"VIEW MASTER"–BIG SCREEN

PRACTICAL TELEVISION

AND TELEVISION TIMES

1/-

EDITOR
F. J. CAMM

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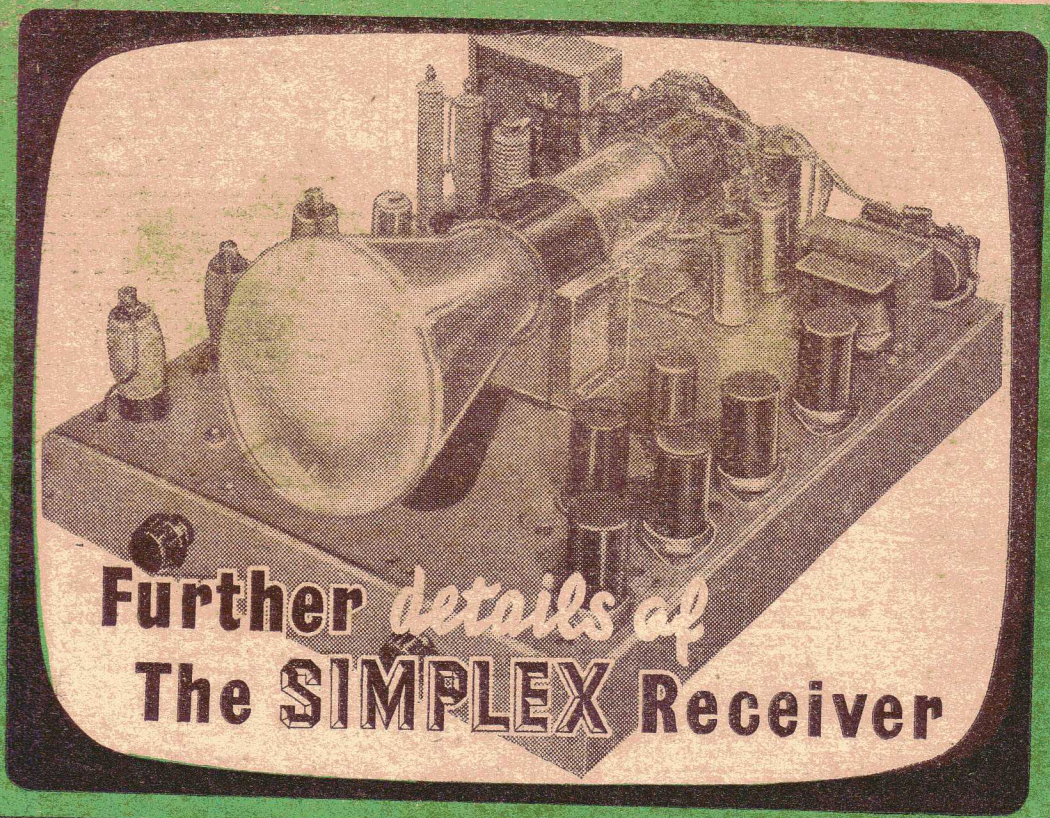

Further details of The SIMPLEX Receiver

FEATURED IN THIS ISSUE

Electrostatic TV for the Experimenter
A New Interlace Circuit
Fault Symptoms
More About Band III
Aerial Installation
Noise Reduction
Your Problems Solved

PRACTICAL TELEVISION
& "TELEVISION TIMES"

Editor : F. J. CAMM

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Televiews

TV—A World Survey

AS this country topped the 3,000,000 mark in TV licences, Unesco has published a World Survey of Television, indicating the march of progress all over the world in this new science. TV is making news in fifty-two countries, and in twenty-one of them public broadcasts are on the air, seven are carrying out technical broadcast experiments and in the remaining twenty-four governments or private organisations are taking active steps to introduce a TV service. It is pointed out that as a product of the age of electronics TV was developed at first in the most advanced countries. The significant aspect of the present phase of its development is that it is beginning to penetrate much less advanced countries and bringing about a fundamental change in world communications.

Amateur television is widespread in the Soviet Union, where enthusiasts have built not only receivers but a complete TV centre at Kharkov. In France, TV is received by entire villages who buy a community set and place it in the school house. In Thailand TV sets are on sale before a TV station has been completed, whilst in Mexico colour TV has been developed and used for medical education at the university. Brazil plans to cover the entire country with 290 stations in 186 localities, and in Japan publicly-owned and private stations are starting simultaneously.

This world survey traces the emergence of this new art, compares the different and frequently-conflicting forms in which broadcasting is organised and traces the history of development in each country.

