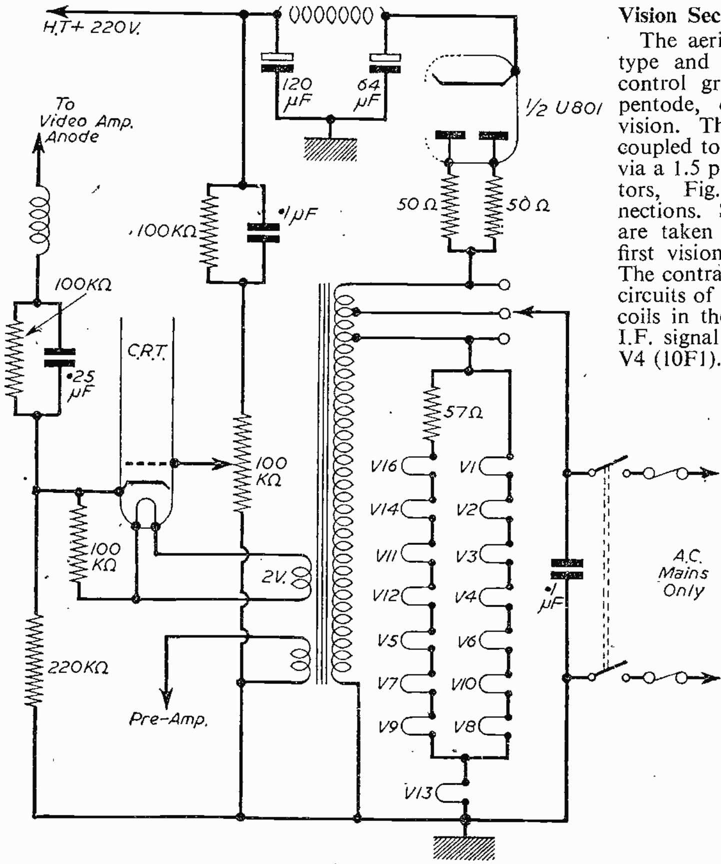


Fig. 2.—Mains circuit showing heaters and C.R.T. supply of the T161, TC162 and TC166.

Vision Section

The aerial input socket is of the coaxial type and the tuned aerial coils feed the control grid of V1 which is a 10F1 RF pentode, common to both sound and vision. The anode circuit of this valve is coupled to the frequency changer V2 (10F1) via a 1.5 pF, a 30 pF and two 20 pF capacitors, Fig. 1 showing the actual connections. Signals at intermediate frequency are taken from the anode circuit via the first vision I.F. transformer to V3 (10F1). The contrast control operates in the cathode circuits of both V1 and V3. A further set of coils in the anode circuit of V3 couple the I.F. signal to the final vision I.F. amplifier V4 (10F1). The last set of I.F. coils couple to the 20D1 double diode, one section of which used as the video detector (V5) whilst the other diode functions as the vision interference limiter. The detector circuit is conventional, the final I.F. secondary winding feeding the anode and the cathode being coupled to the video amplifier control grid via a choke/resistor network.

The video amplifier is referred to as V6 and is another 10F1 pentode. This has its cathode bias resistor shunted by two capacitors. One is a 680 pF fixed type whilst the other is a 700 pF maximum variable. This is fitted as a video corrector to ensure that the video response is that desired to obtain best picture quality. Whilst this is preset and should not require attention, a slight adjustment may help to remove "ringing."

This shows as black after white and white after black. A very small amount of this "ringing" is often beneficial as it appears to define outlines and therefore enhances the focus.

The anode of V6 is connected to the sync. separator, cathode of C.R.T. and interference limiter by various means and to the H.T. line by a 6.8 kΩ resistor. Signals to the sync. separator are fed via a 10K resistor to the .1 μF coupling and charging condenser, whilst the C.R.T. cathode receives its modulation via a resistance capacitor network and on most models through a filter choke.

As already stated, the second section of V5 is employed as the vision limiter and the cathode of this diode is connected direct to the V6 anode. The anode is connected to the cathode by a 4.7 MΩ resistor shunted by a 1 MΩ which may or may not be in circuit depending upon the position of the interference limiter adjusting screw at the right-hand rear of the receiver. When this screw is screwed clockwise the limiter is less effective and therefore peak whites are passed to the C.R.T. Unscrewing will result in interference pulses being attenuated but the peak whites of the picture signal will also be slightly affected. The 1 MΩ resistor is shunted across the 4.7 MΩ by the screw action, a .1 μF completes the circuit to chassis.

Sound Channel

A 2 pF capacitor couples the V2 anode to the control grid of V7 which acts as the first sound I.F. amplifier, a 10 K resistor decoupling the anode and screen in conjunction with a .003 μF capacitor to chassis. The first I.F. transformer couples the sound signals to V8 which, as V7, is a 10F1 pentode. From the anode of this valve signals are fed to the sound detector, one section of a double diode 20D1, via the final I.F. transformer. This is connected to the anode of the diode, the cathode being loaded to chassis by a 68 KΩ resistor. A .01 μF capacitor couples the cathode of the detector diode to the cathode of the second diode which as in the vision section is used as the interference limiter or noise suppressor. The cathode of this section is taken to chassis by a 1 MΩ resistor. The sound signals are taken from the anode of this section which is connected to H.T. by a 4.7 MΩ resistor. As in nearly all receivers employing this type of series limiter distortion of sound is often caused by this resistor going high. When its resistance rises to almost infinity, almost a complete loss of sound will result, perhaps only audible as a faint "cracked" response from the speaker sometimes leading one to suspect the sound output transformer. However, to return to the circuit, sound signals are passed from the limiter anode to the output valve 10P13 (V10) via a 33 KΩ resistor and a .02 μF coupling capacitor. The grid leak of this valve is an 820 KΩ resistor and the 33 K is shunted to chassis by two 300 pF capacitors for H.F. filtering purposes. The cathode of V10 is taken to chassis by a resistor of 390 Ω in series with one of 15 Ω. The 390 Ω is shunted by a 50 μF electrolytic capacitor, the 15 Ω being only passed to chassis and a 10 Ω resistor is taken from one side of the output transformer secondary to the junction of these cathode resistors for negative feedback purposes. The volume control is placed in the cathode circuit of the first sound I.F. V7. The control is a 25 K and smooth operation is ensured by the inclusion of a 150 K wired from H.T. to the "top" of the control thus rendering it less dependent upon the cathode current of V7.

Faults

A condition of no picture in these receivers is frequently met. Upon removing the rear cover the U25 E.H.T. rectifier will often be seen to be glowing blue. This would usually lead one to assume that the valve is "soft" and indeed this is often the case. However, this is not always so and a new valve will

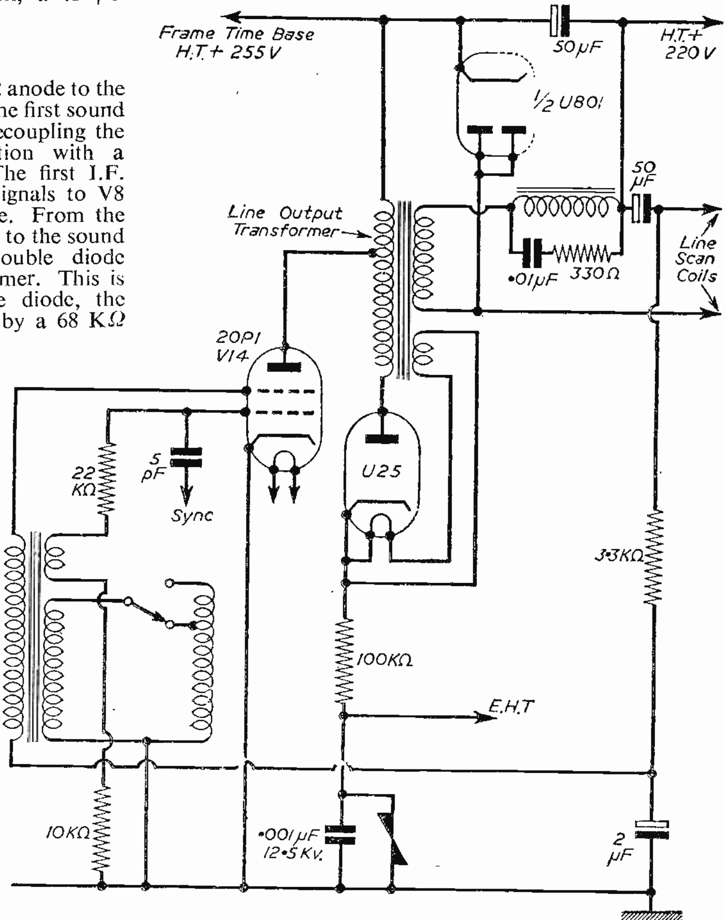


Fig. 3.—Line Timebase of the Ekco T161.

give the same symptom. Nearly always this is due to a leak inside the line output transformer and a meter check will often show a reading of 1 MΩ or less between the heater of the U25 and H.T. or chassis, with the set " off " of course !

This was and is a frequent fault on the original type of transformer and a replacement will be found to have an external winding beneath the U25 valve position on the bakelite panel mounting. Less frequently this overloading of the E.H.T. rectifier may be caused by a defective .001 μF condenser or the Metrosil bleeder, but these are easily checked by simply disconnecting them and seeing if the U25 lights normally and the E.H.T. reappears. A picture which persistently tears or slips horizontally may be caused by a leak between the heater and cathode of the tube. In more severe cases large areas of the horizontal scan may be unintelligible and discoloured until a point is reached where the picture cannot be held and is just a meaningless jumble. Tapping the tube neck will often clear the condition or worsen it, and this will prove the diagnosis. The cure is quite simple and well known. Fit a 2 volt secondary heater isolating transformer to the woodwork immediately above the tube neck and take the heater leads to it instead of to the receiver mains transformer. The primary should be connected to the receiver side of the on/off switch (as opposed to the mains side). The TU models will of course require a different voltage secondary winding on the transformer (assuming the set is being worked from an A.C. supply) and the heater leads cannot be just disconnected as they form part of the heater chain. A resistor of the correct value and wattage should be fitted to replace the tube heater's place so as to maintain the correct current through the valve chain.

When an isolating transformer is fitted it will be found best to short the cathode to heater, i.e., short out the 100 K resistor so as to ensure that no variation occurs as the leak comes and goes.

Blown Fuses

This can usually be traced to a defective U801 rectifier, a flashover occurring due to mains fluctuations or to some other more obscure reason. In any event, if a meter check shows no shorts and replacement fuses go again, it is reasonably safe to fit another U801.

Frame Timebase Troubles

Frame hold not locking with control at the end of its travel.—Replace the 2.7 MΩ resistor in series with the centre slider of the control. This often " goes high " and provokes this symptom.

Reduced frame scan, difficult to lock.—Check 1 MΩ resistor in anode circuit of V12, this being wired from one end of the frame oscillator transformer to the boosted H.T. line. Sometimes this is due to shorted turns in the oscillator transformer itself, and if the fault shows as a raster no higher than an inch or so with no hold at all and perhaps the picture upside down, the oscillator transformer will again almost certainly be at fault.

Foldover at the Bottom

This is usually due to a defective 6L18, a leaky .1 μF oscillator to output coupling condenser or perhaps the 4,700 pF (.0047 μF) linearity feedback capacitor developing a leak.

Weak Line Lock

This means that although the control is at its locked position, the picture continues to slip sideways, perhaps at varying intervals. The 5 pF line pulse feed capacitor from the anode of the VII sync separator may be found to have lost capacity and should be replaced. This is connected directly to the control grid of the 20P1 V14.

No Picture

If a raster can be resolved but with little or no trace of a picture when the contrast is advanced, whilst at the same time the sound is normal, check the voltage readings on V3 and V4 and if no anode or screen voltage is present, check for shorts and if none are present change the 4.7 kΩ H.T. decoupling resistor. If a short has caused the original resistor to burn out, suspect the relevant .003 μF decoupling capacitor.

If valves and valve voltages are in order check the continuity of the corrector choke from cathode of V5 detector to 150 Ω and 3.9 kΩ in the control grid circuit of the

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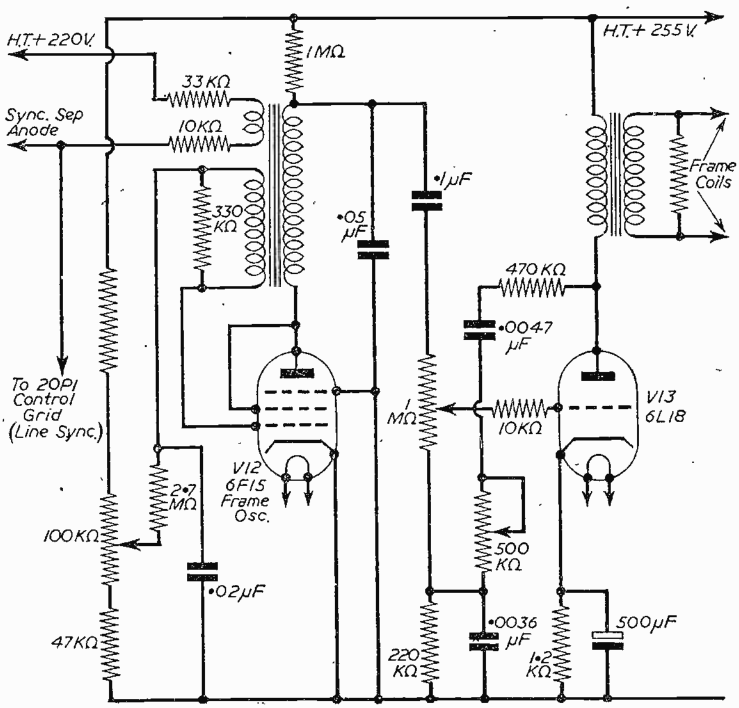
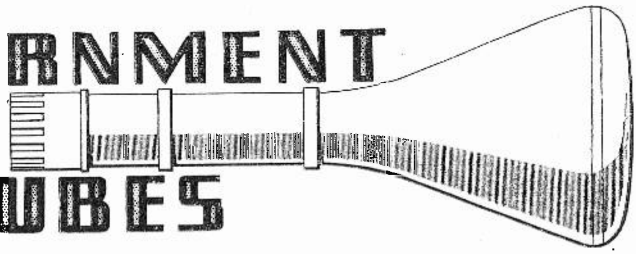


Fig. 4.—Frame Timebase and feed to sync separator.

EX-GOVERNMENT C.R. TUBES



DETAILS OF MOST OF THE SURPLUS TUBES NOW AVAILABLE

By "Erg"

(Continued from page 207, October issue)

Tracing the Base Connections

THE multiplicity of CR tubes produced during the war makes the identification of base connections a fairly difficult task. Certain rules can be applied, but the exceptions to these rules are many and varied.

The easiest type of tube to deal with, generally, is the magnetic tube which has heater connections, grid and cathode on the base with the final anode on a side cap near the screen. A standard octal base is usually employed with the heaters connected to pins 7 and 2 with (usually) the cathode on pin 8. One of the remaining pins is the grid and in most cases it will be found on pin 5. If there is any doubt it is safer to connect all the remaining pins together and assume that they are the grid pins, then when the tube is under test they can be disconnected one at a time until the real grid is discovered.

The heater pins are easy to identify as they will present a very low resistance. A 4.5 v. battery in series with a 3.5 v. bulb and the pins should show the connections (Fig. 1).

Some tubes have electrostatic focusing and the connection is made to one of the remaining pins of the group. Trial and error are the only satisfactory methods of dealing with these cases.

British tubes are almost invariably equipped with 4 v. heaters and the American tubes are generally 6.3 v.

Tube Bases

There are three main classes of tube bases. They are the small 9-pin, the large 12-pin spigot, and the 12-pin side contact such as is used in the VCR97 and 517.

The small base is used on the very small tubes such as the type employed in the G.E.C. Miniscope. These are the NC1, VCR522 and the NC19. The numbering can be identified by the four closely spaced pins which are pins 3, 4, 5 and 6. These pins are numbered in a clockwise direction looking at the tube from the rear. (In all cases we shall quote the numbering of the pins as though the tube were being viewed from the rear, with the key, if any, at the top.)

The cathode is usually on pin 4 and the grid on pin 6, with the heaters on pins 4 and 5. Note that the cathode is usually tied to the heater and suitable precautions must therefore be taken in the circuitry.

In most cases the focusing anode is connected to pin 3 with final and accelerating anodes on pin 7. The X and Y plates are usually arranged on pins 1 and 8 and pins 2 and 9 respectively. If it should be found that when connected in this fashion only a diagonal trace is obtained, then the X and Y plates are cross connected. To verify which is which disconnect three of the plates and connect them to a bias potential from the E.H.T. bleeder. Apply a sawtooth waveform to the remaining plate and note if its direction is vertical or horizontal. This will distinguish one of the plates.

The next step is to connect that plate to the others and take off one of the other plates, connecting the sawtooth waveform to this plate. By this method it will be possible to identify each plate.

The 12-in. spigot base is used with tubes of the VCR139 class. Usually the cathode is on pin 1 and the grid on pin 2, with pins 3 and 4 for the heater. Anode 2 will generally be found on pin 5 and anodes 1 and 3 on pin 9. The X plates are on pins 8 and 10, while the Y plates are on pins 7 and 11.

Once again the constructor is warned that there may be exceptions to this rule.

The 12-pin side contact base is usually used for the larger tubes though some of the smaller classes such as the VCR138 also use this type of base as they were derived from the larger screened tube.

The cathode is generally on pin 2, with grid on pin 1, but note that some of the larger tubes in the 12in. class have this order reversed, the grid being on pin 2 with the cathode on pin 1.

The heater will usually be found across pins 3 and 4, with the focusing anode on pin 6 and anodes 1 and 3 on pin 10. Note that in some cases pins 5, 7 and 10 are connected together internally within the bulb, the connections being anode 1, anode 3 and the internal coating. The X plates are on pins 9 and 11 and the Y plates on pins 8 and 12.

Not all tubes are connected in this manner; there are exceptions to the rule.

American Tubes

The American tubes which are generally available are mostly 6 v. heaters with 14-pin bases. Bearing in mind the warning given previously about exceptions, the following guide to pin connections is given.

Heaters are usually found on pins 1 and 14, with cathode on pin 2 and grid on pin 3. The focusing anode is on pin 5, anode 1 on pin 9 and anode 3 on

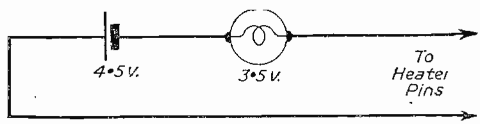


Fig. 1.—Circuit arrangement for identifying the heater pins.

the side cap. The X plates usually occupy pins 10 and 11 and the Y plates pins 7 and 8.

Non-standard Tubes

Certain tubes such as the ACR2 have the deflector plates brought out to side connections and not to the pin base. A little experimentation with the connections should enable them to be identified.

Unidentifiable Tubes

Quite often the home constructor obtains a cheap ex-Government tube which is rather a mystery, the connections being unknown. In this case, with a little care, it is generally possible to identify the connections.

The first important rule is that the tube is generally divided into two sections so far as the connections are concerned. They are the low voltage group of connections and the high voltage group. The low voltage groups are located near the heater and comprise the heater, the cathode and the grid.

In the case of the high voltage group (E.H.T. group) we have the accelerating anode, the focusing anode, the final anode, the two X plates and the two Y plates.

The first step is to identify the heater and the best method is to use a sensitive ohmeter. If this is not obtainable employ the circuit given in Fig. 1. This will show which connections are low resistance. In some cases pins are connected together and this can often be verified by taking off the backplate in the case of the British 12-pin side-contact base.

So as not to mistake interconnected elements for the heater (assuming that the other method fails), then apply a voltage of 4 v. to the low resistance pins. (6 v. in the case of the American tubes.)

It should be possible to observe the heater light up.

So far, so good. In most cases the cathode and grid will be found adjacent. For example, if the heater is on pins 3 and 4, then the cathode and grid are most likely to be on pins 1 and 2.

Connect the suspected heater and grid together and then connect the remaining pins together. These should be the high voltage group.

A source of E.H.T. should be available with a bleeder network on the lines of that shown in Fig. 2. Make all the resistors in the chain 470 K except R7, which should be about 22 K.

A voltage of about 1,000 v. should be available, but if the supply is, say, 2.5 Kv such as obtained from many E.H.T. transformers, then tap the chain one-half way down at point "x."

The next important rule is to apply voltages for brief periods only. Having connected the heater and given sufficient time for warming up, connect the strapped cathode and grid to the bottom end of the bleeder chain and then tap the strapped E.H.T. connections to the E.H.T. supply. (Remember this is the tap if the high potential end of the bleeder is fed from a 2.5 Kv source.)

A glow should appear on the screen. If the glow is too bright tap the connections farther down the bleeder chain.

In order to identify the cathode and grid, separate the two, connect one to the bottom of the bleeder and the other to point "y" (Fig. 2). Once again apply the E.H.T. to the E.H.T. group and *quickly* tap the wire on "y" to the bottom of the bleeder and back again.

If the wire on point "y" is the grid wire, then the trace on the screen will be brighter when it is on point "y" than when it is at the bottom of the bleeder.

If the wire on point "y" is the cathode the trace will be brighter when the wire is at the bottom of the bleeder than when it is at point "y." Point "y" is positive with respect to the bottom of the bleeder and it is, therefore, obvious that a positive applied to the grid will brighten the trace, while if applied to the cathode the trace will be darkened.

It is emphasised that this switching of connections must be done very rapidly.