Two-way TV Sets

TOWARDS the end of the year two-wave TV sets will be on sale, designed to receive BBC and commercial TV programmes. Externally they will not differ from existing receivers and they are likely to cost about £10 more. Converters for existing sets may cost around £5. It is likely that existing receivers in the dealers' shops will be sold with such converters already fitted.

The measure of public demand for commercial TV will be the demand for receivers and converters capable of receiving both, and this demand may provide the answer to many controversial issues.

Obstacles to Colour TV

A MEMBER of the BBC research station, in a recent address to the Television Society, said that since the transmission and reception of signals by radio is a known art colour TV offers no fundamental technical problems. The problems which do arise are not technical but economic, and they arise because of the need to conserve band width and the probable need to produce a system which does not render obsolete all the black and white transmitting and receiving equipment now in use. We agree that there is great advantage to be gained if a colour system can make use of a signal which can be handled by existing transmitters and links, and an even greater advantage if the picture can be received also in black and white on existing receivers. Such a system has been developed in America, and its specification laid down. It is obvious that for colour pictures an additional signal is required to provide the variations of colour. The system must provide a signal which conforms substantially to present black and white standards.

"The Practical Motorist and Motor Cyclist"

ON April 8th will be published "The Practical Motorist and Motor Cyclist," a newcomer to our "Practical Group." It will be published monthly at 1/-, and it will cover all aspects of upkeep, overhaul repair and maintenance of cars, motor cycles and motor-assisted bicycles. It is published at a time when the need for such a journal is urgent, in view of the large numbers of owner-drivers who are compelled to run second-hand cars and also to carry out their own running repairs. It is lavishly illustrated with practical diagrams and supported by a free advisory service. It will review the latest accessories and test the latest cars and motor cycles and it will provide a forum for the interchange of news and views.

Remember the date, April 8th, publication day for the May issue of this new monthly.—F. J. C.

The "View Master" With Wide-angle Tubes

DETAILS OF MODIFICATION FOR VARIOUS LARGE TUBES

IN October, 1952, we gave details for modifying existing models of the popular "View Master" receiver so that large tubes which had just been introduced could be incorporated. Since that date other types of tube have become available and further experiments have been carried out by the designer with a view to obtaining the maximum performance from the receiver with the later tubes. The makers of the main components for this receiver have now produced the necessary wide-angle components (line auto-transformer, scanning coils, etc.), and thus it has been possible to standardise the new design and make it available in kit form. The photographic illustrations below and on the following pages show the receiver fitted with an English Electric 16in. diameter tube and fitted with the special English Electric mask. It is also possible to utilise one of the Brimar or Mullard rectangular tubes (on which the diagonal measures 17in.) and for these a slightly different form of mounting is needed.

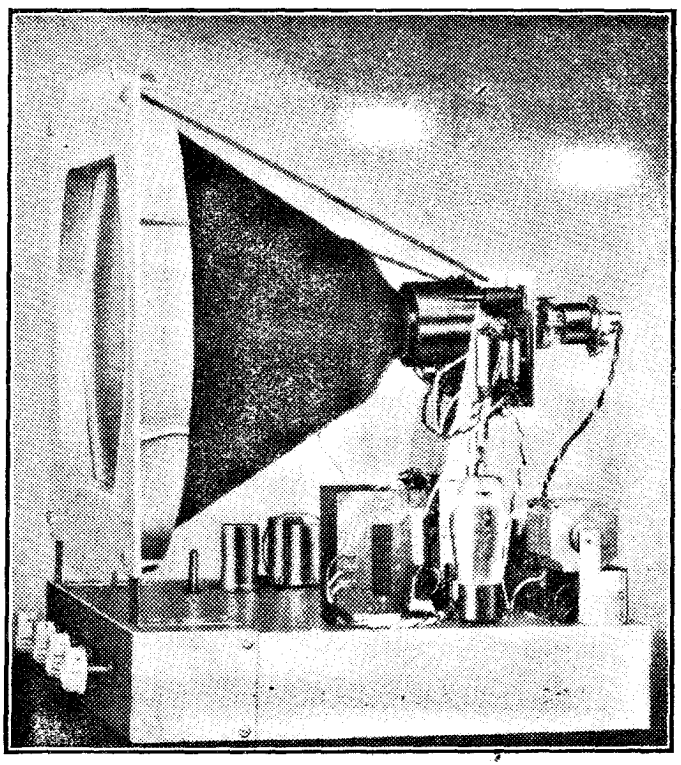
As most readers will by now be aware, the use of wide-angle tubes enables a large picture to be obtained without unduly increasing the depth of the cabinet, the modern tubes having necks no longer than those formerly used in 9in. or 12in. tubes, but to obtain the increased length of scan the timebases have to be modified. Furthermore, whereas the 9in. or 12in. tubes called for an E.H.T. voltage of only 6 to 9 kV, the new wide-angle tubes may be used with E.H.T. up to 15 kV and thus the E.H.T. circuits also have to be modified.

Frame Timebase

The accompanying line illustrations show the new line and frame timebases, which differ in several respects from those published in our 1952 issue. The component reference numbers and values have been given on these illustrations for those who may wish to use them for converting their existing models and the following data is given. In the frame unit, the changes are confined to the inter-valve coupling and the output stage only. The frame output valve originally employed is retained, but the connections to the valve-base are modified so that it is used as a pentode instead of as a triode. The input to the output valve is taken through a 1μF coupling condenser to a 1 MΩ potentiometer arranged in the same manner as an ordinary audio volume control, and variation of this controls the input to the output valve, and thus acts as an efficient height control. At the lower end of the control is a network which includes certain feed-back components, and a variable .25 MΩ resistance provides regulation of the feedback resulting in a useful linearity control. This particular control is, however, rather interdependent upon circuit tolerances, and the designer points out that in some cases the tolerances on various components may all be in one direction and instead of levelling up matters may all go one way and call for a slight modification in the linearity components. The specified value of cathode bias resistor (R.91—330 Ω) may therefore have to be modified slightly, whilst it may also be necessary to modify slightly the value of R88 and/or C49.

Linearity

The values specified will, however, with normal component tolerances, provide a picture which will satisfy all but the most critical, and precise regulation of linearity at the bottom and top as well as across the centre of the picture may be obtained by slightly modifying the components mentioned.



The "View Master" with English Electric 16in. Tube and Mask.

Line Timebase

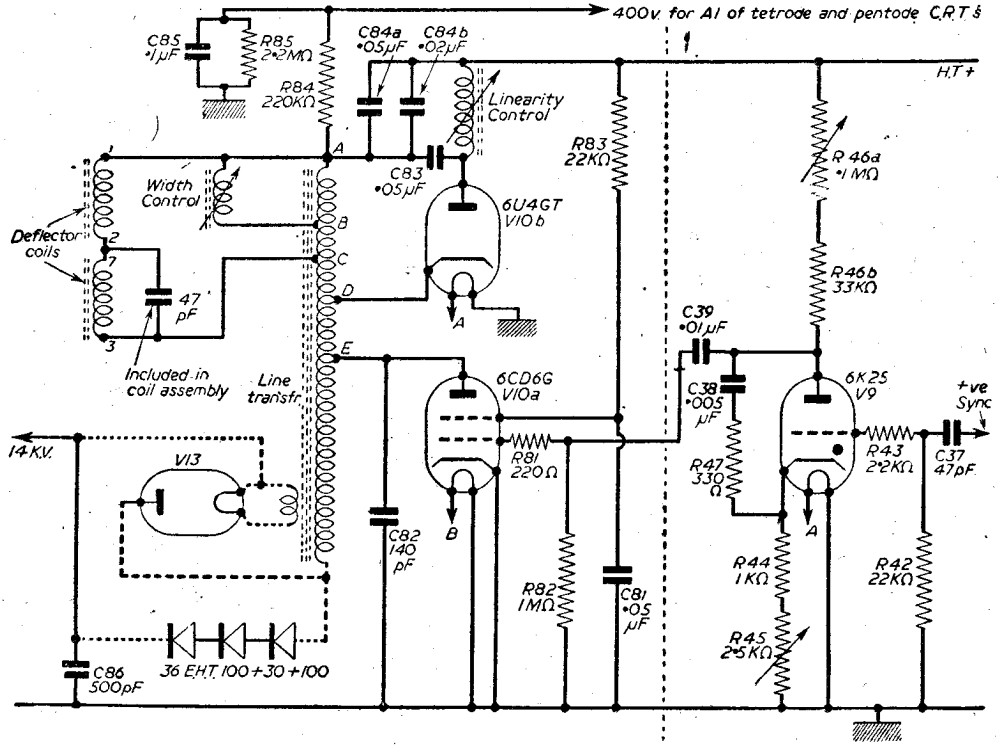
In the case of the line section the oscillator remains unaltered, but to assist in obtaining a suitable output the anode resistor has been split so that a portion is adjustable and acts as a " line drive " control. Some slight differences have been introduced in the output stage, mainly in the interests of improved regulation of the E.H.T. supply and of the method of obtaining it. In the 1952 notes a rectifying valve, type R16 or U37, was specified and this had a 1.4 v, directly-heated filament. An indirectly-heated type of valve is now recommended, and this should be an R12 or EY51, which has a 6.3 volt heater. As an alternative it is possible to use metal rectifiers, for which an extra type 36/E.H.T./100 component is called for, plus a 36/E.H.T.30, and these, plus the existing one, are added across the line transformer as may be seen from the illustrations. The auto-transformer delivers an E.H.T. voltage around 14 kV., and at terminal A on this component a boosted H.T. of about 400 volts is available for the first anode of pentode or tetrode picture tubes.