Locating the Focusing Anode

The focusing anode requires approximately one-fifth of the E.H.T. voltage. Take a tap from one of the resistors about one-fifth up the bleeder network. (In Fig. 2 this is actually about point "z.") The grid

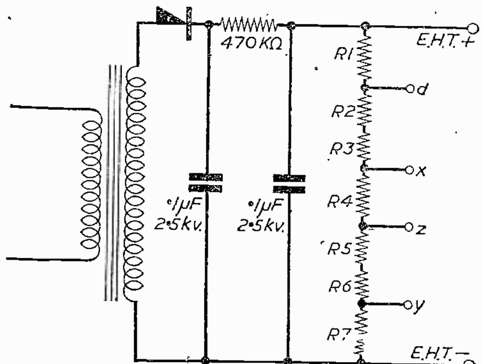


Fig. 2.—Circuit for location of the focusing anode.

and cathode should be connected cathode to point "y" and grid to the bottom of the bleeder. R7 can be made variable if desired so as to ensure that the bias is not so high that the beam is cut off. Now take one of the E.H.T. group pins and connect it to point "z" with the remainder connected to the E.H.T. point. If the wire is the wanted one (the anode 2 connection) the size of the trace on the screen will be altered. Repeat the process, if necessary replacing each wire in turn until the correct one is found.

The correct pin being found, then the wire can be left connected to point "z" provided the spot is *not too small and too brilliant*. If this is the case adjust R7 until the trace is moderately brilliant and adjust the focusing anode tap to a point on the bleeder where the spot is not too small.

The first anode must now be identified and this is simply done by disconnecting (and replacing after disconnection) the remaining wires in the E.H.T. group. When the final anode has been disconnected no trace will be observed. If there are now five pins left to identify one of them is likely to be the remaining anode, but this can be found in the final process while identifying the plates.

The Deflector Plates

The deflector plates may now be identified by taking a tap a little way down the bleeder shown as point "d" in Fig. 2.

Disconnect one wire from the remaining E.H.T. group and tap it on point "d"; if this is a deflector plate the spot will move up or down or left or right. The appropriate movement indicates the appropriate plate. If it is the remaining anode, then no movement should be observed.

(*Concluded on page 254*)

EXPERIMENTAL CHASSIS CONSTRUCTION

A SUGGESTION FOR A CHASSIS DESIGN FOR EXPERIMENTAL RECEIVERS

By F. W. Austin

THIS article is specifically intended for those readers who are capable of forming their own circuit arrangements and solving any problems which might be encountered in the course of their experiments. The "mixing" of circuits has long been discouraged both by responsible engineers and technical journals alike, and the reasons for this must be apparent. It is not possible (short of building an identical replica) to answer with certainty the multitude of faults likely to develop and to supply a certain cure for them. And even then the fault (if not present in the first instance) must be *simulated* in the replica. This is such a tall order that nobody could have the means or the time to deal with such matters. Having read this, most readers should rest content and pursue published designs in the full knowledge that a replica exists which has probably undergone exhaustive tests.

But there are, on the other hand, certain readers whose interest is aroused by some short article dealing with improved sync. separator circuits, or single-valve line timebases, interference limiters, etc. They may possibly proceed by way of a 9in. cathode-ray tube, through to a 12in. and finally use a 17in. wide-angle screen. Their lot is by no means an easy one, but their enthusiasm remains undaunted. The total cost of their experiments exceeds by far the cost incurred by the average constructor who is content to follow a reliable published circuit with a known standard of performance. For them I offer this system of chassis construction which was evolved to take care of different sizes of tube and give scope for incorporating various improvements as these became more widely known and practised.

General Construction

A close study of Fig. 1 will give the reader almost all the information he may need. The different sections are clearly marked (A) to (F) and these letter references will be used throughout the text. (A) and (B) are made into two rectangular frames (or side-runners) from angle-section aluminium material (see Fig. 2). Upon these two side-runners all other sections are mounted and the appearance is similar to a bob-sleigh. Fig. 3 shows a side-on view of sections (A) and (B) which are cut and bent at the same time in order to keep the two sides truly parallel to each other. As actual measurements are a matter for the individual experimenter those given are approximate only, but should be adequate to cater for a 17in. rectangular tube.

Timebase Mounting

The section (C) is a single sheet of stout aluminium (say 18-gauge) which is bent at right-angles across the width of the frame to form a "saddle" at the rear. It will be noted that this section can be fixed to the side-runners at any required distance back and forth, thus accommodating tubes of widely varying length. In Fig. 1 cut-outs are shown for valveholders, etc., the line timebase being built up on the left-hand side and the frame timebase on the right. This is simply a guide and is the method used by the author to keep both line and frame timebases as far apart as possible (to guard against interaction), both terminating in a single four-pin socket at the centre for inserting a plug which is connected to the deflector coils. Other arrangements are possible, but this is one well worth contemplating. The arrangement shown in this drawing for the timebase controls (speed, width and linearity) on the side panel (C) may be found unsuitable for installation in a cabinet, but has the advantage of being able to view from the front whilst making adjustments. An alternative is given in Fig. 4 showing the same controls mounted on a hinged strip at the rear.

Alternatively these may terminate in sockets, and the controls placed on a front panel later.

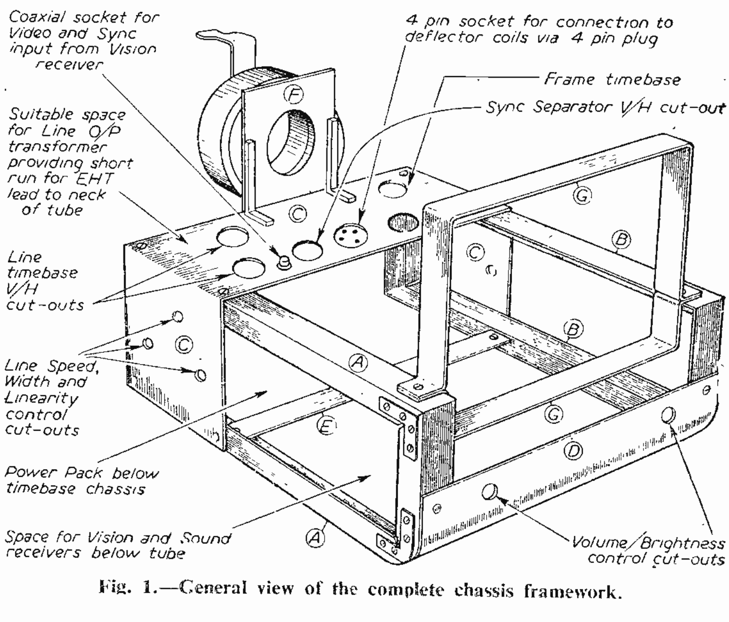


Fig. 1.—General view of the complete chassis framework.

Front Controls and Tube Support

Section (D) is a thin sheet of flat aluminium which is fixed to the front of the frame (A) and (B) and bent underneath the frame for screwing to the underside and, although of thin material, forms a substantial bracing piece for keeping the frame rigid. On this piece are mounted the volume/on-off and brightness controls. The section (E) is a further brace for the frame and can be about 1in. wide by about 3/16in. thick. Suitable material is the shaped bar aluminium used for stair carpet retainers. Section (C), with (D) and (E), forms an extremely strong framework with space beneath for the sound and vision receivers and the power pack.

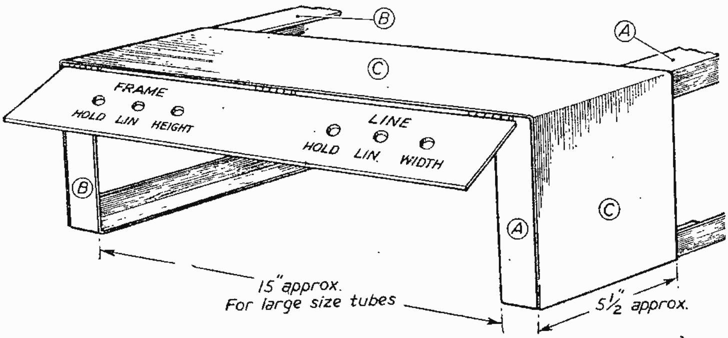


Fig. 4 (above).—Alternative arrangement for the timebase controls, which are mounted on a hinged panel at the rear.

Section (F), to which the focus magnet assembly is fixed, is mounted on (C) by means of two square section right-angled brackets. This is quite adequate for supporting the neck of the tube. It would be wise, if the experimenter intends at the outset to increase tube sizes, to use wide-angle focus magnets and make the central hole of section (F) of suitable width. Smaller tubes can have a small amount of card packing placed around the neck to keep the magnet assembly central in relation to the neck of the tube. Section (G) is of strip aluminium and supports the front of the tube. This will have to be a matter for the individual and be decided by size and shape of tube, but small pieces of sponge rubber can be placed at various intervals (fixed with Bostik) around the inner rim to relieve excessive pressure on the tube.

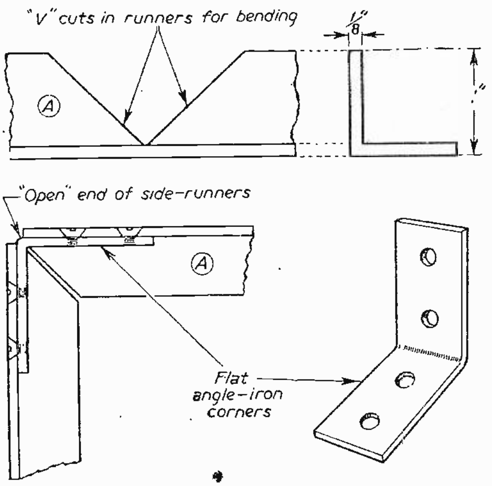


Fig. 2 (upper).—Angle aluminium used for side runners A and B. (Lower) Method of finishing off "open" ends of side runners by means of flat angle irons.

Connecting the Units

The power pack is made up on a chassis of suitable length and width to be accommodated beneath the timebase chassis (C). The arrangement used by the author made use of two differently shaped supply plugs and sockets; one for the timebase supply and one for the sound/vision receivers. The power pack itself held the two sockets thus safeguarding against "live" terminations on the plugs when these were disengaged from the sockets. The video output is taken via co-axial cable to the socket on timebase chassis (C) and thence to sync. separator valve (adjacent) and grid or cathode of tube (depending on method of modulation employed).

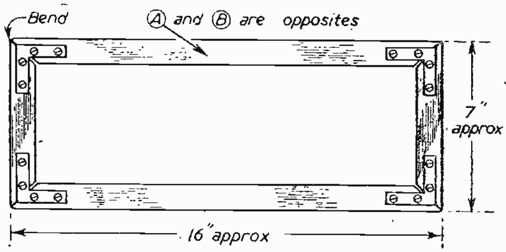


Fig. 3.—Details of one complete runner.

EX-GOVERNMENT C.R. TUBES

(Continued from page 252)

The movement of the spot should be noted and if it is from right to left it is X2 plate, or if from left to right it is the X1 plate. Similarly, if it is up to down it is the Y1 plate or if down to up it is the Y2 plate. Each plate can thus be identified.

All that is left to do now is to strap all the deflector plates to point "d" and then to adjust the focusing tap (point "z") to obtain a small, sharply focused spot.

The tube can then be built into an E.H.T. network following lines similar to those in the test network.

Note that if the tube is 3in. in diameter then do not apply more than 1.5 Kv to the final anode; if it is 6in. in diameter do not apply more than 2.5 Kv to the final anode; if it is 12in. in diameter then do not apply more than 4.5 Kv to the final anode.

If there is difficulty in obtaining any trace at all, then the E.H.T. of the test bleeder may be insufficient. A rough guide on the amount of E.H.T. required can be obtained by measuring the screen diameter in inches; take the square root of this figure and multiply the result by 500.

TV DX

TELEVISORS FOR THE RECEPTION OF EUROPEAN TRANSMISSIONS

By B. L. Morley

(Continued from page 202 October issue)

THE standards of Television Transmission in Europe appear to be settling down to a pattern decided by the C.C.I.R., and it is likely that the majority of the new stations will follow this pattern. The main features of the system are summarised in the following paragraphs.

Line Structure

The system uses 625 lines and therefore the line frequency is rather higher than that of the 405 line British system. In our system the line frequency is of the order of 10,125 cps. but with the 625 line system the frequency is 15,625 cps. The frame frequency in each case is 50 cps.

Negative Modulation

The carrier is negatively modulated with respect to picture brightness. By this we mean that peak whites drive the carrier voltage towards the zero level. Fig. 1 shows the scheme.

The British system is positive modulation, and if a negatively modulated signal is applied to such a receiver then the picture will be in reverse, blacks coming out as white, and whites coming out black as in a photographic negative.

One main difficulty here would be to hold the picture as the sync pulses would be reversed in direction and would not trigger the timebases correctly.

Bandwidth

The bandwidth of the recommended standard is 5 Mc/s against our own 3 Mc/s. It is doubtful if any real disadvantage lies here, as it should be possible to resolve the picture with the restricted bandwidth of existing televisor circuits. We are not after pictures of excellent quality, but any pictures at all!

F.M. Sound

Because the sound is frequently modulated it would not be receivable on our existing sound receivers. In any case, as the sound is spaced further from the vision carrier than is the case in our system it would appear that the solution to the problem would be in the provision of a separate sound receiver.

Horizontal Polarisation

The signals from the transmitters are radiated in the horizontal plane. It is possible to receive such signals under certain conditions, on a vertical aerial, but these are freak cases. To attempt reception seriously would involve the provision of a horizontally polarised receiving aerial.

Non-Synchronous Mains

The frame frequency is not synchronised with the mains and for optimum reception the smoothing arrangements of the receiver must be first class. However, it is doubtful if a slight ripple down the side of the picture would be objected to, provided a picture was obtained at all!

Interlace

This is the same as in the British system of 2/1.

The C.C.I.R. system is being adopted by most European countries. One notable exception is France, which is adhering in the main to its high definition system of 819 lines.

The French Systems

In France two distinct systems co-exist. There is the 441 line system, similar in many respects to the British, and the 819 line system.

The 441 line system broadcast from Paris radiates on 46 Mc/s with the sound on 42 Mc/s. The vision signal is double side-band, positively modulated and transmitted vertically with a power of 30 kW.

It is often receivable in Great Britain on televisors tuned to Channel I when conditions are favourable.

The 819 line system operates in Band III and transmissions are made from Paris and Lille in Band III, actually with the vision on 185.25 Mc/s and the sound on 174.10 Mc/s. The picture is positively modulated and the sound is A.M. as in the 441 line system. Polarisation is vertical and the line frequency is 20,475 cps.

Sidebands

As the C.C.I.R. system employs the upper sideband modulation, the lower sideband being suppressed we have yet another factor which points to the use of a separate sound receiver if reception is to be attempted.

American System

The American system which is common to practically the whole of the American continent including Canada and stations in South America is based on the 525 line scheme.

The vision signal operates with a bandwidth of 4 Mc/s the total channel width being 6 Mc/s. Interlace

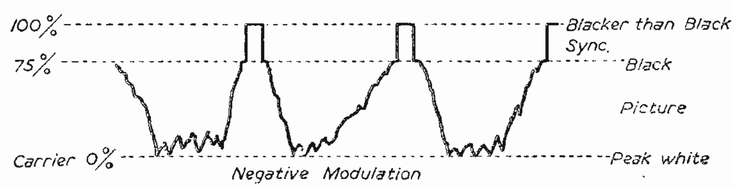


Fig. 1.—Positive and negative modulation.

is 2/1 as in the British system, but the frame frequency is 60 cps. with a consequent line frequency of 15,750 cps.

Vision modulation is negative and the sound is F.M.: the black level equals 75 per cent. of the peak carrier.

The Russian System

To complete the picture of the different systems the Russian system must be included. This is identical with the C.C.I.R. system excepting for the fact that the vision signal has a bandwidth of 8 Mc/s instead of 6 Mc/s.

Two transmitters work from Moscow, one is at Leningrad and one is at Kiev.

These, then, are the different systems which may be encountered besides our own British system of 405 lines, 50 frames, 2/1 interlace, 10,125 line frequency, positive modulation and A.M. sound.

Receiving Equipment for TV dx

It is fairly obvious that with the different systems likely to be encountered, either a separate receiver must be adapted for the reception of one particular system, or some switching system must be employed so that the receiver can be switched from one system to another. In some countries in Europe this is done with commercial receivers; in Belgium, for example, where transmissions are on the 625 and 819 line systems, switching gear is included so that a single televisor can be used on either system.

For the hobbyist who may regard TV dx work as a definite branch of his hobby it is considered that there is no better receiver than an adapted R1355 for the job. This receiver is extremely powerful, especially when used in conjunction with an RF26 or RF27, and is capable of pulling in signals from really long distances.

As indicated in a previous section, except for the French transmissions the sound signals are F.M. and it is suggested that a second R1355 could be adapted for the sound signal.

Carrier Modulation

It has been noted that there are two methods of carrier modulation—positive or negative. In the former system (the British system is an example) peak white is represented as peak carrier amplitude, while in the second system peak white is represented as maximum carrier modulation.

The net result of this is that a detector circuit arranged for positive modulation will produce a negatively modulated signal in reverse; blacks would come out white and white blacks and the sync signals would be of incorrect phase.

The phase of the signal at the output of the video valve will depend upon the method of connecting the detector. All that is necessary to reverse the polarity of the signal is to reverse the diode detector.

The method of detector connection will depend upon the method of modulation of the C.R.T. If the grid is modulated (as in most electrostatic models such as the Simplex), then the input to the video output valve is negative, the peak whites driving the grid in a negative direction with a consequent positive uplift in the anode circuit by reason of the phase reversal within the valve circuit.

To ensure that the grid of the video valve is driven in the correct method, the anode of the detector is connected towards the grid of the video valve, as shown in Fig. 3, which, with the other illustrations, is repeated from last month's issue.

This circuit can be adapted for a negatively modulated signal by reversing the diode, as shown in Fig. 2.

Where cathode modulation of the C.R.T. is employed then the detector valve will be found connected in a similar manner to Fig. 3, and to receive a negatively modulated signal it should be reversed, as in Fig. 2.

It is possible to arrange switching so that either signal can be received, as indicated by the circuit in Fig. 4. The switch should be of the low-loss type and must be mounted as close to the accompanying components as possible.

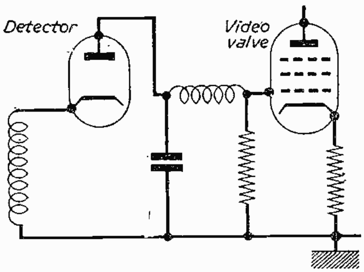


Fig. 3.—Positive grid input for cathode-modulated tubes. (Positive modulated carrier.)

Tuning Arrangements

For serious work it is obvious that the R.F. mixer and oscillator stages should be tunable. When an RF26 or RF27 is used with the R1355 there is no problem beyond making the tuning unit cover the frequency band required.

There is no difficulty in doing this with either of the units for Band I, but there has, as yet, been no published design for using these units on Band III. However, most Band III tuning units or converters have a variable tuning

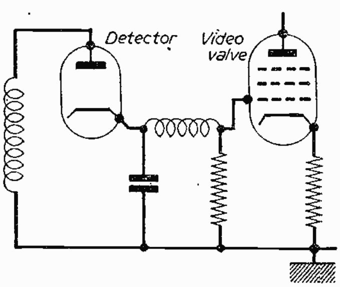


Fig. 2.—Negative grid input for grid-modulated tubes. (Negative modulated carrier.)

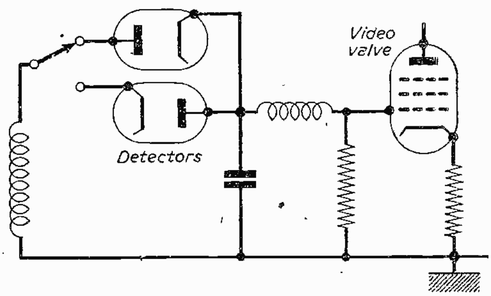


Fig. 4.—Switched grid input for positive or negative modulated carrier.

device in the form of an oscillator trimmer. The R.F. and mixer stages are usually very wide band (often 18 Mc/s and more), and tuning can usually be accomplished over the greater part of the band with the oscillator.

Where no separate tuner is fitted to a televisor then it is usual to find a trimmer on the oscillator, and

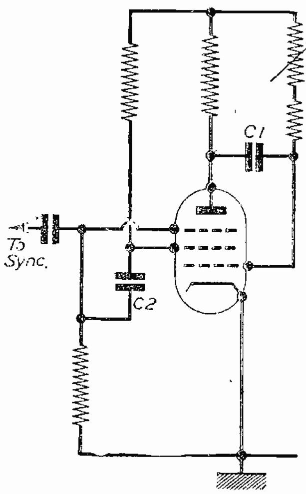


Fig. 5.—Standard Miller oscillator.

careful adjustment of this trimmer will enable a large proportion of the band under inspection to be covered.

Preamplifiers

Undoubtedly a preamplifier will be an asset for this class of work, and it is preferable to use one of the low-noise type. Little will be gained by using more than two amplifying stages in the preamplifier and to avoid difficulties with the tuning it should be of the wide-band type.

In the case of fortunate viewers in the South Coast regions where consistent results may be obtained from certain continental stations, then a special pre-amplifier designed specifically for the desired channel may be employed.

Line Circuit Modifications

There are two cases to consider for modification of the line oscillator; the first is where an electro-static C.R.T. such as the VCR97 is being considered, and the second is where a magnetic C.R.T. is used which obtains its E.H.T. from the line flyback. In this case the value of the E.H.T. obtained depends to a certain extent upon the resonance of the associated circuits and modification of the line oscillator to a higher frequency may result in a reduction of E.H.T.

Most circuits employing electrostatic tubes use a Miller type of timebase In some cases it may be found that there is sufficient control available in the line hold control to enable the line circuit to operate to 625-line transmissions. If the line frequency cannot be made high enough, however, then the condenser C1 in Fig. 5 (a typical Miller circuit) should be reduced in value.

It may be found that this reduction causes foldover of the picture and in this case C2 should be reduced in a similar manner.

Where reception of 819-line transmissions being attempted, halve the value of C1 and C2.

If an adaptable timebase is required then the principles of the oscilloscope can be adopted and a course frequency control fitted. This can be a dual switch arranged to switch in and out different valued condensers to cater for differing frequencies, as shown in Fig. 6.