Oscillation or " Ringing "

It will be noted in the two diagrams that two resistors are connected across the frame coils and a fixed condenser across one half of the line coils. These items are mounted on the components as purchased ; and are fitted to prevent the effects of oscillation or " ringing," or, in other words, to damp spurious oscillations. The small fixed condenser across one half of the line coils may, however, in some cases be found insufficient, and this will be evidenced by two or three vertical dark bars on the left of the screen. Such bars can, however, be caused by other defects, but if they should be present when testing out the converted receiver, the first step would be to remove the 47 pF condenser and fit in its place a variable pre-set of the ceramic type and adjust this to a satisfactory value. If it fails to have any effect on the dark bars, attention will have to be paid to other parts of the circuit. One further external item is called for and that is a new focus magnet. Again, two types are made available, one for triode picture tubes and one for tetrodes or pentodes, and needless to say, the correct model must be chosen. An ion trap magnet, also chosen according to the type of tube used, must also be placed round the rear of the neck of the tube.

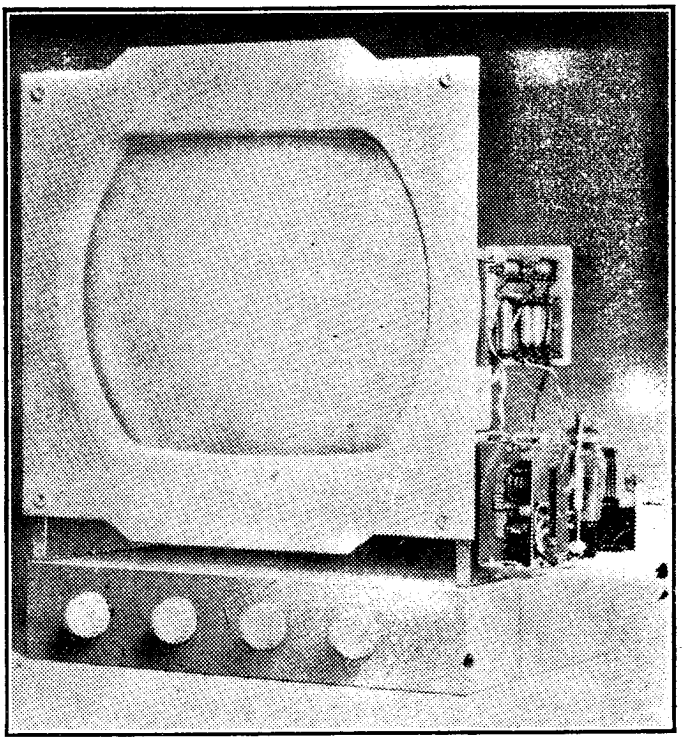
Mechanical Considerations

If the circular tube is adopted the mask may be of the type shown, supporting lengths of brass valance rail such as is obtainable at the popular stores, being used for holding the mask rigidly on the chassis. With this type of mounting, which is supplied by the English Electric Co., a ring of rubber is fitted round the periphery of the metal tube and it is smeared with vaseline and carefully pushed into the mask. With the neck supported in the felt-lined cut-out in the focus support, the tube is then rigidly and safely held. A short piece of thin brass should, of course, be first bent round the edge of the tube at a convenient point, to which a length of suitable lead should be soldered for the E.H.T. connection. The most satisfactory lead is ordinary 80 ohm coaxial with the outer plastic and



The revised line timebase circuit.

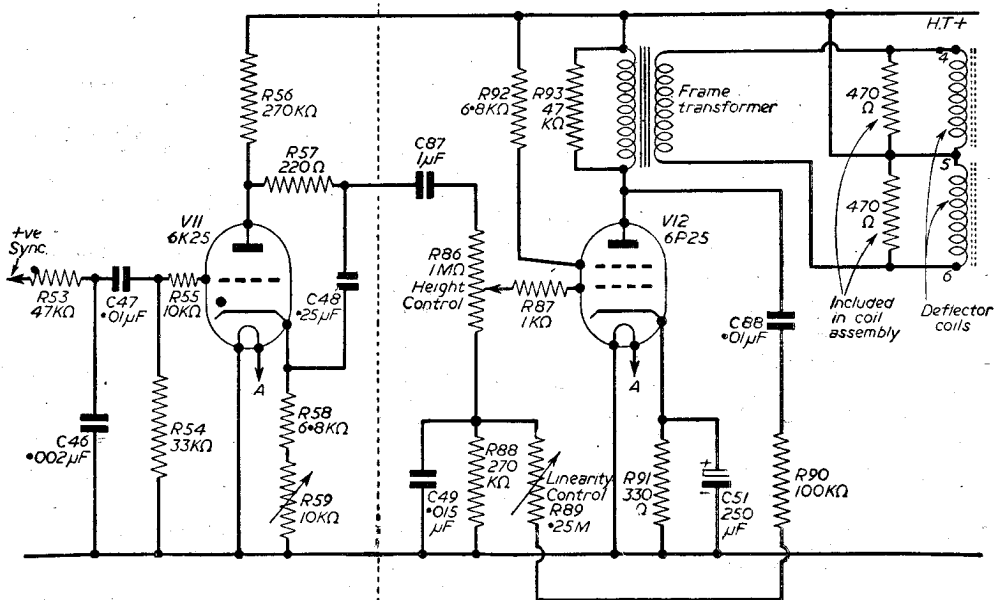
screening braid removed. Bring it away at right-angles to the tube and make certain that between the point of connection and C86 it does not pass closer than 2in. to the metal chassis or metal cone of the picture tube. Furthermore, where the lead is soldered on both the condenser and the tag on the tube, endeavour to use a large quantity of solder with a really hot iron so that a good round " blob " of solder is left, and remove the iron so that no point is pulled up. At the high-voltage circuits any points or angular bends will undoubtedly cause arcing or corona discharges to be set up, with a reduction in the E.H.T. applied to the tube, a risk of damage to some component, and the generation of ozone, which will soon be noticed in the room.



Another view of the English Electric mask

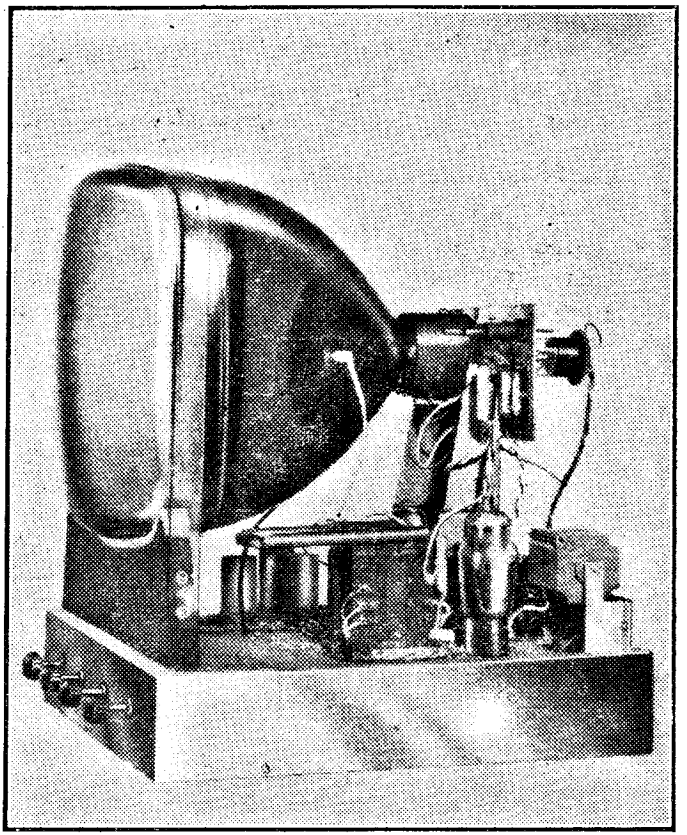
Adjustments

In setting up a receiver using the circuits employed in this model, there are two or three adjustments which are vital—apart from linearity adjustments. Firstly, with regard to the line drive which, as already mentioned, has a big effect upon the E.H.T. output. The drive control is the potentiometer R46a mounted on the deck of the chassis. The spindle is provided with a screwdriver slot, and a long piece of thin wooden dowelling or long bone or plastic knitting needle should be provided with a sharpened end like a screwdriver. Do not use an ordinary metal screwdriver, especially if the metal English Electric or Mullard tube is employed. When the set has been switched on and a raster has been obtained by suitable adjustment of the brilliance control, turn R46a and note the centre of the screen. As it is rotated in one