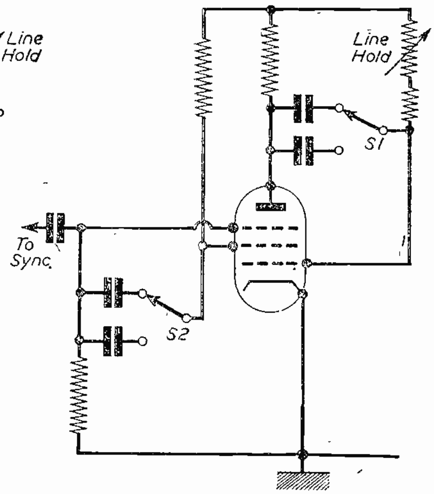


Fig. 6.—Switched oscillator.

Magnetic circuits are not quite so easy to modify and there are so many different circuits that it is difficult to give any concrete advice. Quite often it may be found that the tolerance of the line hold control will enable the 625-line system to be received but where this is not possible further steps must be taken.

Where a blocking oscillator circuit is employed, then reduction of the condenser value may enable the desired line frequency to be obtained. In Fig. 7 is shown a typical circuit and the condenser "C" is the one concerned.

In many cases the natural resonant frequency of the associated transformer is brought into the action of the circuit and in these cases it may be necessary to fit a transformer of lower inductance.

A typical example of the Multivibrator is shown in Fig. 8. This is the cathode coupled type and the condenser "C" shown in the circuit is the one which should receive attention.

It will be noted that in each case it is the condenser associated with the line hold control which has to be reduced in value and this can form a useful guide to the selection of the correct condenser in the circuit.

In the case of frame circuits the only variation in frame frequency is that of the American system which is 60 c.p.s. The normal operation of the frame hold control should cover this frequency for those bold enough to attempt such long distance reception.

Sync Circuits

There may be some difficulty with the sync circuits in the case of reception of negatively modulated carriers as noise effects (ignition, etc.), are inclined to affect the sync pulses.

Because of this the C.C.I.R. system recommends the use of flywheel sync circuits and it is worth considering the use of such a circuit where serious work is intended.

With negative modulation the interference drives the C.R.T. into the black level so that the spots of ignition interference appears as black dots instead of white ones, as in the British system. It is largely a matter of individual taste as to which is preferable but when this form of modulation is used, then the spikes of interference can cause large pulses in the blacker than black level and give spurious sync pulses in the timebase.

The polarity of the sync pulses is automatically catered for in the modified detector stage and there is no need for any switching arrangements here.

Bandwidth

The R1355, good though it is in other respects, suffers from a rather narrow bandwidth and requires careful stagger tuning to enable the British system to be received at full quality. It is, therefore, difficult to adapt for quality reception of transmissions with a wider bandwidth, but this is of no real moment, as we are aiming at getting any signal at all.

With a receiver designed for the full 3 Mc/s bandwidth of the British system there is still likely to be a reduction in the quality but it is not considered worth while to extend the width of the I.F. stages for reasons mentioned previously.

One effect which must not be overlooked is that the reduction in bandwidth may affect the sync pulses and this is another good reason for the use of flywheel sync where serious work is intended.

It should be noted that the gain of the receiver is improved with a narrower bandwidth and the net effect may be in favour of restriction in this direction.

Sound

Apart from this country, France and Belgium are the only ones with A.M. on the sound system, the rest being F.M.

It is considered that the best solution to the problem would be to provide a separate sound receiver and the detector stages could be arranged for reception of A.M. or F.M. as desired.

The provision of a combined sound and vision section where sound is taken from the vision I.F. stages is not practicable. Not only is the sound spaced at a rather larger distance from the vision carrier than in our system, but it may be in a different relation to the carrier according to whether the upper or lower sideband is suppressed.

The simple modifications suggested in the foregoing paragraphs are all that are really required to adapt the televisor to other systems. Circuits for F.M. reception of sound have not been given as these have been dealt with from time to time in our companion paper *Practical Wireless*.

It remains now to consider the aerial system which must be converted to a horizontal type for most of the European transmissions.

The Aerial System

The high-powered TV transmitters in Great Britain use vertical polarisation. The other European countries which use this system are France (the low-definition system at Paris) and Italy (the Turin transmitter). The remainder use horizontal polarisation.

It is obvious that to attempt reception a horizontally polarised aerial should be used for the majority of the transmitters.

For general use, two directors with dipole (folded) and reflector should be found suitable. It would be desirable to arrange that the system can be rotated so as to orient the aerial in the position for the maximum signal.

Where facilities are available a double-stacked array comprising two complete units of two directors, folded dipole, and reflector would be beneficial. Such an array would provide about 3db gain more than the single array.

Standard construction principles should be employed and the dipole should be made for the centre of the band which it is desired to explore. Folding the dipole not only assists in effecting a good match but also broadens the bandwidth of the array.

For optimum results the elements should be spaced at 0.2 wavelength and the dipole, a folded one, with a 2in. spacing between adjacent sections

It is important to take care in connecting the two members of a stacked array together. The best method is to run a length of coaxial cable from one array to a point midway between the two and then to run an exactly similar length of cable from this point to the second dipole.

The two cables can now be connected in parallel with the down lead.

Dimensions, etc., of the elements have not been given as they have been dealt with previously in these pages.

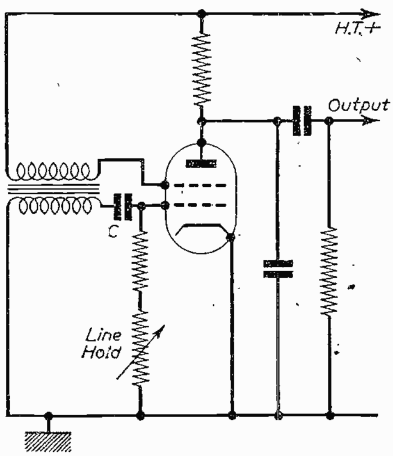


Fig. 7.—Typical blocking oscillator.

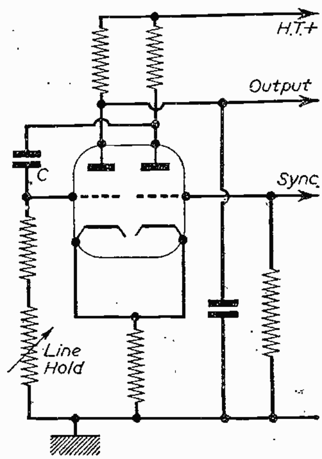


Fig. 8.—Cathode-coupled multi-vibrator.

SERVICING (*Continued from page 250*)

video amplifier (V6). If the choke and the resistors are in order check continuity of I.F. transformer secondary windings, and if the anode voltage on V3 and V4 is much lower than the screen, also the primary windings as these are shunted by resistors which maintain a certain amount of voltage on the anodes even when the windings are O.C. If a very weak picture is evident and the brilliance control has to be advanced beyond its normal setting in order to display a raster check the anode load resistor of the video amplifier V6. This is a 6.8 kΩ and if it drops in value the C.R.T. cathode voltage will be raised with very little modulation and very weak, if existent at all, sync pulses.

If, on the other hand, this resistor should " go high " excessive brilliance will result with a poor, smeary picture. Excessive brilliance with no modulation should direct attention to the coupling components from the V6 anode to the C.R.T. cathode.

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1L4	7/6	12H6	8/6	807	7/6
2B7	8/6	12J5	6/-	ECH35	12/6
3A4	9/-	12AH7	12/6	EA50	3/6
3B7	8/6	12SG7	7/6	EBC33	8/6
6AG5	7/6	12SK7	8/6	EB34	3/6
6AK7	9/6	12SR7	7/6	EF36	6/6
6B4	7/6	28D7	7/6	EF39	6/6
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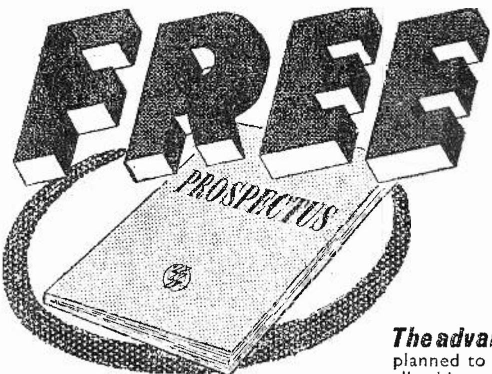

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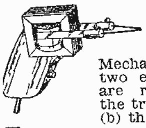

A 7 - second solder gun was described in "Practical Mechanics." Only two essential parts are required : (a) the transformer and (b) the push switch. These we can supply at **13/6**, plus 2/- post. The rest of the parts you will have in your own "junk" box. Copy of the article concerned given free with the kit.

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11/6

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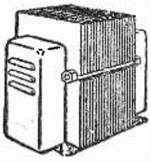

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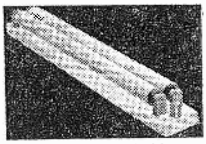

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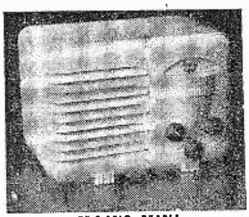

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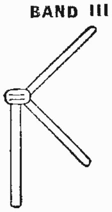

"The Folded V" was described in the July number of this magazine. We tried this and found it to be most efficient. The kit comprises alloy elements and connectors, neat plastic centre piece and saddle for mounting. 8/6, post 1/6.

W.W. BAND III KIT

One of the most successful circuits for Band III conversion. We offer complete kit of parts including the specified EF80 valves, wound coils, drilled chassis, in fact, everything including copy of the circuit diagram. Price only **42/6**, post 2/6 extra. Mains components if required, 25/- extra.

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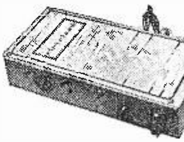

Almost any television receiver, whether superhet or straight A.C. or A.C./D.C. home constructed or factory built, will receive I.T.A. if this converter is added. No modifications are necessary to the receiver. Simply plug in the aerial leads and connect to A.C. mains. The converter is in a neat metal case with provision for fixing to the side or the back of the set. Price **£7.10.0**, or **£2.10.0** deposit and six payments of **£1**.
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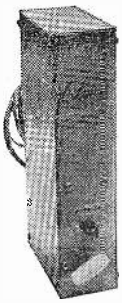
ADDITA—BAND III CONVERTER

NOW AVAILABLE FOR LONDON & MIDLANDS



Hundreds of our "Addita" converters are already in use in the South ; results have been well up to expectations and the converter has proved itself not only easy to build but most simple to align and really stable in operation. The illustration shows the complete unit with built-in power pack.

Price of all components, including stove enamelled case and even transfers for the front, is **£4/5/-**, plus 2/6 post, or **£5/5/-** if mains components also required. Data is included free with the parts or available separately price 2/6.

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THE "ELPREQ" Band III SIGNAL GENERATOR

1. Will provide the signal for tuning to any Band III station.
2. Can be used as grid-dip meter for checking the frequency of Band III T.V. aerials, Coils, etc.
3. Can be made to give a pattern on T.V. Receiver screen.

This instrument is very easy to correctly calibrate and all the necessary equipment to do this is included in the kit. All the parts including valves, tuning condenser and metal chassis are available as a Kit at 25/- post free. Constructional data free with Kit or available separately, price 2/6.

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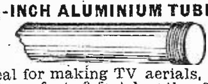

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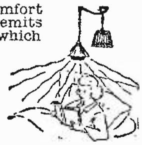

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5-VALVE SUPERHET YOURS FOR ONLY 40/- DOWN

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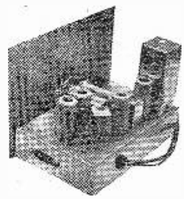

This tuner is based upon the very successful circuit published by Data Publications. We have made up models at all branches and will gladly demonstrate. Stability is extremely good and making and aligning most simple. Cost of all parts including valves, prepared metal chassis, wound coils and stove enamelled scale, slow-motion drive, pointer, tuning knob, in fact everything needed is **£6/12/6**. Data is included free with the parts or is available separately, price 2/-. Extra for fringe area model, 20/-.

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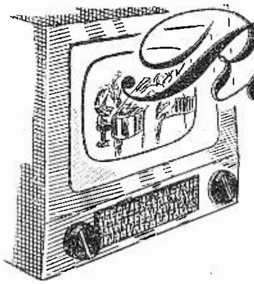


Receiving the I.T.A.

THE FIFTH IN A SERIES ON THE PROBLEMS INVOLVED IN THE RECEPTION OF COMMERCIAL PROGRAMMES ON BAND III

By Gordon J. King, A.M.I.P.R.E.

(*Continued from page 207, October issue*)

Channel Switching for Alternative Channels

THE mode of channel switching in Bands I and III varies considerably between individual manufacturers on both two-band receivers and on adaptor-type tuner-units which have been evolved for inclusion on certain recent Band I receivers.

A large number of manufacturers, however, are adopting the turret-type tuner-unit in the design of their recent two-band receivers and also as the basis of an add-on tuner-unit for specially prepared Band I receivers. This kind of tuner is manufactured in somewhat standard form and provides all the variable tuning necessary for 12-channel reception—five channels in Band I and seven in Band III. They embody a cascode R.F. amplifier followed by a triode-pentode frequency changer—such as we have previously considered.

Channel switching is achieved by the use of 11 fixed phosphor-bronze spring contacts and a 12-sided barrel-shaped turret. Each of the 12 sides forms the base of a pair of coil units, and each coil pair is equipped with 11 contact studs in a row. The desired channel is selected by rotating the turret by means of the channel-changing knob until the studs on the corresponding pair of coils come into connection with the phosphor-bronze spring contacts.

The turret itself is divided into two sections along its axis by a metal screen ; one section carries the R.F. coils and the other section the associated oscillator coils. Each coil can be removed and each is independent of the other. At the present time it would appear to be general practice for the manufacturers to install only the pairs of coils corresponding to channels 1 to 5 in Band I and channels 8 and 9 in Band III, although there are some manufacturers who install only one pair of coils in Band I. Any additional pairs of coils can, however, very readily be fitted when required simply by removing the base screen from the unit and clipping the appropriate ones into the turret.

A "fine tuning control" is also fitted to these units, the spindle of which is nearly always brought out through the centre of the channel-changing spindle to permit the use of a dual control knob, the outer section of the knob indicating to what channel the receiver is switched and the inner section controlling the tuning capacitor.

While this latter control is effective on all channels, it is most effective on the channels in Band III owing to their higher frequency, and is incorporated mainly to balance up the tuning on all channels and to provide a means of easily counteracting oscillator drift.

The tuning capacitor itself is quite interesting for, instead of the usual method of variable vanes, it consists of two small plates with air between them as the dielectric. An increase in capacitance is obtained by increasing the dielectric constant, and this is achieved by means of an eccentrically shaped piece of plastic material which enters the space between the two fixed plates as the tuning control is rotated. This dielectric method of varying the capacitance avoids the necessity of moving electrical contacts, and thereby eliminates noise and unsmooth operation which might otherwise occur at V.H.F. on the conventional type of variable capacitor as the contacts become dirty and wear. The usual kind of variable capacitor is rarely used as a fine tuning control on any pattern of V.H.F. tuner-unit.

A cascode R.F. amplifier, a triode-pentode frequency changer, and a 12-position rotary channel-changing switch and fine tuning control form the basis of the two-band tuner-unit used in Pye, Invicta and Pam receivers.

The channel-changing switch comprises four Yaxley-type ganged switch wafers which permit switching of the aerial circuits, the band-pass transformer couplings to the frequency changer and the oscillator circuits. The various coils corresponding to these circuits are self supporting and soldered directly between adjacent tags on the switch wafers, as shown diagrammatically in Fig. 15.

This is sometimes called the incremental system of channel changing, because as the channel switch is rotated a small alteration of the total inductance of the circuit occurs, the alteration being in small steps or increments.

For the five channels in Band I—switch positions 1 to 5—the coils are made up of a number of turns that one is accustomed to in Band I. For the channels in Band III, however, the required inductance is formed by small wire loops, but since a frequency

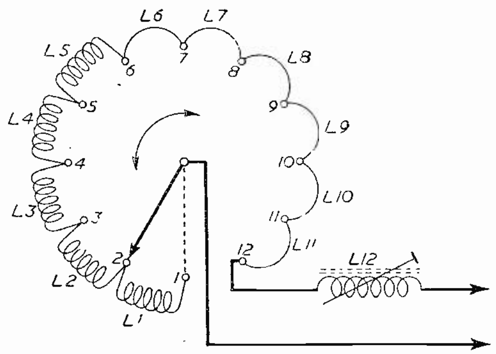


Fig. 15.—A single section of the channel switching arrangement used in Pye, Invicta and Pam receivers.

increment between channels of only 5 Mc/s is required more than enough inductance is provided by the loops, so the loops themselves are also shunted by a straight piece of wire!

The shunted loops are used for alignment purposes and answer as inductive trimmers, the adjustments being made during manufacture by bending and manœuvring the loops until the inductance of each section is balanced to provide the desired frequency deviation.

Arguing that it will be a very long time, if ever,

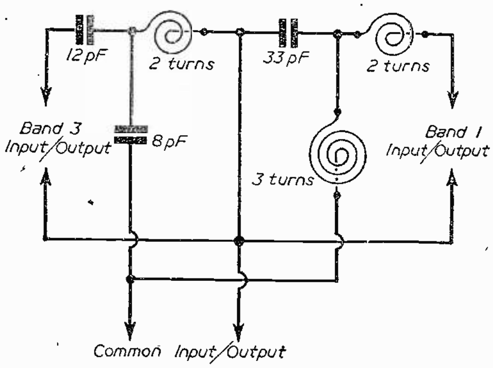


Fig. 20.—A circuit diagram of a tuned filter.

before 12 or 13 programmes will be available, some manufacturers incorporate only a three-position switch in their two-band tuner-units to give one programme in Band I and two in Band III. It is generally possible to preset the desired stations in both bands on this kind of unit so that any of a possible 13 may be tuned, but so that only three of them will immediately be available on the switch.

Other manufacturers use an ordinary five-channel preset tuner for Band I, and a band-change switch which when set to the Band III position disconnects the Band I tuner and brings into circuit a continuously variable Band III tuner.

Band III tuning on these units is usually carried out by means of iron-dust or brass cores which traverse the formers of the aerial, R.F. and oscillator coils and thus give rise to an alteration of inductance. The cores are accurately ganged and mechanically coupled to the channel-changing spindle. The channel - changing knob is marked off in channel numbers so that a given channel setting corresponds to a certain coil inductance which tunes to the relating frequency.

Aerial Input Circuits

On all turret tuners the aerial input socket is common to both Bands I and III, and the same applies to certain switched and continuously variable units. Other units, however, feature separate aerial input terminals for Bands I and III. The impedance at both inputs, or at a common input, is now standardised at 75 to 80 ohms, and coaxial feeder is nearly always specified. On earlier two-band receivers a 75 to 80 ohm Band I input and a 300 ohm Band III input were sometimes used, but this, we understand, has now been modified to 75 to 80 ohms.

The aerial input circuits of the new range of Ferranti two-band receivers are shown in Fig. 16. These receivers use a preset Band I tuner, a band-change switch—S1A, S1B and S1C—and a continuously variable Band III tuner. They also feature separate aerial inputs for the two bands; for Band I a coaxial socket is fitted, and a three-pin socket is used for Band III. It is possible, however, to make use of a single input by shorting pins 1 and 2 on the three-pin socket. This arrangement permits the use of a common coaxial feeder to carry both the Band I and the Band III signals.

The Use of a Cross-over Unit

In areas where a very strong signal is available on Band III and little disturbance from signal reflections ("ghosting") is experienced the use of a combined Band I/Band III aerial system will almost certainly suffice, in which case a common feeder may be used to carry both signals to the receiver.

Now, if the receiver is fitted with a common two-band aerial input circuit all will be well, it simply being necessary to connect the feeder to the receiver in the ordinary way. If, on the other hand, the receiver has separate input sockets for the two bands, then it will be necessary to split the feeder at the end and maintain correct matching at both input circuits—see Fig. 17.

Similarly, a method of combining the two signals while maintaining correct matching will be required where separate Band I and Band III aerials are fed to a receiver having a common input socket—see Fig. 18. Such an arrangement may be necessary in areas of relatively low Band III signal strength and where excessive "ghosting" is experienced on a combination type aerial.

The circuit network necessary for combining or splitting the two signals and preserving an impedance match is generally built into a small metal box to be mounted either near the aerials themselves—possibly at the top of the mast—or inside the building on a wall or wainscot, and is

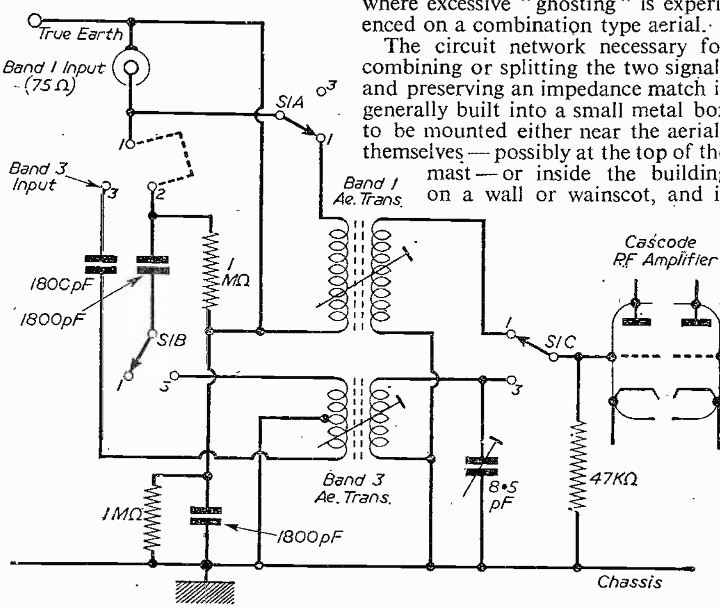
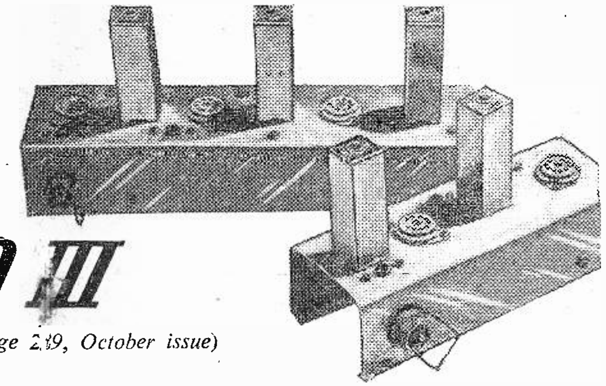


Fig. 16. — The two-band aerial input circuits used in Ferranti receivers.