The revised frame timebase circuit.

direction the raster will become brighter, the length of the scanning lines will increase, and a point will be reached where two bright bands will appear in the centre of the screen, and if turned any further the centre of the raster will fold over. If any picture intelligence is present when this adjustment is being made, it will be noted that the foldover accompanies the brightening of the lines and the correct setting for the drive is just before these lines appear. Therefore, turn slowly until the bright vertical lines begin to appear and then turn back the control very slightly. This is the position of maximum performance. When the other controls, such as width, linearity, etc., have been adjusted to obtain the best picture—a procedure which is best carried out on Test Card "C"—the drive control may again be adjusted to make sure that it cannot be advanced any further. As already mentioned, this control does affect the width of the scan, and as adjustment of the width control also affects this, there is some inter-relation between them. The brilliance control is also affected by the E.H.T. voltage, and thus this control will also be found to be in some measure dependent upon the drive and width controls, but when once set up it should not be necessary to make any further adjustments except when rendered necessary by the ageing of valves.



The "View Master" with a 17in. Rectangular Tube.

Constructor's Envelope

For those who require a detailed wiring diagram of the revised circuit the publishers of the original "View Master" envelopes have produced a complete envelope of instructions and wiring diagrams which are available in the same form, price 3s. 6d. This envelope also includes a list of the components used in the conversion, and we include below a list of the additional components needed. Many of the items already included in the timebases are, of course, retained.

LIST OF ADDITIONAL COMPONENTS REQUIRED FOR CONVERSION

RESISTORS (½ w. except where stated)

220 Ω	6.8 kΩ (1 w.)	47 kΩ	270 kΩ
330 Ω	22 kΩ (1 w.)	100 kΩ	1 MΩ
1 kΩ	33 kΩ	220 kΩ	2.2 MΩ

CONDENSERS (all T.C.C.)

140 pF (Type CC142UO)
500 pF (Type CP56WO)
.01 μF (Type CP32N)
.02 μF (Type CP34S)
.05 μF (Type CP35N)
Two .05 μF (Type CP37S)
.1 μF (Type CP37S)
1 μF (Type CP91N)

TUBE

16in. : English Electric T901, or Mullard MW41-1, or
17in. : (Rectangular) Brimar, C17BM, or Emitron 17ASP4, or Mullard MW43-64

1 front chassis extension WB/124
1 pair extension brackets for above, WB/121
1 line transformer WB/113
1 frame transformer WB/114
1 scanning coil assembly WB/115
1 width control WB/116
1 linearity control WB/117
1 heater transformer WB/119
1 focus ring WB/118
1 ion trap magnet WB/120
} Whiteley Electrical Radio

1 group board type C109 (Bulgin)
1 B12a socket for C.R. tube
1 Octal socket
2 Westinghouse metal rectifiers (Type 36/EHT/100)
1 Westinghouse metal rectifier (Type 36/EHT30)
One 6CD6G Brimar valve
One 6U4GT Brimar valve
One R12, or EY51 valve if desired, in place of the two metal rectifiers, 36/EHT/100
One .1 MΩ Type A linear variable resistor
One 1 MΩ do.
One 25 MΩ do.
} Radio Resistor Co. (Lab.)

THE REDUCTION OF NOISE

SOME VALUABLE DATA FOR FRINGE AREA VIEWERS AND EXPERIMENTERS

By Edwin N. Bradley

LIKE the majority of troubles, noise (which appears as "snow" on the television screen) causes the greatest annoyance where it can least be endured—in fringe area and extreme range reception. Not only do the white dots and flashes mar the picture, in serious cases they can prevent a picture from forming by over-riding the sync pulses and pulling the line timebase completely out of lock. The constructor using a very high gain receiver in a poor reception area can check on this by removing the sync separator valve and holding the timebases in rough synchronisation by hand. It is possible under some conditions to obtain a weak but perfectly visible picture by this means when no picture at all can be locked in with the sync separator in operation. Receivers in which the raster shrinks from the edges of the mask with the gain control turned right up with no signal applied may quite probably exhibit this effect. Such receivers either have more gain than is usable or produce too much noise. It is also possible that they are connected to an unsatisfactory aerial array or a noisy preamplifier.

Noise stems from two sources, from the aerial and from the receiving circuits themselves, and any attempt to reduce the noise in a high gain receiver must take account of both origins.