CONVERTERS FOR BAND III

Obtaining Power Supplies for the P.T. Converter which was the Subject of Last Month's Free Blueprint



(Continued from page 249, October issue)

Feeding Power to the Converter

DURING the course of development of this converter it was in turn powered from several commercial receivers, and the results obtained were quite satisfactory. It was found, however, that if the receiver had a smoothing choke or filter resistor connected to the rectifier output, and the H.T. current of the converter was carried by this component, the receiver H.T. line voltage dropped by an amount sufficient to reduce the horizontal and vertical scans. If the H.T. to the converter was taken direct from the rectifier output (from the cathode in the case of a valve rectifier), through a resistor, this effect did not occur, and the H.T. line voltage remained substantially constant. Furthermore, tests revealed that the receiver H.T. rectifier was subjected to overload if the converter current exceeded about 23 mA ; this was on sets two to three years old.

Sets of earlier style—and it will be these on which the converter will mainly be used, since adaptors are being produced (and retailed at present) specifically for the receivers of more recent years (in some cases back to 1951/2)—have considerable reserve of H.T. power, and the addition of the converter H.T. current has little effect on their operation.

Nevertheless, to be on the safe side it is always desirable to measure the receiver H.T. current and to check on the rating of the H.T. rectifier to make sure that it is capable of delivering an extra, say, 30 mA. If it is not, then either a larger rectifier should be used or a separate power unit should be made for the converter.

Where receivers using a Brimar RM4 metal H.T. rectifier are found to be operating at maximum current (260 mA average) the rectifier may be substituted by an RM5 which, at 250 volts, has a maximum mean current rating of 300 mA.

The circuit at Fig. 25 shows how the H.T. may be tapped off. It is important to note that, apart from the rectifier itself, no other components in the receiver are called upon to pass extra current. The value for R can be found by dividing the difference between the H.T. voltage at the rectifier output and 180 by 0.028. A slightly lower value resistor may be used where extra Band III gain is essential, but on no account must the converter H.T. rise above 200 volts. An 8 or 16μF capacitor C may be used to decouple the converter H.T. feed.

A large number of commercial receivers use a simple half-wave H.T. rectifier circuit which makes the H.T. negative lead and the receiver chassis have contact with one side of the mains supply. When the converter is connected to a receiver of this kind its chassis will also be in contact with one side of the mains, and if this is the "live" side considerable shock may be experienced during the process of adjusting. It is important, therefore, to ensure that the chassis is connected to the neutral side of the mains ; a neon bulb or A.C. voltmeter may be used for this purpose.

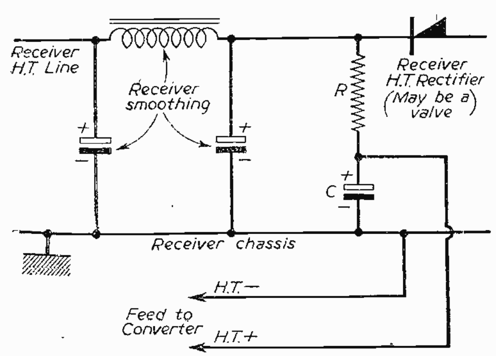


Fig. 25.—One method of feeding power to the P.T. converter.

The coaxial sockets on the converter, being insulated from the chassis and isolated by C1 and C13, are not at any time in direct connection with the mains supply, so it is quite safe to operate the converter without fear of harming the associated Band I receiver and without transmitting a dangerous mains potential along the Band III feeder and into the aerial.

Once the converter has been properly installed in the cabinet it really does not matter which way round the mains is connected, for it is thoroughly isolated from external controls and leads.

The L.T. Supply

Where the converter will be required to obtain its heater power from an A.C. receiver, and where the receiver heaters are 6.3 volts, the 6.3 type valves should be used in the converter and wired as in Fig. 3—these valves are V1 ECC84 and V2 ECF82. The heater supply lead from the converter may then be connected across a suitable heater winding on the mains transformer. In the case of an A.C./D.C. receiver which uses 0.3 amp valves, either a small heater transformer will need to be used to supply the converter with L.T. or it will be necessary to use the 0.3 amp equivalent type valves in the converter and wire them in series with the heater chain in the receiver. These valves are PCC84 V1 and PCF82 V2 whose heaters must be wired in the converter according to the circuit at Fig. 26, where it may be seen that an additional heater choke is required.

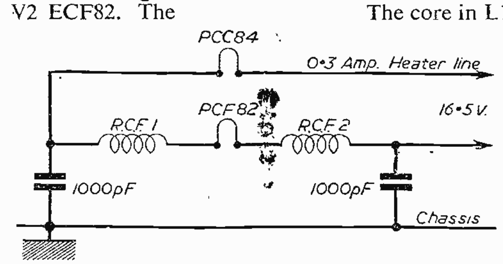


Fig. 26.—Circuit showing how the converter heater wiring is modified when using 0.3 A. valves.

A transformer will almost certainly be necessary if the heater supply is other than 6.3 volts in an A.C. receiver. When a transformer is used the primary winding should be connected to the receiver side of the receiver's on/off switch, as shown in Fig. 27.

Alignment

The output of the converter must be connected to the Band I receiver aerial socket by the shortest possible length of best quality close-braided coaxial feeder, and after inserting the Band I and Band III aerial leads the band-change switch should be actuated to ensure that Band I reception is still possible and that no Band I break-through is occurring when switched to the Band III position.

Having established that this section of the circuit is working properly, the band-change switch should be set to "Band III" position, the receiver contrast and sensitivity controls turned to maximum and the brightness and volume controls set accordingly. A considerable "hiss" will now be heard from the loudspeaker which should be brought to a maximum by adjusting the core in L7/8.

An attempt should now be made to receive the Band III sound signal by very slowly adjusting the core in the oscillator coil L6 from its fully out position. A picture may also be evidenced at this stage.

As soon as the sound signal has been established, the core in L5 should be adjusted, from its fully out position, to bring it to a maximum. It will be found that adjustment to L5 will alter slightly the oscillator frequency and this should be kept on the sound signal by retuning L6 in step with the adjustments to L5.

The core in L1/2 should next be adjusted for maximum sound. At this stage a picture should also be resolved, though it may be found to be rather weak. The correct balance between the sound and vision signals may be achieved by unscrewing by between three-quarters to one and a half turns the cores in coils L1/2 and L5.

Finally, the core in L7/8 should be re-adjusted for optimum results, with a slight re-adjustment to L6 if necessary.

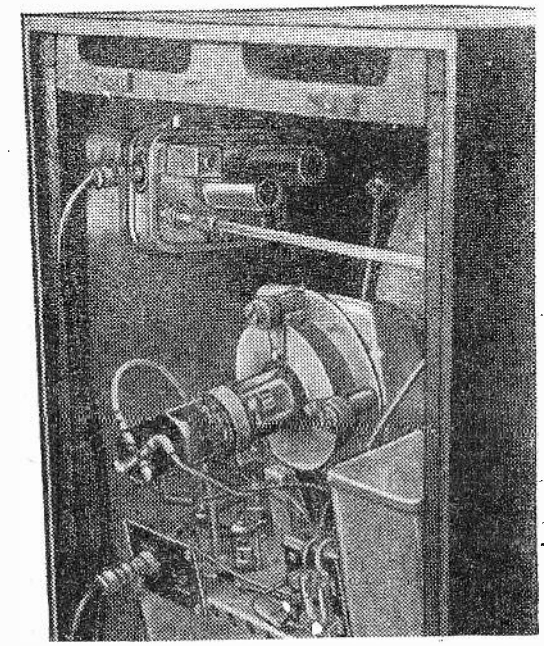
With some types of receiver a picture will be obtained at two different settings of the oscillator core, but it will be found that the sound signal will accompany the vision only at the correct setting.

Operating Notes

Provided the coils are made to specification and the correct value components used, the converter is tunable over Channels 8, 9, 10 and 11 and Channels 12 and 13 can be catered for by substituting threaded brass cores in place of the iron-dust ones.

The output transformer tunes over Channels 1 to 4 ; for Channel 5 receivers it will be necessary either to substitute a threaded brass core in place of the dust core in L7/8 or remove 2.5 turns from L7.

Slight alteration of the inductance of the V.H.F. coils can be effected by altering the turns spacing. For example, if it is found that a coil tends to peak when its core is screwed right in, the spacing between the turns should be reduced, and the spacing should be increased if the coil starts peaking as the core is coming right out.



The unit mounted inside a commercial receiver.

If excessive Band I break-through is experienced, the Band III aerial should be removed from the converter, and if this effects a cure a Band I filter should be installed in the aerial lead. If the break-through continues, however, attention should be given to the inter-connecting link and the screening in the Band I receiver itself and in compartment C of the converter.

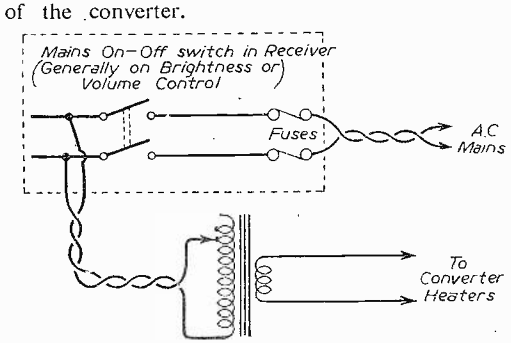


Fig. 27.—If a separate heater transformer is used the mains input should be arranged as shown here.

Definition and Picture Quality

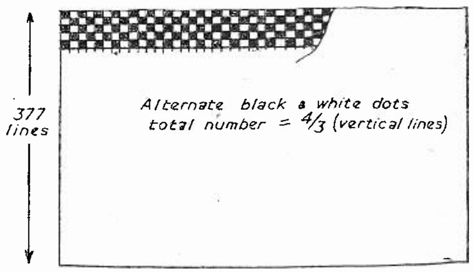


Fig. 1.—Checker board pattern.

FACTORS WHICH AFFECT THE QUALITY OF THE TELEVISION PICTURE

By L. B. Moore

IN the photographic world we talk of the definition of a photograph, meaning the reproduction of the detail of the original image which is present in the print. The greater the detail reproduced the better is the definition. It is not exactly the same as the "sharpness" of the picture, though the layman often thinks it is. One of the reasons for this error, perhaps, is that a sharp image is usually found with good definition.

In the television world much the same principles apply, but here the difference between sharpness of focus and definition is more clearly seen. It is possible to have a finely focused television picture yet the detail in it may be rather poor.

Definition depends also on visual acuity; those with very good sight being able to differentiate between minuter details than those with poorer sight. Generally speaking, the average person cannot detect a change in the detail of an image which subtends an angle of less than one minute of an arc at the eye.

This is by reason of the make-up of the retina of the eye. Two spots which are less than half the diameter of one of the light sensitive cells in the retina of the eye will obviously not be separated by that cell. They will appear as one spot.

Press Pictures

The inability to distinguish separate elements below a certain size is used to advantage in the reproduction of pictures in newspapers. The original picture is broken down into a large number of separate parts by taking a photograph of the picture to be reproduced through a finely divided screen.

The result is the production of a metal plate which is covered with a large number of elementary dots. Where the original photograph showed dark shadows the dots are closely bunched together; where the original showed bright lights the dots are very few and far between. Thus more ink is impressed on the paper in the place of the shadows than is the case with the brighter parts of the picture, and the result is a fair imitation of the original.

Where a paper is produced by high-speed presses it is essential that the dots should not be too fine or they will become clogged and the resultant picture smudged. A limit is therefore set on the maximum number of dots per square inch. The definition of the reproduced image will not be as good as the original, because if the original contained some detail which was smaller than one of the dots making up the plate that detail would not be produced in the printed copy.

Improving Definition

The definition of the printed photograph can be improved fairly simply. First the metal copy can be made so that it has a rather finer screen which produces many more dots per inch; this plate could not be used on high-speed presses for newsprint so a paper of much better quality must be employed. Such paper is very expensive and its employment increases the cost of the magazine. So the second factor in reproduction of finer detail is the use of a higher grade paper.

Television Definition

The same principles apply in television. Modern techniques make it possible to transmit and receive a picture with a much higher definition than is obtainable at the present time. Should this be done, then the costs of equipment would be enormously increased and this includes the increased cost of the television receiver.

A compromise has to be struck between costs and quality of the picture, so that television becomes available to as many as possible.

The problem goes even deeper than that; if we were to employ the French 819-line high-definition system, for example, the bandwidth of one station would occupy three of the present BBC channels. In Band I, therefore, it would be possible to operate only two high-powered stations instead of the present five!

Definition and Bandwidth

There is a direct relationship between the definition of the produced image and the bandwidth of the transmitted signal.

The photograph in the newspaper is divided into a large number of elements in the form of dots. The picture on the television screen is also divided into a large number of elements—the lines making up the picture which are very apparent upon close inspection of the screen and a large number of horizontal elements which are not so apparent.

The optimum viewing distance for a television screen is where the horizontal lines merge into one another so that they cannot be separately distinguished. This will give the best vertical rendition of the image. The vertical section of the picture can be taken as alternate bright and dark bands, the bright bands being those formed by the moving spot and the dark bands (black) being the spaces between the lines.

With the 405-line system the received picture contains 377 working lines (28 are taken up for synchronising purposes). Our picture is therefore 377 lines high, and contains 377 separate vertical elements. To obtain the same sized elements in the horizontal line (and hence the same definition horizontally as vertically), then we shall have to

sometimes known as a cross-over unit, splitter-box or Diplexer (Belling & Lee, Ltd.).

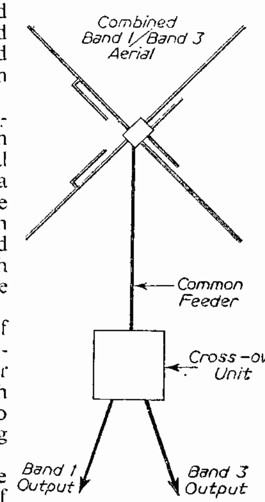
It may be desirable to mount the unit close to the receiver in areas of low Band III signal strength in order to permit the use of special low-loss feeder from the Band III aerial: this, of course, would apply particularly where a Band III array is to be added to an existing Band I system.

Where a new two-band system is to be installed in an area of relatively low signal strength, and the receiver has a common input circuit, it may be desirable to mount the unit in proximity to the aerials and run just a single length of high quality low-loss feeder to the set.

From the point of view of economy it is sometimes worthwhile to utilise two cross-over units to enable a single length of coaxial feeder to connect two aerials to a receiver having separate inputs—Fig. 19.

Several manufacturers are producing cross-over units of this nature, and most of them are virtually representative of tuned filters which have an inverse characteristic to that at the aerials. A tuned filter for this purpose is produced in printed-circuit form by T.C.C., Ltd., and is used in a number of commercial cross-over units. The circuit arrangement of such a filter is shown in Fig. 20.

Since all cross-over units introduce a certain degree of attenuation it is good policy in fringe areas, and where separate inputs are available on the receiver, to use a coaxial feeder on each aerial. Such an arrangement permits special attention to be given to the Band III system, which, in the majority of locations for the time being, will receive considerably less signal than the Band I aerial.



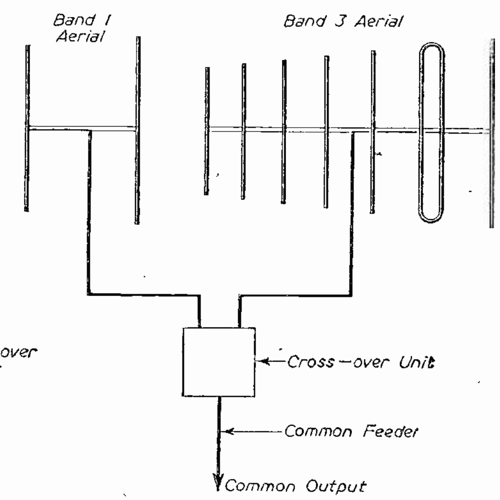


Fig. 17 (left).—A cross-over unit is necessary where a combined Band I/Band III aerial is used with a receiver having separate inputs for the two bands. Fig. 18 (right).—A cross-over unit is also required where separate Band I/Band III aerials are used with a receiver having a common input.

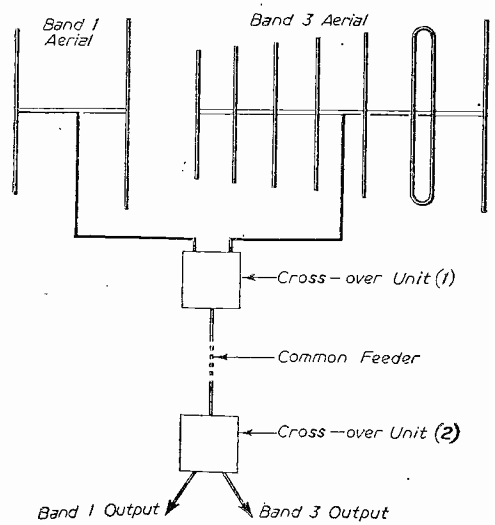


Fig. 19.—It is sometimes worthwhile to utilise two cross-over units to enable a single length of coaxial feeder to connect two aerials to a receiver having separate inputs.

Needless to say, at distances in excess of, say, 25 miles from the transmitter it is most unwise to erect combination type aerials, since the signal strength is extremely low and the combining network used by the aerial manufacturer must aggravate the matter, possibly attenuating the signals by as much as 6 db.

It is understood that all commercially produced cross-over networks are designed for an all-round terminating impedance of 75 to 80 ohms. This is, of course, ideal for the majority of receivers, but with receivers which have a Band III input impedance in excess of 80 ohms a slight mismatch will occur, but this in most cases can be neglected.

Quite reasonable results can, in fact, be obtained on both bands simply by splitting the end of a common coaxial feeder two ways and plugging one of the "Y" connections into the Band I aerial socket and the other into the high impedance (possibly 300 ohms) Band III socket. A better method, however, is again to split the common coaxial into two feeds, plugging one as before into the 75 ohm Band I socket, but this time introducing an 82 ohm resistor in series with the Band III connection.

(To be continued.)

BOOKS RECEIVED

"Second Thoughts on Radio Theory," by "Cathode Ray" of *Wireless World*. Size 8¾in. x 5½in., 409 pages. 266 illustrations. Cloth bound with jacket. Price, 25/- net.

"Guide to Broadcasting Stations 1955-56." Compiled by the Staff of *Wireless World*. Eighth Edition. Size 7¼in. x 4¾in., 80 pages. Price 2s. 6d. net. (postage 2d.)

Both the above published by Iliffe & Sons.

multiply this figure by $\frac{4}{3}$ as the ratio of width to height is as 4 : 3.

Each horizontal line must therefore contain $\frac{4}{3} \times 377 = 503$ elements (Fig. 1).

The maximum difference between the elements making up the line is when one element is black and the other is white ; we shall thus have $\frac{1}{2}(503)=256\frac{1}{2}$ cycles of alternation between black and white for each line. The bandwidth of our transmitter must therefore cover a total of $256\frac{1}{2} \times 377$ cycles per complete frame (Fig. 2). In other words, each frame will contain a total of $256\frac{1}{2} \times 377$ alternate black and white elements.

Each frame is transmitted in $^1/_{25}$ of a second and therefore the total number of cycles of operation per second will be $256\frac{1}{2} \times 377 \times 25 = 2{,}400{,}000$ (or 2.4 Mc/s).

Our transmitter must therefore have a bandwidth of 2.4 Mc/s. (Actually a greater bandwidth than this is required as we have not taken into consideration all the other details, but the figure is sufficient to illustrate the principle.)

Supposing the vertical definition was improved so that there were 600 active lines in the picture, then, applying the reasoning given above, our transmitter will require a bandwidth of 6.0 Mc/s.

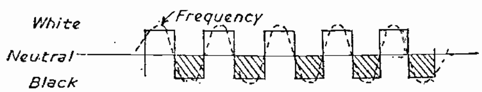


Fig. 2.—Alternative black and white elements forming A.C.

By increasing vertical and horizontal definition by half as much again we have more than to double the bandwidth.

It is clear that the definition and quality of the received picture are very much dependent upon the bandwidth. A receiver with a restricted bandwidth will not reproduce the detail of the original. In bad cases the picture will appear to be out of focus, or the blacks will be smeary.

Spot Size and Definition

In the printed photograph the size of the dots making up the picture decides the quality of the reproduced image. In television the size of the spot from the electron beam in the tube also decides the quality of the reproduced image. The smaller the spot the better the definition.

This factor is brought out very clearly when comparing a VCR97 with a larger magnetic tube. The VCR97 provides a small picture with very satisfactory definition. It is very difficult, however, to resolve completely the frequency test bars on Test Card C which provide an indication of the bandwidth of the receiver. This tube will show the $1\frac{1}{2}$ Mc/s bars clearly, and in most cases the 2 Mc/s bars, successfully indicating that the receiver has a bandwidth as wide as this figure. Only in exceptional cases will it resolve more than the 2 Mc/s bars, as at this point the size of the spot on the tube is larger than the width of the bars. The picture, however, appears of good quality because of its small size.

If a circuit designed for the VCR97 is used with a larger tube, then the definition is improved because of the smaller spot used with the larger tube. The spot is smaller than the total area of the screen as compared with the smaller tube.

As a matter of interest it may be mentioned that the VCR97 has a lower sensitivity than the average magnetic tube ; when changing from one to the other the extra gain available can be usefully employed in widening the bandwidth of the receiver.

A small spot requires a higher E.H.T. and a higher E.H.T. requires a greater power from the scanning circuits, and this in turn means higher production costs. Further, the finer the lines making up the picture the greater is the apparent distance between the lines ; vertical definition may appear to be worsened.

Vertical Definition

The optimum viewing distance for correct perspective is given as four times the picture height. With a 17in. tube this is 4ft. 1in. (height of picture on this class of tube is $12\frac{3}{4}$in.), but at this distance from the screen the horizontal lines are clearly visible. When sited at a distance from the screen where the lines are not seen separately, then the perspective of the viewed image suffers, and we do not get the feeling of being actually present at the scene.

The question of perspective is quite important. In the cinema the size of the screen and seating arrangements have to be borne in mind to retain the illusion. In many shots the figures (or close-ups) on the screen are much larger than life-size, yet they do not appear so to the person in the cinema. The dearest seats are usually those which give the correct perspective.

If the number of lines of the television image are increased a noticeable improvement in the quality of the picture occurs at the optimum viewing distance. This improvement continues rapidly up to 600 lines and then tends to tail off. The difference between 400 and 600 lines is much more noticeable than between 600 and 1,000 lines.

It would appear, therefore, that a figure of about 600 lines represents a good compromise between costs and quality ; this is probably one of the reasons for the choice of the 625 line system by the C.C.I.R.

Interlace

One of the most important factors which affect the definition of the received picture is accuracy of interlace. It is in this respect that many television receivers fail.

Where the interlace fails moderately, resulting in pairing of lines, the main detraction from the quality viewpoint is the apparent broadening of every other line. The screen has to be viewed from a greater distance in order to achieve welding of the line structure.

Where failure to interlace exceeds about 20 per cent., then alternate pairs of adjacent lines will touch and will at times overlap. Unfortunately very minor discrepancies will now reveal themselves in the alternate lines and the screen will have a slight tendency to fuzziness in the horizontal direction. Loss of horizontal definition results.

Where interlace is lost completely and the lines are superimposed, then the condition is worse than if only half the number of lines were used, as the superimposition is not perfect and the horizontal definition will be impaired.

The worst condition is where the interlace fails intermittently many times during the space of a few seconds. The whole of the picture appears to be moving or shimmering and horizontal definition is very poor.

With the present British system perfect interlace is difficult to attain and many ingenious circuits have been devised to overcome what may appear to be a lack of development in the transmission of the frame pulses.

Impulse Excitation

Another feature which adversely affects the definition is the response of the circuits to impulse excitation.

The effect is produced when a black suddenly changes to white, or vice versa. In this case the carrier is instantaneously changed from 30 per cent. modulation to 100 per cent. and a signal with a good harmonic content is necessary to contain the change. It follows that the bandwidth of the video receiver must be adequate to cater for the harmonics.

Unfortunately adjustment of the circuits to produce this condition often results in the circuits " ringing " ; the effect on the picture is that of a black object being followed by an outline or may be several outlines.

This fault is very apparent on many commercial receivers.

Astigmatism

This is the failure of the focusing system to focus the beam into a spot. The vertical focal point is not at the same distance from the source as the horizontal focal point. The tube can be made to focus in one or other of the two planes, but not in both simultaneously. The result is that the spot tends to be oval instead of round.

For this reason it is always wisest to focus the picture in the vertical plane. Instead of focusing on the horizontal lines use the vertical lines of Test Card " C " or the tuning-in signal.

When checking a receiver for bandwidth it is good practice to check the focus in the horizontal plane before attempting to increase the resolution of the test lines by tuning.

Summary

To obtain better definition than that which we enjoy at present it would appear that the adoption of the 625 line system would be very desirable.

Unfortunately in this country we are committed to a 405 line system, which is partly the result of us being pioneers in the field of high-definition television and partly because of the limitation of channels.

It is to be hoped that when Band IV is opened advantage will be taken of the greater bandwidth

New TV Valve Tester

THE M.O. Valve Co., Ltd., has developed a new table specially for conditioning and testing Osram N339 and U329 valves. Both types are used in television receivers, the N339 as a line output valve and the U329 as a booster diode with exceptionally high heater-cathode insulation. The new table subjects them to the same high peak voltages and currents as they encounter in service, and ensures a uniform high standard of performance.

Two of the new tables are shown in the accompanying illustration. Each of them incorporates twelve test positions which will accommodate either type of valve. The valves are inserted and a Perspex window is drawn down over them. The peak voltages developed on the valves can then be increased from zero to maximum either manually or automatically to a preset sequence. Each valve is monitored by pressing the button located immediately below it, the peak output voltage being indicated on a meter let into the front of the table.

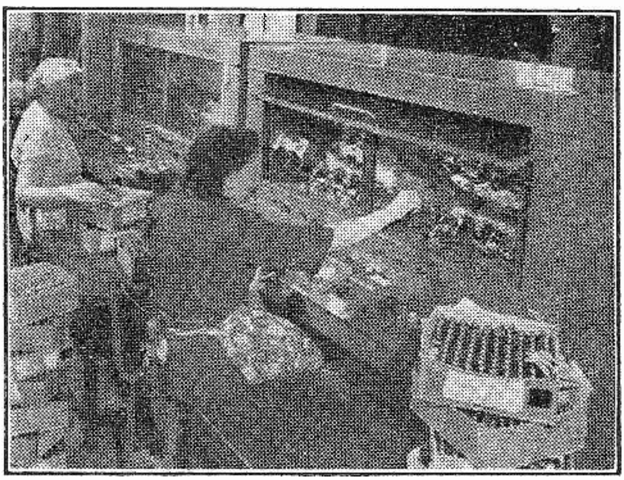
Circuit Details

The test circuit for each valve is very similar to the line timebase circuit used in television receivers. The line transformer is loaded with a dummy coil to simulate the effect of the deflection coils. All twelve test positions are driven by a negative 10 kc/s pulse at the grid of the N339 from a common driver unit, the output of which is kept at a constant amplitude.

The peak voltage developed on the anode of the N339 is dependent on the rate of change of current through the valve at cut-off. The current flowing through the valve is controlled by a variable screen grid supply which, therefore, controls the peak voltage output.

The automatic conditioning is achieved by providing a stepped input voltage to the screen grid power supply from a thyratron operated timer unit. The number of switched steps available is 24 and the duration of each step is variable over a considerable range by adjustment of the thyratron circuit. The maximum screen grid voltage may be preset by a control on the front of the desk.

After the conditioning process is completed the equipment may be set up for testing the valves. The valves are switched on cold and the peak voltages



Two of the new testing tables in action.

are allowed to build up quickly to the maximum rating. This is the treatment the valves receive in a television receiver and the conditioning process ensures that no flashing will take place during testing and use.

VALVES GUARANTEED NEW AND BOXED

ALPHA

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1A3	9/-
1A5GT	6/6
1A7	11/6
1C5GT	8/-
1L4	6/6
1LD5	6/9
1N5	10/-
1R5	7/6
1S5	7/6
1T4	7/6
1U5	8/-
2X2	4/-
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3Q5	10/-
3D6	5/-
3S4	8/6
3V4	8/-
4D1	3/-
42	8/-
5U4G	8/6
5Y3GT	8/6

5Z3	8/6
5Z4g	8/6
6A7	10/6
6A8G/GT	10/6
6AC7	6/6
6AG5	6/6
6AK5	6/6
6AL5	7/-
6AM5	5/-
6AM6	7/6
6AQ5	8/6
6AT6	8/6
6B4	5/-
6B8G	4/-
6BA6	8/-
6BE6	8/-
6BR7	9/6
6BW6	8/6
6C4	7/-
6C5GT	7/6
6C6	6/6
6C9	8/-
6D3	7/6
6D6	7/3
6F1	12/6
6F6G	7/6
6F6M	8/6
6F11	13/-
6F13	13/6
6F14	12/6

6G6G	6/-
6H6	3/6
6J5G/GT	5/-
6J5M	6/6
6J6	7/6
6J7G	6/6
6K6GT	6/6
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6Q7G/GT	9/-
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6SG7	7/6
6SH7	6/-
6SJ7GT	8/-
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6SL7	8/-
6SN7	8/-
6SQ7	9/-
6SS7	8/-
6ST7	7/6
6U4GT	15/-
6U5G	8/6
6U7G	9/-
6V6G/GT	7/6

6X4	8/-
6X5G/GT	7/9
7B6	9/6
7B7	8/6
7C5	8/6
7C6	8/6
7H7	8/-
7Q7	8/-
7R7	8/6
7S7	8/6
7Y4	8/6
75	10/6
77	8/-
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956	3/6
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10C2	12/6
10F1	10/-
10F9	12/6
10LD11	11/-
10P13	11/6

10P14	11/6
12A6	6/9
12AH7	6/9
12AT7	9/-
12AU7	9/-
12AX7	10/-
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12K7	9/-
12K8	11/-
12Q7	9/6
12SC7	7/6
12SG7	7/6
12SH7	5/6
12SJ7	8/6
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20L1	12/6
25L6GT	8/6
25U4GT	12/-
25Y5G	9/-

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25Z5	9/-
25Z6GT	8/6
35L6GT	8/9
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EBF80	11/6
ECH35	13/6
ECH42	10/6
ECL80	11/6
EF22	8/6
EF41	10/-
EF42	13/6
EF80	11/6
EL2	12/6
EL35	7/6
EL41	11/6
EL84	12/-
EM34	11/6
EM80	11/-
EY51	13/6

EY91	7/-
EZ40	10/-
EZ41	11/-
EZ80	10/-
E1148	2/-
FW4/500	10/-
GZ32	12/6
H30	5/-
HL2	5/6
HL23DD	7/6
HP211C	6/9
KL35	8/6
KT2	5/-
KT33C	10/6
KT66	10/6
KT74	8/-
KTW61	7/9
KTW63	8/6
KTZ41	6/-
LP220	6/9
MH4	5/6
MS/PEN	5/-
N78	10/6
N709	12/-
P41	9/-
P215	5/-
PEN25	8/-
PEN46	8/6
PEN220A	4/-
PCC84	12/6

PCF80	12/6
PCF82	12/6
PL81	13/6
PL82	11/6
PL83	13/-
PP225	5/-
PY80	10/-
PY81	11/6
PY82	10/6
QP21	7/6
SP22	6/-
SP220	6/9
TP26	9/-
U10	9/-
U22	8/-
U25	13/6
U229	13/6
U403	10/-
U404	9/-
UU6	10/-
UB41	9/-
UBC41	11/-
UCH42	11/-
UF41	11/-
UL41	11/6
UY41	10/6
VR21	3/-
VR53	6/6
VR54	2/-

VR55	7/6
VR56	6/-
VR57	8/-
VR65	3/6
VR65A	3/3
VR66	3/9
VR91	5/6
VR91SYL	7/6
VR92	2/-
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VR119	4/-
VR123	6/6
VR136	7/-
VR137	5/3
VR150/30	9/-
VP23	8/-
VS70	3/-
VT52	8/-
VT501	6/-
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VU64	8/6
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★ ★

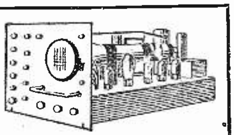
SENTERCEL RECTIFIERS
RM1, 3/9 ea.; RM2, 4/2 ea.; RM3, 5/- ea.; RM4, 16/- ea.

METAL RECTIFIERS
12 v. ½ amp., 1/6 ea.; 12 v. 1 amp., 4/6 ea.; 2 v. 1 amp., 3/- ea.; 250 v. 45 mA., 6/3 ea.; 250 v. 75 mA., 7/6 ea.; 300 v. 60 mA., 7/6 ea.

MAINS TRANSFORMERS 3-WAY MOUNTING TYPE

MT1
Primary: 200-220-240 v.
Secondaries: 250-0-250 v. 80 mA. 0-6.3 v. 4 amp. 0-5 v. 2 amp.
Both tapped at 4 v.............17/6 ea.

MT2
Primary: 200-220-240 v.
Secondaries: 350-0-350 v. 80 mA. 0-6.3 v. 4 amp. 0-5 v. 2 amp. Both tapped at 4v ....17/6 ea.

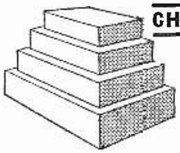


AMERCIAN INDICATOR UNIT TYPE BC929A
Brand new incorporating 3in. tube 3BP1, with mu-metal shield, 2-6SN7GT, 2-6H6GT, 6X5G, 2X2, 6G6G, 9 potentiometers, 24 v. aerial switch motor, transformer, and a host of small components. The whole unit which measures only 8½in. x 8½in. x 13¾in. is brand new, enclosed in black crackle box, and can be supplied at 65/-, plus 5/- p. & p.

PERSPEX IMPLOSION GUARDS
Incorporating escutcheon and filter. 12in. type, 11/6 ea.; 16in. type, 14/6 ea.

PENCIL RECTIFIERS
K3/25, 5/8; K3/40, 7/6; K3/45, 8/2; K3/50, 8/8; K3/60, 9/8; K3/100, 14/8.

CRYSTAL DIODES
Plastic case, wire ends, 2 for 2/1.



CHASSIS

Aluminium Undrilled with Reinforced Corners. Available in the following sizes.

6in. × 4in. × 2½in.	4/6 ea.
8in. × 6in. × 2½in.	6/3 ea.
10in. × 7in. × 2½in.	7/3 ea.
12in. × 8in. × 2½in.	8/6 ea.
14in. × 8in. × 2½in.	9/6 ea.
16in. × 9in. × 2½in.	12/- ea.

All are four sided—ideal for radio receivers — amplifiers — powerpacks, etc.

HEATER TRANSFORMERS

230 v. Input 2 volt .5 amp.	4/6
230 v. Input 2 volt 3.0 amp.	7/9
230 v. Input 4 volt 1.5 amp.	5/-
230 v. Input 4 volt 3.0 amp.	10/-
230 v. Input 5 volt 2.0 amp.	10/-
230 v. Input 6.3 volt .5 amp.	5/-
230 v. Input 6.3 volt 1.5 amp.	6/-
230 v. Input 6.3 volt 3.0 amp.	9/-
230 v. Input 12 volt .75 amp.	5/-

Standard 1¼in. Brown Knobs, per dozen..................	5/6
Zenith Dropper 910 ohms, each	2/6
Erie Dropper, 1,340 ohms, 150 ohms, each....	2/6
Box. 4 BA Nuts and Bolts, each	1/-
Intervalve Transformers Ex. Equip, each..................	2/-
High to low impedance headphone units (insert in lead), each	3/6
Sleeving, various colours, 1 MM, length........	1½d.
Mains Switch, 2 hole fixing, S.P., each..................	1/6
Yaxley Switch, 3 P., 3 B., 3 W., each......................	1/6
Yaxley Switch, 1 Pole, 9 Way, each	1/9
Waxed Cartons, 8 M.F.D., 450 v., each.....	1/9

MOULDED MICA CONDENSERS
All by well-known makers. T.C.C., Dubilier. Hunts, etc. .0001 (100 pF), .0002 (200 pF), .0003 (300 pF), .0005 (500 pF), .001 (1,000 pF), .01 (10,000 pF), etc. All 4½d. each.

PRESET CONTROLS (Carbon).
Fully insulated. 50K ohms, ½ meg, 1 meg, 2 meg. 1/6 ea.

MAINS TRANSFORMER
Input 200/250 v. output 325-0-325 v. 20 mA. 6.3 v. .3 a. 11/- ea.

YAXLEY SWITCH 1 pole 9-way, 1/6 ea.

DRYDEX TORCHES AT BIG REDUCTIONS
2PT5 Penlight, chrome, clips into pocket like a pen...... 1/7 ea.
2N5 Handylite (coloured) suitable for ladies' handbags 1/7 ea.
N15 Candlelite (coloured) ideal for child's bedroom... 3/6 ea.
Prices include bulb but exclude batteries.

COLLARO High Fidelity Pick-up for standard records. Listed 46/5. Our Price 35/- ea.

METAL TUBULAR CONDENSERS (WIRE ENDS)
Sprague .1 mfd. 350v. ... 9d. ea.
,, .02 ,, 750v. ... 9d. ea.
,, .05 ,, 500v. ... 9d. ea.
,, .001 ,, 1,000v. ... 4½d. ea.
T.C.C. Metalmite, .02 mfd. 350 v........................ 9d. ea.
Sprague, .5 mfd. 350 v.......... 6d. ea.

AERIAL RODS
Copper Plated Tubular Rods 12in. long. Will plug into one another to make any length Rod Aerials. 4d. ea.

CHOKES
H.F. Pile Wound Chokes...... 1/- ea.

COIL FORMERS
Alladin Coil Formers ⅜in. complete with Iron Dust Cores.......................... 9d. ea.
Alladin Coil Formers ¼in. complete with Iron Dust Cores.......................... 6d. ea.
Ceramic Coil Formers ⅜in. dia. 1in. long. 4 Ribs........ 5d. ea.

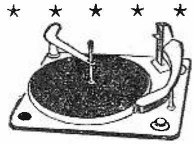
PUSH BACK WIRE
7/0076 size. Colours available: White, Blue, Green........ 2d. yd.

FLEX MAINS TYPE
Twin 14/0076. P.V.C. covered 3d. yd.

Westectors, WX12, WX6, each .... 9d.

SILVER MICA CONDENSERS
Dozens of sizes available, including 30 pF, 50 pF, 15 pF, 100 pF, 200 pF, 300 pF, 500 pF, 1,000 pF, etc., etc. Price 3½d. ea.

★ ★ ★ ★ ★ ★ ★ ★



B.S.R. MONARCH AUTOMATIC RECORD CHANGER
These units will autochange on all three speeds, 7in., 10in. and 12in. They play MIXED 7in., 10in. and 12in. records.
They have separate sapphires for L.P. and 78 r.p.m., which are moved into position by a simple switch.
Minimum baseboard size requires 14in. × 12½in., with height above 5¼in., and height below baseboard 2½in. A bulk purchase enables us to offer these BRAND NEW UNITS at this exceptional. price. These units are beautifully finished in cream enamel with cream bakelite arm. COMPLETE WITH FULL INSTRUCTIONS, £8.19.6. plus 3/- carriage.

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R. & A. 10in. unit	25/6 ea.
Plessey 6½in. lightweight unit	16/6 ea.
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5/6 VINCES CHAMBERS
VICTORIA SQUARE
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TERMS: Cash with order or C.O.D. Postage and Packing charges extra, as follows: Orders value 10/- add 9d.; 20/- add 1/-; 40/- add 1/6; £5 add 2/- unless otherwise stated. Minimum C.O.D. fee and postage 2/3.

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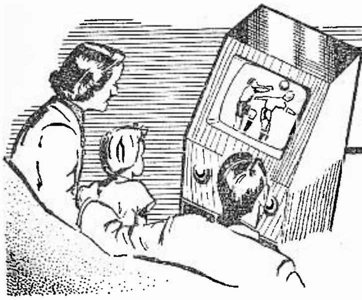


UNDERNEATH THE DIPOLE

TELEVISION PICK-UPS AND REFLECTIONS

By Iconos

THE FOREIGN MARKET

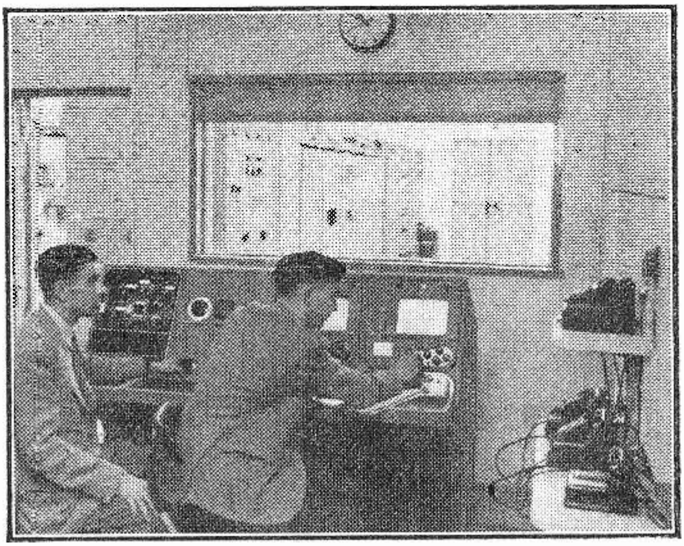
THE special importance of filmed programmes can be realised from the fact that there are 14 or 15 countries which are "in the market" for products for their TV stations using English language. Many more countries are possible purchasers if the feature is of a "dumb" kind—i.e., visual comedy, not relying on dialogue or features to which local language commentary can be readily added. There are many TV films now being made in England at a cost far in excess of what their promoters will receive from ITA transmissions only. The makers are relying on the Empire and foreign market for their profits and merely hope to break even on the domestic TV field. "Packages" of 30 or 40 half-hour features are finding a ready sale. But costs are mounting and so is the demand in some countries for quotas or other protection against importation of foreign-made TV films.

ISLE OF MAN ENIGMA

ON a recent visit to the Isle of Man I was fascinated by the variety of TV aerials erected on the houses in various parts of the island. In some localities horizontally disposed dipoles were seen in the same street or even on the same house as vertical dipoles, and the multitude of variations in folded dipoles, directors, reflectors and so forth was quite extraordinary. This is accounted for by the geography of the island, which is dominated by the 2,000ft.-high Snaefell mountain, which, with other high points, considerably restricts the range of the BBC's relay station near Douglas Head. A leading radio dealer in Douglas agreed with the official statement that the Carnane transmitter on Channel 5 was probably reaching 60 per cent. of the island's population, but that was because 60 per cent. live in the neighbourhood of Douglas. Many viewers on the east and south of the island still received the best pictures from Manchester on Channel 2, while the west and certain localities in the north and south obtained the best results from Belfast, which transmits horizontally polarised pictures on Channel 1. I saw excellent pictures on sets in Douglas tuned to the local relay station, and not once did I see the vertical line which is superimposed upon the picture when the relay quality is inferior for interference reasons or otherwise. This vertical line indicator finds great favour locally as a guide that one's receiver is not at fault. In due course, the erection of a permanent station on the top of Snaefell will solve all these problems, if difficulties of possible interference with the Ministry of Transport and Civil Aviation station on the same site can be overcome. I suppose that in due course, if the ITA extends its activities to the island, the chimney stacks of the more ambitious viewers will carry many more aerial arrays of weird and wonderful shapes. And all this variation of reception takes place in an island which has an area of less than 230 square miles, 33 miles long and an average width of seven miles.