Noise from the aerial, apart from local interference, is due to static or atmospheric sources and can be combated only by choosing the most suitable aerial system for the location, mounting it as high as conveniently possible and matching it correctly to the receiver by a high quality feeder. It would seem that in the many debates over the relative merits of various aerials the factor of noise is often overlooked. An aerial with a narrow beam angle will generally give a better signal-to-noise ratio than will a less complex array, and as a rule a multi-element beam is preferable to a simple H array at long distances if only for this reason alone.

In any tuned circuit the signal-to-noise ratio depends to a degree on the bandwidth of the circuit. With a narrow bandwidth, i.e., in a sharply tuned circuit, the gain at resonance is much greater than at other frequencies, with the result that the required signal is given much more amplification than are random noise pulses which occur over a broad frequency band. In a broadly tuned circuit, however, gain falls whilst more and more noise is accepted with the signal, and it is this state of affairs which exists not only in the tuning coils of a television receiver but also in the aerial itself which, too, is a tuned circuit with broad bandwidth. The aerial must be chosen, or made, to suit the local channel to obtain the best possible discrimination against noise whilst giving good reception of the signal. Enthusiastic viewers moving into different receiving areas have been known to press their existing aerials into use on channels adjacent to those for which the arrays were designed. In these conditions a decrease in the signal-to-noise ratio can be expected besides the obvious reduction in signal pick-up efficiency.

Mismatched Feeder

A mismatch of the feeder at either the aerial or receiver end will have similar results, for whilst the required signal will suffer by what amounts to a mistuning effect, the random noise signals will be but slightly affected. Matching at the aerial can safely be left to the manufacturer, but a mismatch between the feeder and receiver is just as serious. A good match is not difficult to obtain when normal 80 ohm co-axial feeder is used, and constructors who may have reason to suspect the matching between their receivers and feeders can try increasing and reducing the number of turns in the aerial coupling coil until the best results are obtained.

A long feeder can itself serve as an aerial for noise impulses, and probably the best installation for long feeder runs in low signal strength areas is a balanced twin feeder, preferably screened, with a balanced input circuit, as shown in Fig. 1. Noise picked up on the feeder lines will then tend to neutralise itself to a considerable extent, whilst an electrostatic screen can be placed between the primary and secondary windings of the R.F. transformer to prevent capacitive transference of the noise. An electrostatic screen can be made by wrapping a single turn of thin metal foil over the grid coil of the transformer, the ends of this single turn slightly overlapping but insulated one from the other by thin waxed paper. The aerial input coil is then wound over the foil.

It is possible to measure the noise introduced into the receiver by the aerial and feeder system by means of a suitable output meter and calibrated noise generator but the home constructor will probably be satisfied with a simpler test. This can be carried out by inspecting the raster on the screen with no signal applied and with the aerial first disconnected, then connected, the gain or contrast control being set at maximum. If results indicate that some improvement might be made check that (1), the aerial is correct for the channel, suitable for the location, and oriented

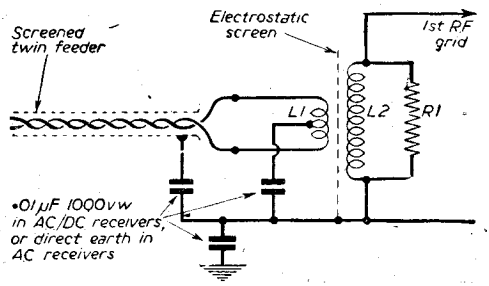


Fig. 1.—A balanced input circuit.

to the best advantage; (2) the feeder is correctly matched at both ends and (3) there are no bad connections due to corroded screws or bolts, dry joints or frayed and broken wires.

Noise generated within the receiver is set up in every stage; the higher the overall gain of the receiver the greater the final noise output will be. As a general

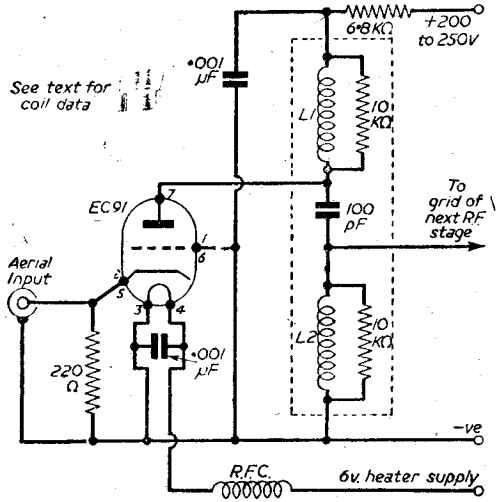


Fig. 2.—A grounded-grid input stage.

rule the maximum usable gain is determined by the consequent noise level, so that as noise is reduced with no reduction in gain the receiver efficiency is improved.