D-DAY

EVERY D-Day in history seems to have carried with it some popular legend about its day before; the anxieties, the mounting tension and the last minute changes of plans are usually forgotten in the light of some popular anecdote which may—or may not—be founded on fact. Drake's game of bowls before A-Day-minus-one and Wellington's eve-of-Waterloo Ball, are incidents which caught the public's fancy. Electronic engineers working on CTV faced up to their recent Waterloo with



Control desk at the new ITA station at Croydon. The main transmitter hall is visible through the control room window.

an equanimity which, in the light of many last-minute improvisations, verged upon oriental fatalism.

CTV-DAY-MINUS-ONE

THE technical plans had been worked out to the smallest detail, even to alternative alibis for technical hitches. The operation was in hand with all ranks at their posts. What, therefore, could be more appropriate on CTV-Day-minus-one than to discover several of the "top brass" of commercial television at a trade dinner at the Savoy Hotel, including Paul Adorian of Associated Rediffusion and Norman Collins of Associated Broadcasting Company. The dinner was given by the Mole-Richardson Company, whose last-minute deliveries of studio lighting equipment at short notice, together with the resources of their hire service and mobile generator equipment, were making CTV-Day possible. The newsreel—ah! the newsreel—that was the item which gave rise to most anxiety. For the highly specialised organisation of a newsreel is as complex as that of a daily newspaper, but in this instance, built up largely on borrowed and improvised equipment owing to unforeseen delays in the delivery of much of its own plant. The result, however, was highly creditable, and the ITA News and Newsreel shows indications that it will be both more human and rather more sensational than the BBC newsreel. I must admit that I had expected a format on the lines of the first BBC newsreels—an all-motion picture reportage in magazine style, with lively musical background throughout. Visible newsreaders seem to have come to stay and there is no doubt that Chris Chataway scored a triumph.

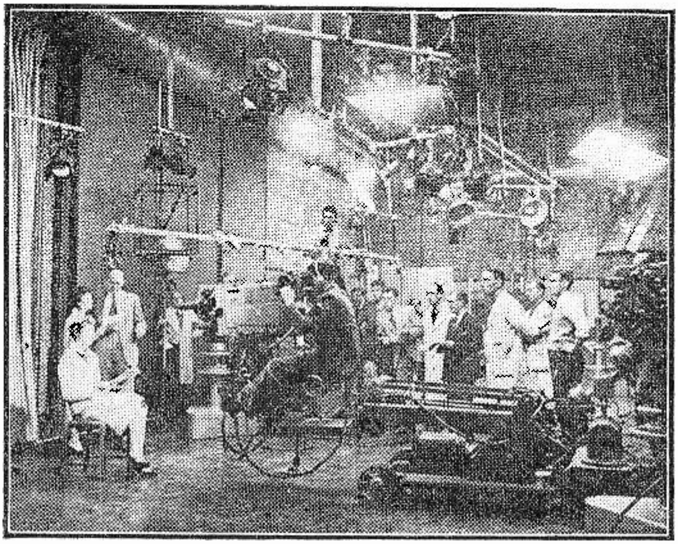
The impact of that first night's ITA programme was felt by the radio dealers next morning; orders for converters and Band III aerials flowed in by the hundred. The cautious had awaited to see what it was like on their friends' sets before spending the £10 odd. Now they will have to wait. In some districts, dealers have waiting lists of hundreds who have suddenly decided to invest in the additional aerial ironmongery.

LONG SHOTS

I OFTEN wonder whether some BBC producers have abnormally good eyesight or whether they monitor their transmissions on extra large C.R. tubes. Many weekly features, variety shows and TV ballets now include ambitious "production" numbers in which numerous performers cavort about elaborate settings like ants in ant-hills. At least, that is what it looks like on my 12in. screen at home. I realise that such ambitious stage mountings are probably impressive to the live audiences at the Television Theatre or at a Radio Exhibition but they leave a large proportion of viewers rubbing their eyes. Even that very experienced producer, Ernest Maxin, seems to have fallen into this trap in a recent Variety Parade. Lorral Desmond was a good enough singer and a strong enough personality not to require the elaborately contrived build-up with four immaculate dancers singing her on to the scene. Later in the same programme, Miss Desmond called Dave King up from the audience and put over an effective duet with him. But the best TV material for the viewer in this particular Variety Parade was the return visit of musical clown, Hal Monty, whose amusing antics were entirely concentrated upon the viewer, not the TV Theatre audience. Ernest Maxin kept his cameras close during this turn and the result was hilarious.

TELEVISION SOUND

POOR sound mixing on the beginning of "Giselle" draws attention to the shortcomings of this side of the business, both on the BBC and ITA. The principal fault appears to be that vocalists and commentators are drowned in a heavy sea of background music, which is often of a type that cuts through dialogue, however low it is monitored. Musical directors and producers, overwhelmed with the problems of the vision side, often forget elementary rules about these musical backgrounds. A musical background of brass, saxophones or pizzicato strings effectively snuffs dialogue unless it is held down at a very low level. When a vocalist is putting over a number in which the lyric is important, diction should be clear and the orchestral background subdued, mellowed with a little artificial echo. Orchestrations should be designed to assist the voice not compete with it. The CTV engineers have been studying this problem carefully and, with recorded sound, are able to carry out careful pre-mixing when the scenes are photographed on film. The latest move is the adaptation of four-track magnetic sound for television film recording. Originally used for the stereophonic sound track that accompanies the magnetic sound versions of CinemaScope pictures, this provides a convenient form for recording separate tracks of dialogue, musical vocal, orchestral and effects tracks. When playing off for TV transmission the tracks can be mixed as desired.



General view of the scene at Wembley on opening day of the new ITA service.

BAND 3 T/V CONVERTER—186 Mc/s-196 Mc/s

£2-5-0 post free.

This Unit comprising drilled chassis, 7in. x 4in. x 2¼in., two miniature valves and met. rect., wound coils, res., cond., etc., is a slightly modified version of the circuit shown in *Wireless World*, May, 1954. It has proved itself highly successful—over 1,000 sets have already been sold to buyers all over England. We invite you to visit us and see it in operation for yourselves. Suitable for most types of T/V sets. T.R.F. or Superhet. Blueprint and circuit details will be sent on application by return of post, 1/6, post free. Supply voltages required 200-250 v., 20 mA H.T.·6.3 v. 1 a. L.T.

Power pack components to fit chassis as illustrated, 30/- extra. Complete set wired, tested and aligned ready for use 20/- extra. Band 1, Band 3 Ae switching can now be added, switch kit, 7/6. Full range of Band 3 aerials in stock. Adaptors from 7/6 per set, dipole from 6/6 each.

Band 1-Band 3 Cross-over filter unit, 10/6.

Volume Controls

Midget Ediswan type. Long Spindles. Guaranteed 1 year. All values 10,000 ohms to 2 Meg-ohms.

No Sw.	S.P.Sw.	D.P.sw.
3/-	4/-	4/9

COAX PLUGS ... 1/2
SOCKETS 1/-
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80 ohm CABLE COAX

STANDARD ¼in. diam. Polythene insulated. GRADE "A" ONLY.

8d. yd.

SPECIAL. — Semi-air spaced polythene, 80 ohm **Coax** ¼in. diam. Stranded core. Losses cut 50%. **9d. yd.**

BALANCED TWIN FEEDER per yd. 6d. } 80
TWIN SCREENED FEEDER per yd. 1/- } **ohms**
50 OHM COAX CABLE 8d. per yd., 1¼in. dia.
TRIMMERS, Ceramic, 4 pf. 70pf., **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., **1/3** each.
RESISTORS.—Pref. values 10 ohms 10 megohms.

CARBON

20% Type. ½ w., **3d.** ; ½ w., **5d.** ; 1 w., **6d.** ; 2 w., **9d.**
10% Type. ½ w., **9d.** ;
5% Type, ½ w., **1/-.**
1% Hi-Stab. ½ w., **2/-.**

WIRE WOUND

5 w. } 25 ohms— 1/3
10 w. } 10,000 1/6
15 w. } ohms 2/-
5 w. } 15,000—
} 33,000 1/9
10 w. } ohms 2/3

WIRE-WOUND POTS.

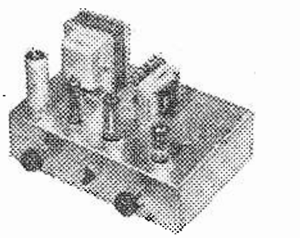
Pre-Set Min. T/V. Type. Knurled Slotted Knob. All values 25 ohms to 30 K., **3/-** ea. 50 K. **4/-.** Ditto Carbon Track 50 K. to 2 Meg., **3/-.**

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. 10 Ω, **3/-.**

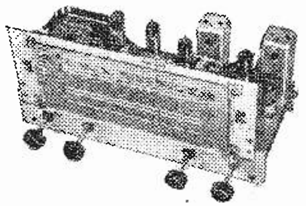
CONDENSERS.—Mica, S. Mica, Ceramics. All pref. values. 3 pf. to 680 pf., **6d.** each. **Tubulars,** 450 v., Hunts and T.C.C. .0005, .001, .005, .01, .02 and .1 350 v., **9d.,** .05, .1 500 v. Hunts Moldseal, 1/-. .25 Hunts. 1/6. .5 Hunts. 1/9. .1 1,500 v. T.C.C. (Simplex), **3/6.** .001, 6 kV., T.C.C., **5/6.** .001 12.5 kV. T.C.C., **9/6.**

SILVER MICA CONDENSERS.—10%.
5 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/-.**



3 VALVE AMPLIFIER

With variable Tone and Volume controls. 3 Midget B.V.A. valves. 4 watts output. Neg. feedback. Chassis isolated from Mains. A.C. 200/250 v. A quality amplifier at an economical price. **PRICE £3.19.6.** Carr. 2/6. Wired and tested, 15/- extra. Circuit and instr. free.



ALL WAVE RADIOGRAM CHASSIS THREE WAVEBANDS. FIVE VALVES

S.W. 16 m.—50 m.
M.W. 200 m.—550 m.
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LATEST MIDGET B.V.A. SERIES.

Brand New and Guaranteed. A.C. 200/250 v. Four position Wavechange Switch. Short-Medium-Long-Gram. Pick-up connections. High Q iron-dust cored coils. Latest circuit technique, delayed A.V.C. and Negative feedback. Output approx. 4 watts. Chassis size 13½ x 5½ x 2¼in. Glass Dial—10in. x 4½in. horizontal or vertical type available, lit by 2 Pilot Lamps. Four Knobs supplied. Walnut or Ivory to choice, aligned and calibrated ready for use. Chassis isolated from mains. Carriage and Insurance, 4/6. **PRICE £9. 15. 0**
8in. or 10in. speakers to match available.

BARGAIN VALUE IN RECORD CHANGERS

Recommended for above chassis

B.S.R. MONARCH.—Latest Model 3 sp. Auto-Changer Mixer Unit. Famous Magidisc, 7, 10 and 12in. Record Selector. Modern Cream Styling Dual Xtal Cartridge Stylus for Hi-Fi reproduction. As used by leading manufacturers. Bargain price.

9½ Gns. post free.

NEW BOXED VALVES ALL GUARANTEED

1R5	7/6	6Q7	8/6	EF41	10/6	MU14	8/6
1S5	7/6	6SN7	9/-	EF50		PCC84	12/6
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3S4	8/-	6X5	8/-	EF50		PL81	12/6
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6H6M	3/6	ECH42	10/6	EM80	12/6	SP61	6/6
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SPECIAL PRICE PER SET
1R5, 1T4, 1S5 and 3S4 or 3V4 ... ... 27/6
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SPEAKER FRET. Expanded Bronze anodised metal 8in. x 8in., **2/3** ; 12in. x 8in., **3/-** ; 12in. x 12in., **4/3** ; 12in. x 16in., **6/-** ; 24in. x 12in., **8/6**, etc.

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SENTERCEL RECTIFIERS. E.H.T. TYPE FLY-BACK VOLTAGES.—K3/25 2 kV., **4/3** ; K3/40 3.2 kV., **6/-** ; K3/45, 3.6 kV., **6/6** ; K3/50 4 kV., **7/3** ; K3/100 8 kV., **12/6** ; K3/160 14 kV., **18/-** ; **MAINS TYPE.**—RM1, 125 v., 60 ma., **4/-** ; RM2, 100 ma., **4/9** ; RM3, 120 ma., **5/9** ; RM4, 250 v. 275 ma., **16/-.**

ENGRAVED CONTROL KNOBS for ¼in. Spindle. 1⅜in. diam. Walnut or Ivory. Gold filled. 16 Standard engravings, **1/6 ea.** Plain knobs to match above, 1⅜in. **10d. ea.,** 1¼in. dia., **8d. ea.** Superior Unmarked Knobs with Gold Ring. Very stylish and becoming highly popular. Walnut or Ivory. 1⅜in., **1/-** ea. ; 1in., **9d. ea.** Pointer Knobs, Black with White Line, **9d.**

WEARITE "P" TYPE COILS. All ranges. 1 to 7, **2/6** ea. Osmor Q Series Coils. Slug tuned. All ranges from **3/6**. Full range popular Coil Packs.

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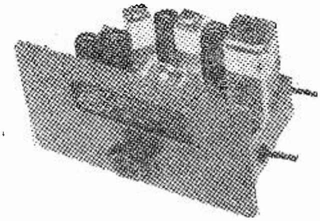
MAINS DROPPERS.—Silicone coated, with 2 slider clips. .15 amp, 1,500 ohms, **4/3** ; .2 amp. 1,000 ohms, **4/3** ; .3 amp. 1,000 ohms, **4/9** ; .3 amp. 750 ohms non-coated, **4/6**.

LOUDSPEAKERS P.M., 3 OHM. Richard Allen, 5in., **16/6** ; 6½in. Goodmans, **17/6** ; 7 x 4in. Elliptical, **18/6** ; 8in. Goodmans, **18/6** ; 8in. Elac., **20/-** ; 10in. Plessey, **25/-** ; 10in. R. and A., **25/-** ; 12in. Plessey, **37/6.**



F.M. TUNER-UNIT (87 mc/s—105 mc/s) **by Jason.** —As tested and approved by Radio Constructor. Complete Kit of parts to build this modern highly successful unit, drilled chassis and J.B. dial, coils and cans. 4 BVA miniature valves and all components etc., for only **£6.10.0,** post free. **SUPERIOR TYPE GLASS DIAL.**—Calibrated in Mc/s and edge lit by 2 pilot lamps, 12/6 extra.
Illustrated handbook with full details, 2/- post free.

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RADIO COMPONENT SPECIALISTS (THO. 2188)

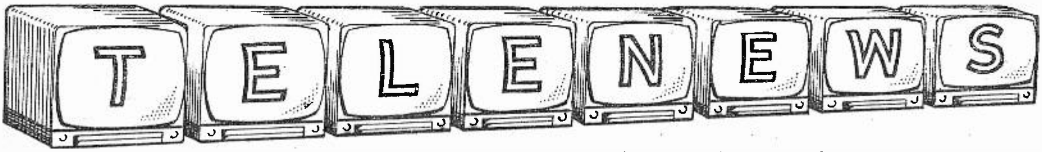
70 BRIGSTOCK ROAD, THORNTON HEATH, SURREY

Buses 130A, 133, 159, 166 & 190

Listed above are only a few items from our very large stock. Send 3d. stamp today for Complete Bargain list.

Hours : 9 a.m.—6 p.m. 1 p.m. Wed. OPEN ALL DAY SAT.

N.B.—Terms C.W.O. or C.O.D. Post/Packing up to ½ lb. 6d., 1 lb. 1/-, 3 lb. 1/6, 5 lb. 2/-, 10 lb. 2/6.



Over 4¾ Million Licences

DURING August the number of television licences increased by 60,832.

14,124,587 broadcast receiving licences, including 4,786,415 for television, and 283,473 for sets fitted in cars, were current in Great Britain and Northern Ireland at the end of August, 1955.

Television Receiving Licences

STATEMENT showing the approximate number of Television Receiving Licences in force at the end of August, 1955, in respect of wireless receiving stations situated within the various Postal Regions of England, Wales, Scotland and Northern Ireland.

Region	*Number*
London Postal...	1,160,211
Home Counties	527,038
Midland...	863,250
North Eastern	703,793
North Western...	698,323
South Western...	278,761
Wales and Border Counties ...	261,618
Total England and Wales ...	4,492,994
Scotland	266,364
Northern Ireland	27,057
Grand Total	4,786,415

First Classified Commercial TV Directory

THE Kemp's Group of Publishing Companies have published the first ever Classified Commercial Television Directory. Issued as part of the new edition of "Kemp's Directory," and also as a separate Supplement (price 5s.) it is made up of classified headings for 33 different sections of the industry.

Compiled in alphabetical order, these include : Advertising Agents with TV Departments ; Animation and Cartoons ; Artistes' Managers and Agents ; Libraries (Film and Effects) ; Libraries (Recorded Music) ; Process Photography ; Sample Packaging ; Rehearsal Rooms ; Storyboards and Visuals ; Studios (Floor Space) ; Studios (Recording) and Theatres (Projection).

Workers Seek Orders

TO prevent redundancy dismissals of about 150, employees at the Ediswan factory at Brimsdown, Enfield, decided at a mass meeting recently to send representatives to every foreign embassy in London to try to get orders for their firm's television cathode ray tubes. The factory had been producing 10,000 tubes a week.

BBC Television Films for the U.S.A.

AN agreement has been signed between the BBC and General Teleradio Inc. for distribution throughout the United States of the BBC Television Film series, "War in the Air," for showing on television.

Payment will be in dollars on a royalties basis. This is the first time that a BBC Television Film series has been sold in the United States.

Underwater Television Trials

VERY successful trials were recently held on the lake at Zurich, Switzerland, using an underwater television camera fitted with a specially designed multi-core signal cable which also acts as a lifting rope. The trials were carried out by Pye, Ltd.

The tests showed that by using this type of cable the time taken to sink and lift an underwater camera is very much reduced. For instance, lowering a camera to the 400-500ft. depth usually takes about 45 minutes whereas the new cable enables this to be done in two minutes. This great reduction is due to the absence of the usual wire hawser which makes a slow descent imperative because of the danger of its fouling the electric cable.

New Wembley Television Studio Centre

WORK on the most up-to-date television studio centre in the world is now nearing completion at Wembley, where Associated-Rediffusion, Ltd., the London weekday programme contractors, are setting up their permanent studios on a 2⅜-acre site.

The centre will consist of five studios, with a master control system designed specifically for commercial television and unique in this country.

Compactness is the keynote of the design, and among the highlights of the new centre are, for the first time : full remote control of all telecine facilities, comprehensive lighting control panels that can be operated single-handed, permanent viewing galleries overlooking the studios for visitors, and special equipment for achieving artistic effects of the "inlay" and "overlay" type.

An interested crowd round one of the television exhibits at the German Radio and Television Show.

First Station for India

A DEMONSTRATION of closed-circuit television has been given in Delhi, India. Dr. B. V. Keskar, India's Minister for Broadcasting, has stated that transmissions will begin from Bombay late next year or early in 1957 at an initial cost of £35,000.

The reception area will not be more than 25 square miles during the transmitter's experimental stage.

Amalgamation in Mexico

BECAUSE Mexico's three commercial TV services have been transmitting programmes at a loss, they have decided to amalgamate into one group—to be known as Tele Sistemax Mexicano.

The immediate aim of the combined stations is to provide the public with clearer pictures and better programmes at less cost.

BBC Station in Jersey

THE BBC announced that the television service to the Channel Islands started on an experimental basis from the new station at Les Platons, Jersey, on Monday, October 3rd. The station operates on Channel 4 (vision 61.75 Mc/s, sound 58.25 Mc/s) and has an effective radiated power of 1 kW. The transmissions are horizontally polarised.

For the first few months the service from Les Platons will be experimental because the station will obtain the television programmes by radio reception from the temporary television transmitter at North Hessary Tor, in South Devon, or alternatively from the more distant station at Wenvoe, in Wales. This arrangement will enable the BBC to provide transmissions in the Channel Islands earlier than would otherwise have been possible, but it means that until North Hessary Tor is working on full power early in 1956 there may be times when radio propagation conditions make reception from the mainland unsatisfactory. If during this experimental period reception of the picture becomes so poor that it cannot be re-broadcast, it will be faded out completely and replaced by a local test signal which appears on the screen as a vertical white bar. This will be done so that viewers may know it is the re-broadcast which is at fault and not their sets. If the picture falls below standard, but is not poor enough to be switched off altogether, the white bar will be radiated for two seconds every three minutes so that the viewer may realise that the fault is not in his set.

Agreement with the British Horse Society

THE British Horse Society in conjunction with the British Show Jumping Association, announced here that they had amended their existing agreement with the BBC so that the BBC Television Service are given the exclusive television rights at the International Horse Show, Horse of the Year Show, and the Three-day Horse Trials at Badminton and Harewood until the end of 1956.

The BBC have emphasised that they are willing, subject to satisfactory payment, to make available a "feed" of part of their transmissions to any other organisation.

The BBC Television Service would also, in the best interests of the sport, continue to televise only excerpts of the various major competitions.

Television Test Transmissions from Lichfield

IT has become necessary to modify slightly the times of transmissions from G9AED, the "Belling-Lee" band III television test transmitter from the I.T.A. site at Lichfield.

The revised times are:

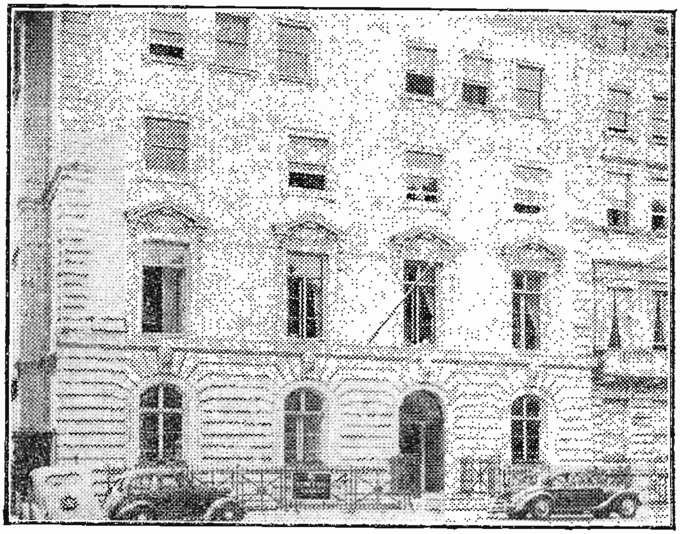
Commencing Monday, October 10th, Monday to Friday 10 a.m. to 1 p.m., 3 p.m. to 6 p.m. and 7.30 p.m. to 8.30 p.m.

Saturday, 10 a.m. to 1 p.m.

No transmissions on Sundays or bank holidays.

It is the ultimate intention to commence transmission at 9.30 a.m. and as soon as this is practicable, viewers will be advised by vocal announcements from the transmitter and by announcements in the trade press.

This is not an I.T.A. transmitter nor are I.T.A. responsible for quality or material.



A general view of the permanent headquarters of the I.T.A. at No. 14 Princes Gate, Knightsbridge

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.

LASKY'S RADIO

BAND III CONVERSION FOR ALL!

Commercial TV has commenced and the demand for these Units is certain to exceed supplies. Order NOW to avoid disappointment.

"THE UNIVERTER"

A Band III Converter for home-constructed or factory-made Band I receivers. Uses two 6AM6, one 12A7M one 6X4. Contains its own power supplies. Complete unit, in Cabinet. Post free **£9/9/-**

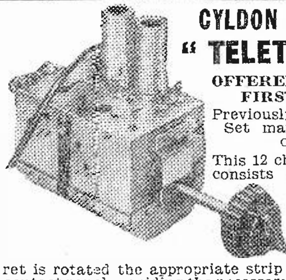
The BOOK, containing circuit diagram, wiring instructions and components list. Post free **3/6**

All components and valves in stock, prices on request.

TELETRON BAND III CONVERTER COIL SET

For use with T.R.F. and superhet Band I TV sets. Uses two Z719. Circuit, wiring diagrams, alignments and full details with each set. Post 1/6. **15/-**

Complete Kit to build the Teletron Band III Converter, including chassis, condensers, valves, etc., with full instructions and diagram. Post 1/6. **48/6**



CYLDON TURRET "TELETUNER"

OFFERED FOR THE FIRST TIME

Previously supplied to Set manufacturers only.

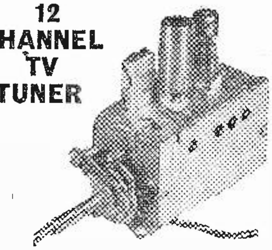
This 12 channel Tuner consists of a turret having 12 clip-in aerial and mixer coil strips. When turret is rotated the appropriate strip locates on a contact panel providing the necessary connections to the valves and circuit. Supplied with coils for Bands I and III (London and Birmingham), BBC and ITA.

This type of tuner enables you to clip in pre-aligned coils for the reception of any station not already provided for in Bands I, II and III, while affording maximum gain, high stability and minimum noise, which are essential in a modern tuner. I.F. output 33-33 Mc/s. Easily modified to other I.F. outputs.

Valves used: PCC84, R.F. double triode cascode R.F. amplifier. PCF80 triode pentode f.c. and mixer. Will work with most sets. Full instructions and circuit diagram supplied. Price **99/6**

Post 2/6. Knob, 3/6 extra.

12 CHANNEL TV TUNER



Famous make. Covers Bands I and III. Complete with valves EF80 and ECC81. Ceramic valveholders, finest quality components, precision made. Switch and fine tuning. I.F. output 20-25 and 40-50 Mc/s. Freq. coverage 50/87 Mc/s and 175-215 Mc/s. Supplied with full details and circuit diagram.

LASKY'S PRICE 89/6 Post 3/6.

Knob, 2/9 extra.

AERIALS OF ALL TYPES

Large stocks. Band I, Band III, Band I/III and F.M. Indoor, loft or outdoor.

300 ohms **Feeder**, per yard, **9d.**

80 ohms **Co-axial**, doz. yds., **7/6.**

Air-cored Co-axial, per yd., **9d.**

Any length supplied.

Open all day SAT. Half day Thurs.

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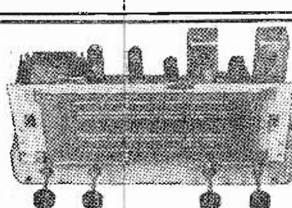

ALL WAVE RADIOGRAM CHASSIS

THREE WAVEBANDS — **FIVE VALVES**

S.W. 16 m.—50 m. — LATEST MULLARD
M.W. 200 m.—550 m. — ECH42, EF41, EBC41,
L.W. 800 m.—2,000 m. — EL41, EZ40.

12 months Guarantee, with 10in. P.M. Speaker, A.C. 200/250 v. W/c Switch, Short-Medium-Long-Gram. A.V.C. and Negative feedback. 4.2 watts. Chassis 13½ x 5½ x 2¼in. Glass Dial—10in. x 4½in. horizontal or vertical available. 2 Pilot Lamps, Four Knobs, Walnut or Ivory. Aligned and calibrated Chassis isolated from mains. PRICE **£10/15/0.** Without 10in. Speaker, **£9/15/0.** Carr. & Ins., 4/6.

CONDENSERS.—New stock. .001 mfd. 7 kV. T.C.C., **5/6.** Ditto, 12.5 kV., **9/6**; 2 pf. to 500 pf. Micas, **6d.**; Tubular 500 v. .001 to .01 mfd., **9d.**; .05, .1, **1/-**; .25, **1/6**; .5, **1/9**; .1/350 v., **9d.**; .1/600 v., **1/3**; 1.1/500 v., **3/6.**

CERAMIC CONDENSERS.—500 v., .3 pf. to .01 mfd., **1/-.**

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

TUBULAR		CAN TYPES		CAN TYPES	
2/450 v.	2/3	16/500 v.	4/-	8+16/450 v.	5/-
8/450 v.	2/3	500/12 v.	3/-	32/+32/350 v.	4/6
16/500 v.	4/-	SCREW BASE		32+32/450 v.	6/6
25/25 v.	1/9	TYPE 512		60+100/350 v.	11/6
50/50 v.	2/-	8/500 v.	3/-	1,000+1,000/6 v.	6/6
100/25 v.	2/-	16/500 v.	4/-	15.00/6 v.	4/6

C.R.T. LOW LEAKAGE ISOLATION TRANS. Ratio 1 : 1.25, 25% boost, 2 v., **10/6**: 4 v., **10/6**; 6.3 v., **10/6**; 10.8 v., **10/6**; 13.3. v., **10/6.** Ditto mains primary **12/6.** **MAINS TYPE** Multi Output.—2, 2¼, 2½, 2¾, 3 v. 2 amp., **17/6.** **MAINS TYPE** Multi Output, 2, 4, 6.3 v., 7.3 v., 10 v., 13 v., two taps boost output 25% or 50%, **21/-.**

B.S.R. MONARCH 3-SPEED MIXER CHANGERS. ACOS GP37 XTAL HEADS.—Baseboard, 14in. x 12in. Height 5¼in. Brand New in Maker's Boxes, **£9/19/6**, post free.

£8-19-6 (Limited Period)

post free.

Brand new Plessey 3-speed Autochanger Mixer Unit for 7, 10 and 12in. Records. Twin Hi-Fi Xtal Head with Duopoint sapphire stylus. Plays 4,000 records. Sprung mounting. Baseboard required, 15½in. x 12¼in. Height 5½in. Depth 2in. Superb Quality. FAMOUS MAKE.—3 speed Single Record unit with Acos 37 Turnover Head, each Sapphire Stylus plays 2,000 records. Starting Switch Automatically places Pick-up on records, 7in., 10in. or 12in. Auto Stop. Baseplate 12in. x 8½in. Height 2½in. Depth 1¾in. Price £7/15/6, post free.

T.V. PRE-AMP.—Channel 1. Midget chassis 6in. x 3in. x 1¼in. Complete with coax. lead, plug and EF42 or 6F13 valve. Brand new (boxed). Listed £3/15/-. Special clearance, **21/-**

SIMPLEX TV. 12 gns. COMPLETE KIT of parts with punched and drilled chassis screens and tube supports to build 6in. **ELECTROSTATIC MODEL** detailed list S.A.E. **6in. VCR97 Tested full picture, £2.**

WIRE-WOUND POTS, 3 WATT. FAMOUS MAKES

Pre-Set Min. T.V. Type. All values 25 ohms to 30 K., 3/- ea. 50 K., 4/-.

Standard Size Pots, 2¼in. Spindle. 100 ohms to 50 K., 5/6; 100 K., 6/6.

RECORDING TAPE. Exclusive Bargain. 1,200 ft. reels, High Coercivity. Brand new, 17/6.

VALVES

All Boxed		3/6	New & Guaranteed	
6/6	1/3	3D6	2/6	5/6
6AL5	EA50	6H6M	2X2	6AG5
6J5	7/6	7/6	7/6	6B8
6K7G	OZ4	6F6	12BE6	EF50
EB91	1R5	6K6	EC91	10/6
8/6	1S5	6K8	EF39	6AM6
6AC7	1T4	6SA7	EF92	6J6
6AT6	1S4	6SL7	EL32	ECL80
6C9	3S4	6V6G	HVR2A	EF55
6SN7	3V4	6X4	U22	EF80
7S7	6BE6	6X5	UF41	EL41
ECH42	6BW6	12AX7	VP23	PY82
12/6	All B.V.A. Types at 1951			12K8
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Volume Controls

Long spindles. Guaranteed 1 year. All values 10,000 ohms to 2 Meg.

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

EXT. SPKR. TYPE 3/-

80 ohm CABLE COAX

Semi-air spaced Polythene insulated. ¼in. dia. Stranded core. Losses cut 50% **9d.** yd.

STANDARD ¼in. Coax. **7d.** yd

COAX PLUGS ... **1/-** **DOUBLE SOCKET** ... **1/-**
SOCKETS ... **1/-** **OUTLET BOXES** ... **3/6**

BALANCED TWIN FEEDER, yd. 6d. 80 or 300 ohms.

TYANA.—Midget Soldering Iron. 200/220 v. or 230/250 v., **14/11.** Triple Three mod. with detachable bench stand, **19/6.** Solon Midget Iron, **22/-.**

RESISTORS: All values: 10 ohms to 10 meg., ¼ w., **4d.**, ½ w., **6d.**: 1 w., **8d.**; 2 w., **1/-.**

HIGH STABILITY, ½ w. 1%, **2/-.** **Preferred values 100 ohms to 10 Meg.**

ALADDIN FORMERS and core. ¼in., **8d.**, ⅜in., **10d.**

SENTERCEL RECTIFIERS.—EHT Type. Flyback Voltage.—K3/25, 2 kV., **4/3**; K3/40, 3.2 kV., **6/-** K3/45, 3.6 kV., **6/6**; K3/50, 4 kV., **7/3**; K3/100, 8 kV. **12/6.** **MAINS TYPE.**—RM1, 125 v., 60 ma., **4/-**; RM2, 100 ma., **4/9**; RM3, 120 ma., **5/9**; RM4, 250 v., 275 ma., **16/-.**

BAND 3 TV. CONVERTER KITS
Suitable all T.V. makes

Ready-wound **Coils, BVA Valves,** all components, **Punched Chassis,** Circuit diagram, wiring plans. **Complete Kit** for mains operation, 200/250 v. A.C., **£3/10/-.**

As Above, less **Power Pack,** requires 200 v., 20 ma., H.T. 6.3 v. 1 a. L.T., **£2/5/-.**

Punched Chassis and **Wound Coils.** Component list, circuit diagram, wiring plans, only **19/6.**

RADIO COMPONENT SPECIALISTS

48 Hour Mail Order Service
307, Whitehorse Road, West Croydon.
Open all day. THO 1665. Wed. 1 p.m.
Post 6d. £1 orders post free. C.O.D. 1/6. Lists s.a.e.

RADIO SUPPLY CO. (LEEDS) LTD.

Dept. N., 32, THE CALLS, LEEDS 2.

Post Terms C.W.O. or C.O.D. NO C.O.D. under £1. Postage 1/- extra under 10/-; 1/6 extra under £1; 2/- under £3. Open to callers 9 a.m. to 5.30 p.m. Sats. until 1 p.m. S.A.E. with enquiries, please. Full list 5d.; Trade list 6d.

R.S.C. TRANSFORMERS

Fully Guaranteed.
Interleaved and Impregnated.
Primaries 200-230-250 v. 50 c/s screened

TOP SHROUDED, DROP THROUGH

260-0-260 v 70 ma, 6.3 v 2 a, 5 v 2 a ...	**16/9**
350-0-350 v 80 ma, 6.3 v 2 a, 5 v 2 a ...	**18/9**
250-0-250 v 100 ma, 6.3 v 4 a, 5 v 3 a	**23/9**
350-0-350 v 100 ma, 6.3 v 4 a, 5 v 3 a	**23/9**
350-0-350 v 150 ma, 6.3 v 4 a, 5 v 3 a	**29/9**

FULLY SHROUDED UPRIGHT

250-0-250 v 60 ma, 6.3 v 2 a, 5 v 2 a Midget type, 2½-3-3in.	**17/6**
250-0-250 v 100 ma, 6.3 v 4 a, 5 v 3 a	**26/9**
250-0-250 v 100 ma, 6.3 v 6 a, 5 v 3 a, for R1335 Conversion	**31/-**
300-0-300 v 100 ma, 6.3 v 4 a, 5 v 3 a	**26/9**
350-0-350 v 100 ma, 6.3 v 4 a, 5 v 3 a	**23/9**
350-0-350 v 150 ma, 6.3 v 4 a, 0-4-5 v 3 a	**31/6**
425-0-425 v 200 ma, 6.3 v 4 a, C.T. 6.3 v 4 a, C.T., 5 v 3 a	**49/9**

FILAMENT TRANSFORMERS
All with 200-250 v 50 c/s Primaries: 6.3 v 1.5 a, **5/9**; 6.3 v 2 a, **7/6**; 0-4-6.3 v 2 a, **7/9**; 12 v 1 a, **7/11**; 6.3 v 3 a, **9/6**; 6.3 v 6 a, **17/9**.

CHARGER TRANSFORMERS
200-250 v 0-9-15 v 1½ a, **11/9**; 0-9-15 v 3 a, **16/9**; 0-9-15 v 5 a, **19/9**; 0-9-15 v. 6 a, **22/9**.

OUTPUT TRANSFORMERS

Standard Pentode 5,000 to 3 ohms	**4/9**
Small Pentode 5,000 to 3 ohms ...	**3/9**

E.H.T. TRANSFORMERS 200-230-250 v 2,500 v 5 ma, 2-0-2 v 1.1 a, 2-0-2 v 1.1 a for VCR97, VCR517 ... ... **37/6**

SMOOTHING CHOKES

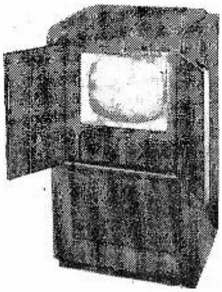
250 ma 5 h 100 ohms	**11/9**
100 ma 10 h 200 ohms	**8/9**
80 ma 10 h 350 ohms	**5/6**
60 ma 10 h 400 ohms	**4/11**

SELENIUM METAL RECTIFIERS
RM4 250 v 250 ma, **11/9**; G.E.C. 300 v 250 ma, **12/9**; 120 v 40 ma, **3/9**; 6/12 v 1 a F.W., **4/11**; 240 v 50 ma, **5/9**; 6/12 v 2 a F.W., **8/9**; 250 v 80 ma, **7/9**; 6/12 v 6 a F.W., **19/9**.

BATTERY SET CONVERTER KIT
All parts for converting any normal type of Battery Receiver to A.C. mains 200-250 v 50 c/s. Supplies 120 v 90 v or 60 v at 40 ma. Fully smoothed and fully smoothed L.T. of 2 v at 0.4 a to 1 a. Price including circuit **48/9**. Or ready for use 8/9 extra.

ALL DRY RECEIVER BATTERY ELIMINATOR KIT.—All parts for the construction of a unit (metal-case 5½-4½-2in.) to supply Battery Portable receivers requiring 90 v, and 1.5 v. Fully smoothed. From 200-250 v 50 c/s mains. Price, inc. point-to-point wiring diagrams, **38/9**. Or assembled and tested at **45/6**.

TV. CONSOLE CABINETS
Handsome well constructed with beautiful figured walnut veneer finish. Size 40in. high, 24½in. wide, 20in. deep. For 15in. or 17in. Tube.
Limited number at only **9 GNS.**
For callers only.
Types with full length doors, **10 gns.**
Table Model types with doors, **5 gns.**



TV. PREAMPLIFIER.—For Fringe Areas. Brand New. Complete with 6F13 valve. Only **22/6**.

CO-AXIAL CABLE ¼in.

75 ohms 14/36	...**7d. yd**
Twin-Screened Feeder ...	...**10d yd**

EX-GOVT. SMOOTHING CHOKES.—

100 ma 10 h 250 ohms Tropicalised ...	**3/11**
150 ma 6-10 h 150 ohms	**6/9**
150 ma 10 h 150 ohms	**11/9**
250 ma 10 h 50 ohms	**14/9**

EX-GOVT. MAINS TRANSFORMERS
Primaries 230/250 v 50 c/s. 48 v 1 a. **9/9**; 400 v C.T. 150 ma 4 v 6 a, 6.3 v 6 a, 6.3 v 0.6 a, 4 v 6 a, 4 v 3 a, 5 v 3 a, 4 v 3 a, 5 v 2 a, **22/9**; 300-0-300 v 120 ma 4 v 1 a, **17/6**.

EX-GOVT. E.H.T. SMOOTHERS
.02 mfd 8,000 v **1/11**; 25 mfd 4,000 v (Block), **4/9**; .5 mfd 3,500 v Can, **3/6**.

BATTERY CHARGER KITS.—Consisting of attractive Green Crackle Case, Transformer, F.W. Rectifier, Fuse, Fuse-holder, Tag strip, Grommets, and Circuit. For mains input 200-230-250 v .50 c/s 6 v 2 a, **25/9**; 6 v or 12 v. 2 a, **31/6**; 6 v or 12 v. 4 a, **49/9**. Any type assembled and tested for **6/9** extra.

R.S.C. 6v or 12v BATTERY CHARGER
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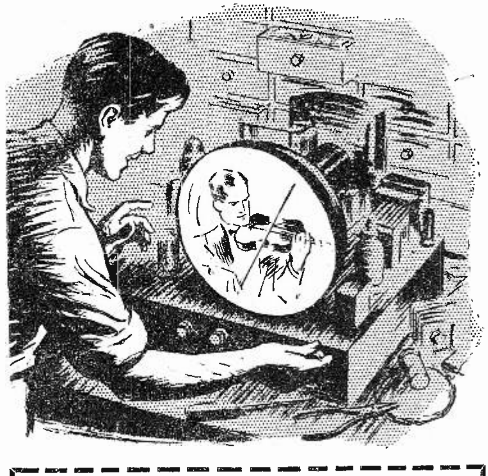

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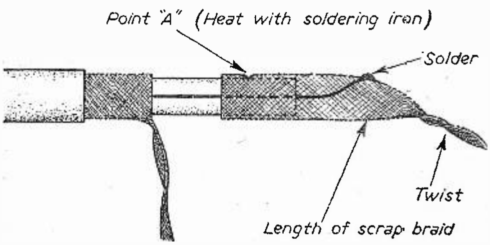
The Editor does not necessarily agree with the opinions expressed by his correspondents. All letters must be accompanied by the name and address of the sender (not necessarily for publication).

COAXIAL HINT

SIR,—The article by W. J. D. on "Coaxial Ends" on page 102 of your August issue is very good. It could be taken a bit further with advantage. Some of the generally available co-ax has a solid conductor which will snap off quickly when the feeder line sways. The multi-strand variety will have its individual small conductors corrode in no time.

Refer to the accompanying illustration. Get a piece of scrap braid, push it over the central dielectric and bring the inner conductor through as shown. Solder, but do not use too much to avoid making the braid too rigid at that point. Press the iron at point A to melt the dielectric into the braid. Allow to cool before handling.—C. McCarthy (Radio EI6G) (Cork).



Mr. McCarthy's coaxial hint.

BBC QUALITY

SIR,—I would like to point out some points for the benefit of readers.

First, Mr. D. R. Boyd, on BBC quality, quotes that the BBC have "achieved the task of reproducing *tape-recorded vision*." As far as I know, and according to the BBC demonstration film, these telerecordings are nothing else but recording on film—just like the news reels in the cinema. The technique of recording of picture signals on tape is being developed in America (Bing Crosby Enterprise being one).

Second, Mr. L. D. Stuart on Test Card "C." The break in transmission at about 11 a.m. every day (except Sunday) is due to a change-over from low to high power (if a set has A.G.C. this would not be noticeable). The continuation of Test Card "C" after 12 a.m. was announced some time ago—and as the demonstration film was made much before the extension of Test Card "C" up to 1 p.m., the sentence quoted is not misleading.—P. J. Rood (Hull).

THE AURORA AND TELEVISION

SIR,—For a long time I have held the view that the Aurora Borealis or Northern Lights affects television more seriously than any other natural source, such as sunlight, sun-spots, etc.

I have noticed for many weeks that, if the effect of the Aurora is blanketed out by heavy rain or snow clouds in the north, a good picture usually results.

From my experience and study of the Aurora within the arctic circle I consider that it is largely of an electrical nature in that it can, day and night, produce a standing current on telegraph circuits, as well as affect wireless and telephone circuits or routes.

I have tried to get the BBC to do something in the matter, such as finding out the intensity of the Aurora, the height and thickness of the northerly clouds, and then include in the 7.25 p.m. Weather Report some idea of how much the picture will be affected, which would save many viewers fiddling with their sets when conditions are bad. As they refused even to consider the matter I have now submitted the idea to the Central Forecasting office at Dunstable.

Meanwhile, I have designed, made and patented a meter which gives a true reading of the actual aerial current without the use of valves or batteries, etc.

This enables me to compare one aerial with another, to judge the efficiency and pick-up and to observe fluctuations in the aerial current, brought about by the varying strength of the Aurora.

When fast-running horizontal lines appear instead of a picture, this indicates loss of signal strength due to the effect of the Aurora, sun, etc., and the aerial current drops to a low figure. This does not occur when the effect of the Aurora is blanketed out by thick, high northerly clouds.

Sometimes, when the sun has set, the aerial current will rise to a high figure for a very short time, indicating that the emission of the Aurora has ceased momentarily, as I think it does now and then.

I find that a car with non-suppressed ignition, or a sewing machine, will cause an increase of up to 10 micro-amps in the aerial current, and it is very interesting to watch the instrument needle rise and fall as the car passes by.—J. W. Hobley (Wellington).

PICTURE DETAIL

SIR,—I am rather annoyed by the repeated use by producers of crowd scenes; for instance in variety, the dancers, where they are at the back of the stage and as a result their eyes and other details are far too small to be reproduced. Is it not a fact that the spot size on most home-receivers is such that the eyes and perhaps even the mouth, under such conditions, cannot be reproduced because they are smaller than the spot, and as a result the chorus and crowd all have blank faces If I am not correct in my assumption how can one reduce the spot size so as to get these details. I might mention that on Card C I get the 2.5 Mc/s bars quite distinctly and, therefore, the small details I have mentioned should appear—if they are transmitted.—G. Bardon (Edgware).

BAND III RECEPTION

SIR,—I recently built your simple converter and although I got a picture it was very poor in quality. After much time and trouble I found that the aerial was to blame—I had made a simple dipole only. Someone told me I needed a Yagi, and on making three directors and fitting these in front of my dipole, it made all the difference. Unfortunately it also brought in London (BBC) but I am experimenting to cut this out, but I thought it worth passing on the hint about the aerial in case other readers find the same trouble.—S. T. Whitwell (N.19).

A Coil-assisted FOCUSSING UNIT

OBTAINING BETTER FOCUS BY THE USE OF COMBINED PERMANENT MAGNET AND ELECTRO-MAGNET

By C. E Gillingwater

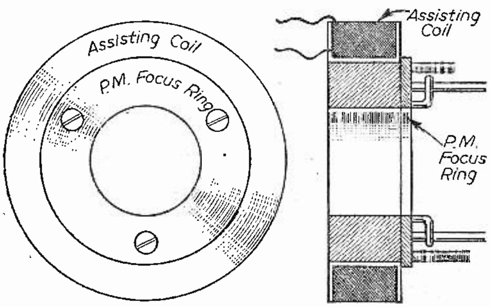
AFTER some years' service a P.M. focussing ring tends to show signs of weakened flux. The adjustable magnetic shunt is eventually screwed out until it rests hard-up against the tube neck support. Correct focussing can no longer be achieved, and the unit must be replaced. A temporary remedy is to move the ring farther back along the tube neck. But this procedure can be complicated by the presence of an ion-trap magnet which has to be positioned correctly.

Such a weakened magnet had been replaced by a series-fed electro-magnetic unit. Focus was again excellent and the extra control soon became an essential to comfortable viewing. But picture centring was no longer perfect. There was a small vacant space on the right of the screen which could not be filled. E.M. units are more cumbersome than their P.M. counterparts. They cannot be manoeuvred so easily and usually possess no provision for picture shift.

The focus component about to be described uses a discarded P.M. ring, which supplies most of the necessary field. The ring was dismantled for examination and with the view to placing a small "assisting" coil inside. But, obviously, there was insufficient space for this so it was re-assembled and considered as a whole. The measurements were: diameter, 2⅞in.; width, 1in., excluding the rear pole-piece which projected slightly upwards.

The Modification

A shallow metal reel, 4in. in diameter by 1in. wide, was made, a good fit over the P.M. ring; the rear pole-piece of which serves as a stop block. For insulation, two rings and a shallow tube of thin card were employed to cover the metal surface completely. This was securely glued to the metal, and well varnished with shellac. One hole was drilled low down in one side for the inner connecting wire. For shunt feed the reel is filled with No. 40 enamel-covered wire, interleaved with paper every thousand turns. Each layer received a liberal application of shellac. To energise the coil a current of between 20 and 30 mA at 250 volts is required.



Details of the device described above.

Testing

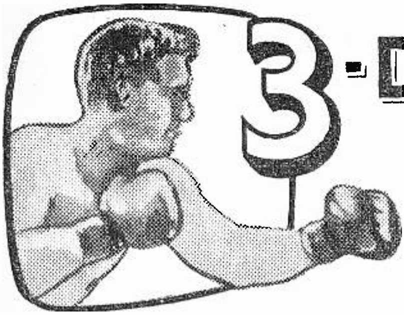
The "assisting" coil is placed in position but not connected until the P.M. focus ring has been adjusted for optimum results. The outer lead is earthed and the inner taken to H.T. positive via a 2,000 ohms wire-wound potentiometer by-passed with a 4 μF condenser. It is now necessary to ascertain that the coil is aiding and not opposing the magnetic field of the focus ring. With minimum current passing through it, check with a voltmeter at junction with potentiometer, which must be rotated for maximum resistance. The picture will be defocused. If the gap requires closing to correct this, all is well. But if not, the leads must be reversed or the coil removed bodily and turned over.

Using the Unit

Now the control can be turned halfway and the P.M. gap closed a little. This unit was now moved forward to its original position along the tube neck and the old wooden spacer replaced. As the potentiometer is fully rotated there is a slight tendency for the picture to turn axially. But, when once the operating range has been found, and the deflection coils adjusted (if necessary), this tendency becomes very slight indeed. The coil has not been tested in a series-fed circuit, but there should be no difficulty provided a stouter gauge of wire is used with a parallel control (500 ohms).

Results

This coil-assisted P.M. focus unit has now been in use for two months with no further apparent weakening of the P.M. ring. The focus control seldom needs touching, but it is interesting to make sure that the tube is giving the best possible picture. The over-all size of the unit is still less than that of a standard electro-magnet. Picture centring can be achieved easily with the further advantage of being able to adjust for any variations of focus from the front panel.



3-DIMENSIONAL TELEVISION

SOME INTERESTING NOTES ON THE STEREOSCOPIC EFFECT THAT CAN BE OBTAINED FROM VIEWING NORMAL FLAT PICTURES

By W. Groome

THE three-dimensional effects which viewers occasionally claim to have seen on their screens are not always figments of fancy, for what they have observed by chance can be repeated by anyone receiving a reasonably good picture. It is not, of course, stereoscopy ; that is only possible by the simultaneous presentation of separate pictures to each eye. But, as this article will attempt to show, and as the cinema is indisputably proving, effects that are strongly three-dimensional can be obtained without the inconvenience and discomforts of the usual forms of stereoscopy.

Because they are spaced about two and a half inches apart our two eyes receive different views of the same subject. This can be checked by looking at any object with one eye at a time. If the evidence of the eyes were accepted by the mind exactly as received we would "see double" even when sober, but fortunately the images are merged by a mental process. It is fortunate, too, that the process is an unconscious one, for the job of comparing and registering two angles of view would be beyond the abilities of our conscious minds.

Another feat of the mind is a kind of trigonometrical calculation which would baffle many if attempted consciously. When looking at any scene the eyes converge, i.e., they turn inwards, quite sharply for near objects and to lesser extents as the distance increases. The amount of movement is used by the mind as an indication of distance to reinforce the other clues of three-dimensional depth. Although this does not shout out loud that the distance is so many feet and inches, it does help to locate relative distances.

Of these two-eyed functions, the first is essential in stereoscopy—the simultaneous presentation of two views of the same scene, one to each eye. The other, convergence, accounts for the discomforts of it, for the degree of convergence imposed by the viewing system may conflict with the other evidence contained in the detail of the picture.

Contrary to the opinion of some stereo enthusiasts, the impressions of depth and distance are by no means entirely dependent upon the use of two eyes, and many indications are of a kind that can be appreciated by one only. On the other hand, a stereo pair which supplies these other clues inaccurately can be distinctly unconvincing. Some of the things that convey the third dimension when viewing a scene at first hand are : perspective, the diminishing of size with increasing distance, the vanishing of lines to the horizon, and the length and angles of cast shadows. These can all be accurately represented in a picture of the scene.

Convergence

Then why, if these are strongly indicative, does a picture having all things correct still appear flat? Convergence is one reason. In life it would indicate that the cottage at the end of the lane was further away than the bush in the foreground. When viewing a picture, however, we converge on the screen or paper and the range registered is the same for all parts of it—distant cottage, foreground bush, and infinite sky. Binocular vision gives the same misleading evidence, for whereas the original would supply two angles of view, the picture gives identical images to each eye. This can only be recorded in the mind as an unnatural state of affairs, thus supporting the impression that the picture is artificial, unreal, flat.

So these are the obstacles to the appreciation of the third dimension. Let us disconnect them. There is nothing drastic about it ; just close one eye. Without the conflicting impressions of the other eye the picture takes on a depth and solidarity that is strongly three-dimensional. Try it.

The viewers who, from time to time, claim that their screens have presented fleeting three-dimensional pictures have probably used only one eye during that brief observation. A blink or squint, a hand raised, or the movement of another person nearby, these and other obstructions could leave the viewer with the use of only one eye for a fraction of a second. In a few cases when a person is tired, it is possible for the mind to ignore the image of one eye, although no conscious knowledge of this would exist.

Apart from three-dimensional effects, blinking, "screwing the eyes," or peering through half-closed eye-lids sometimes produces an improvement in definition by reducing the effective aperture of the pupil or lens of the eye. As all photographers know, no lens gives its best definition or depth of focus at full aperture and a most noticeable improvement is obtained by "stopping down" the iris diaphragm.

Try It Out

If you want to try the "3-D TV" effect for yourself, a simple gadget would be an old spectacle frame with black paper or card fitted to one eye-piece. The other may either be left open or, if you also wish to "stop down" for better definition, covered with black card in which a small hole has been pierced.

The writer suggests this novelty merely as a way of checking the statement that the third dimension is already presented quite strongly in the average run of pictures, but would emphasise his opinion that the eyes should not be subjected to it (or to any other optical gadget) for any length of time.

Your PROBLEMS Solved

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

ULTRA (NO MODEL NUMBER)

I have an "Ultra" 15in. TV set, and with the advent of commercial television I should like to fit an adaptor suitable for receiving such broadcasts in this and other areas. Would you please advise me what type I should require and what the cost would be if I fit it or if I had it fitted by the supplier of the set.—J. E. Watkin (Birmingham).

Assuming this to be a Model V817 or W817, a Band III tuner unit is available and this may be plugged in with little modification. The actual fitting instructions should be obtained when the unit is purchased. An *approximate* cost of converting the receiver with aerial, cable, etc., would be some £10. A dealer would naturally increase this sum to cover labour, overheads, etc., to something like £13. These figures are very rough and will vary according to the job on site.

BUSH TV22A

My set has developed a fault; the picture has shifted to the left about 1½in.

First, it blew a fuse, and when I examined the set to find the cause I found the 30 KΩ width-control would not function. It had overheated and melted the case and burnt a hole in the carbon track.

I have substituted the control by another, but the fault remains. There is a condenser in series with the control, but I cannot tell what capacity it is or what is its working voltage.—T. Connell (Liverpool).

The condenser in series with the 30 K width control is an 80 pF, and should be of the high-voltage rating type, as it is wired from the cathode of the PY81 efficiency diode. A rating at 2.5 kV is desirable, but lower could be used. The lack of width could well be due to leakage through this component, but if the replacement does not effect a cure the efficiency diode circuit should be checked generally.

MARCONI VT73DA

Could you kindly advise me regarding my Marconi set. The symptoms are as follows: Width, vert hold, height, and also focus controls fully out to obtain a reasonable picture, but I am unable to get a full scan, horizontal and vertical. The horizontal hold control is approximately correct, but a very small movement of this control either way causes the picture to break up.

I have taken a voltage reading from the H.T. rectifier, at first suspecting this, being common to all circuits, and I find that it gives approximately 220 volts. If you suspect this could you please give me the type of this rectifier, because this is not stated in the circuit diagram.—H. Lees (Birmingham).

We would suggest that the B36 double triode is at fault and should be replaced. A 220 volt H.T. line is approximately correct, but should the metal rectifier require replacement in the future its number is 14A86. A.C. mains to centre plate, outers strapped to D.C. H.T.

MURPHY V150

My Murphy Television, Model V150 produces a pronounced buzz on the sound when the cameras change to bright studio close-ups. This buzz can be reduced by reducing the contrast, or of course reducing the volume of sound. This fault has always been present but is more pronounced recently so as to be very annoying. If you can indicate a method of removing this it would be most helpful.—B. J. Farrell (Eltham).

The "buzz" is due to vision on sound which may be removed by a slight adjustment to the oscillator core (L13). This is mounted adjacent to the valve 10C1 (V3) which is the frequency changer. If too much movement of the core is made the condition will change to sound on vision, when loud passages of sound will affect the vision response. The correct setting is maximum sound consistent with clear vision.

R.G.D. 1800 (H)

I receive a perfect picture, but with a very pronounced hum on sound which never varies whatever the volume. New H.T. reservoir and smoothing condensers made no difference. Hum still persists with aerial disconnected.

I get a "Pssss" effect on sound, but this is only very slightly noticeable on speech, otherwise sound is perfect.

The only way I get rid of this hum is when I remove the 6LD20 (sound detector and amplifier valve), but obviously this does away with the sound altogether.—D. Bowker (Bradford).

This symptom is most likely caused by poor heater to cathode insulation in one of the valves associated with the sound department—and most probably the 6LD20 is to blame.

EKCO TS105

I am experiencing trouble with my set and I would be extremely grateful for your help.

As you are probably aware, the set is a combined radio and television, and the trouble lies in the radio section. On switching the radio section on, the set is completely dead on all stations. The valves light up and I have had them tested. On switching on the vision section, the vision and vision sound are both normal, but now comes the trouble: on switching the selector switch from vision to radio, the radio section comes to life, but after approximately 30 seconds the sound slowly fades away and the radio section becomes dead—no mains hum, absolutely dead.—R. John (Merton).

(*Continued on page* 287)

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ALL DISTRICTS. An opportunity exists for Television Technicians to establish a business of their own. The business can be commenced in first instance in spare-time, showing an all the year round increasing income. Write, giving particulars of age, training, test equipment, experience, to TELEPATROL LTD., Federation House, Epsom.

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The engagement of persons answering these advertisements must be made through a Local Office of the Ministry of Labour or a Scheduled Employment Agency if the applicant is a man aged 18-64, inclusive, or a woman aged 18-59, inclusive, unless he or she, or the employment, is excepted from the provisions of the Notification of Vacancies Order, 1952.

TESTERS REQUIRED for Television Production Line. Apply in writing, giving details of experience and rate required to PERSONNEL MANAGER, McMichael Radio Ltd., Wexham Rd., Slough, Bucks.

VALVES

ALL TYPES OF VALVES REQUIRED for cash. State quantity and condition. RADIO FACILITIES LTD., 38, Chalcot Road, N.W.1. (PRImrose 9090.)

WANTED, Valves 6F13, 6F15, 6U4, EY51, 5Z4, ECL80, KT61, 25A6, etc.; prompt cash. WM. CARVIS LTD., 103, North Street, Leeds, 7.

GUARANTEED VALVES, boxed, PCC84, PCF80, U25, 20P4, 20P3, **10/-**; PL81, 20F2, U282, 6F17, **9/-**; UU6, ECL80, EBF80, EF80, U281, 10C2, 10F1, PY81, 6K8, X150, **8/6**; 6SN7, ECC81, PY82, U22, **7/6**. W. FEWELL, 19, Mapledene Road, Dalston, E.8.

EDUCATIONAL

BUILD YOUR OWN T/V and learn about its operation, maintenance and servicing. Qualified engineer-tutor available while you are learning and building. Free Brochure from E.M.I. INSTITUTES, Dept. PT58, London, W.4. (Associated with H.M.V.)

FREE! Brochure giving details of Home Study Training in Radio, Television, and all branches of Electronics. Courses for the hobby enthusiast or for those aiming at the A.M.Brit.I.R.E., City and Guilds Telecommunications, R.T.E.B., and other professional examinations. Train with the college operated by Britain's largest electronic organisation; moderate fees. Write to Dept. PT28, E.M.I. INSTITUTES, London, W.4.

This fault is almost certainly due to the UY41 radio rectifier being inoperative. When switching from TV the cathode of the P230 rectifier is still warm and continues to become operative for a brief period. If the UY41 is known to be good, inspect its 160 ohm anode series resistor. It may well be open-circuited.

BAIRD P2114

I bought a new Baird P2114 14in. TV set on December 10th, 1954, and on April 20th, 1955, I had to have the EY51 valve replaced by the dealer from whom it was purchased.

Last week-end this replacement valve, a U43, failed in exactly the same manner.

When these valves start to go and give notice of failure, the symptoms are as follows :

On the chassis there is a phosphor bronze spring strip which makes contact with the outside coating on the CR tube. I get a display of blue sparks, as if a condenser is discharging itself and the picture jumps about, also the EY51 valve lights up a violet colour.

In time this valve (EY51) lights up with a violet light and the picture goes away completely, leaving the sound only (perfect in all respects).

Will you please tell me for what reason these valves fail and can you suggest a remedy ?

Both these valves were returned to the manufacturer and were replaced free of charge.

I cannot help thinking that there is a fault somewhere, and it is a waste of time and money fitting new valves.—Cyril Mellie (Stoke-on-Trent).

The anode connection of the C.R.T. is apparently making intermittent contact with the Aquadag coating which is earthed to chassis via the clips. The C.R.T. may be defective and your dealer's attention should be called to this defect and the symptoms described to him. It may be found that there is an easy way of remedying the fault, but then again the C.R.T. may have to be replaced.

H.M.V. 2807

I recently bought a second-hand television set, H.M.V. 2807, designed for use on the Sutton Coldfield station. I would be obliged to you for your advice re the necessary replacements required so that the set can be used on the Holme Moss station. Would it be possible to use a converter ?—T. H. Barker (Blackpool).

Yours is a fixed channel receiver and one which is not very easily internally modified to receive a station on a different channel. Your best plan would be to use a superhet-type channel converter. This would also assist if at any time you wanted to use a Band III converter to receive the I.T.A. programmes. The Band III converter could then be arranged to provide a channel 4 output, and in this way you would avoid break-through from your local BBC station.

Channel converters can be obtained from most recognised TV dealers. The kind made by Spencer West, of Great Yarmouth, are suitable for your set. Alternatively, you could construct one yourself by following one of the designs given in past issues.

HOME-MADE ELECTROSTATIC

I have a fault on my electrostatic which is proving rather difficult to localise.

The fault is intermittent non-interlace. For some programmes fly-back lines are correct but will vary even between different cameras sometimes. If contrast is kept right down interlace is O.K. Picture does not slip on line or frame.—R. Blackedge (Garston).

Your remarks indicate that some picture signal is gaining admittance to the frame oscillator. When the emission of the picture-tube is failing one is often tempted to obtain a brighter picture by advancing the contrast control. Unfortunately this practice causes overloading of the video amplifier and sync separator valve and often severely disturbs the frame synchronising. You should check this possibility in your case, and also check the condition of the resistors and capacitors used in the frame integrating circuit.

COSSOR 933—BAND III

With reference to Band III transmissions from the Midlands—I own a Cossor Model 933, purchased 12 months ago—could you please give me information as to the type of adaptor to be used and its method of incorporation in set ? After reading the articles in previous issues of "Practical Television" I'm pretty sure of the type of aerial I shall require. I am fairly certain I shall receive a good signal, being situated in open country and having studied the terrain between here and Lichfield, although I shall welcome any information you care to give.—B. Butler (Gloucester).

A type A or B 13-channel turret tuner unit will be available for your Cossor shortly (you should put one on order immediately). The unit is built on a sub-chassis for inclusion in the cabinet of the receiver. Its power requirements are derived from the set by a four-pin plug and socket. It has an I.F. output appropriate to the receiver, incorporates two pre-set sensitivity controls for signal equalising and uses valves type 7AN7 and 8A8. Service data is in the course of preparation.

HMV 2805

I recently purchased a 15in. tube, the 10in. being a TA10, the 15in. a TA15. This, as you will know, is an exact equivalent except, of course, for dimensions, etc. After modifications in fittings, etc., I switched on. The picture size is O.K. in every form. The only trouble is when turning up brilliance, or contrast even, the picture takes on a satin effect, then goes negative.

The E.H.T. is definitely up to standard and all bleeder network also. I have noted that the tube heater voltage is 3.8 volts, but surely .2 volts would not cause such a symptom. My only solution is tube emission.

Hope you can help as I have spent quite an amount of money on the set and after such an occurrence I am rather disappointed.—E. B. Sanderson (Sheffield).

The fact that the picture goes negative when turning up the brightness or contrast definitely indicates that the tube is being over-driven. You must remember that the picture brightness given by your TV cannot be compared with modern "daylight viewing" sets. We would advise you to check the cause of the low tube heater voltage.

QUERIES COUPON

This coupon is available until NOVEMBER 21st, 1955, and must accompany all Queries.

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