It may almost certainly be taken for granted that the tests described, and noise reduction remedies in general, will be made only on superhet receivers. It is unlikely that internal noise will be a problem in any T.R.F. receiver.

Checking

A check on the noise introduced by various stages can be carried out by removing the aerial feeder, turning up the gain control and removing valves one by one whilst watching the raster. In a very high gain receiver, especially in the case of receivers using converted surplus units such as the 1355, the noise alone will be sufficiently powerful to radiate and cause interference in neighbouring broadcast receivers. The valves are removed starting at the first R.F. stage, and in many receivers noise will be negligible when the R.F. valve or valves and the frequency changer and oscillator are out of circuit. Receivers where the I.F. stages alone still show a considerable amount of noise on the screen should have their contrast controls turned down (assuming that I.F. controls are used) until the raster is clear, when the early stage valves may be replaced and the test repeated. I.F. noise in these receivers may have masked the fact that the R.F. and mixer stages are contributing little noise to the final level.

An improved signal-to-noise ratio in the first stage may be obtained by substituting a triode for a pentode. Most pentodes give good gain but require a relatively high grid impedance in the process, thus serving as quite efficient noise generators. A grounded-grid triode may be tried in place of a pentode in this stage, though the advantages of one circuit must be weighed against those of the other. The feeder can easily be matched into the triode cathode and fair gain can be maintained but the very broad response of the input circuit will allow noise to pass with the signal. A typical grounded grid stage is shown in Fig. 2 using an EC91.

The advantages of the cascode R.F. amplifier are by now well known and where one or two R.F. stages are discovered to be contributing noise to the receiver it is worth while to test the effect of completely replacing the existing stage or stages by a two-valve cascode circuit. One of the several circuits which have appeared in past issues of PRACTICAL TELEVISION may be used, or the double-triode arrangement of Fig. 3 may be tried.

Unless the frequency changer-oscillator circuit has been carefully designed it is likely that this stage will be the most serious offender in introducing noise. Tests of all types of combined mixer-oscillator circuits indicate that the double-triode is best for long-range superhets. Typical triode mixer-triode oscillator circuits appear in the P.T. "Lynx" receiver and in No. 3 of "Pages from a Television Engineer's Notebook," page 465, PRACTICAL TELEVISION, March, 1953, where design data is also given.

The coupling from the frequency-changer to the I.F. strips is also important, and for low noise should consist of a double-wound transformer for the vision channel at least. The sound I.F. may be tapped off via a small capacitance and applied to a single tuned circuit feeding into the grid of the first sound I.F. amplifier. Resistance-capacitance couplings into the first I.F. stages should be avoided since these have relatively large time constants which might assist the building-up of noise or interference pulses. Later stages of an I.F. strip coupled in this manner can even be choked by such built-up pulses.

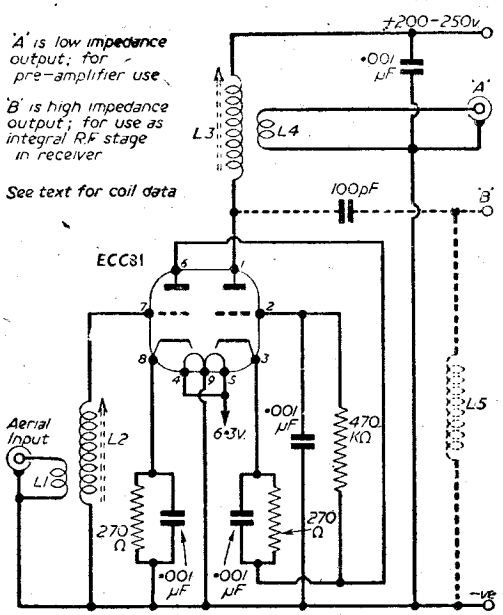


Fig. 3.—A double-triode cascode R.F. amplifier.

In high-gain I.F. strips, such as that of the 1355 receiver, the shot noise in the strip alone will cause radiated interference. Such a degree of gain, sufficient to brighten up the raster on the screen to full brilliance, is a hindrance rather than a help and is best reduced. The gain can be held back by further staggering of the tuned circuits, but there are obvious limits to this, and reducing the H.T. line potential, or cutting out as many as two stages, is to be preferred. When stages are removed from the vision I.F. circuit it is possible to retune the coils by adding capacitance so that they may be used as a sound I.F. strip.

Substituting double-wound I.F. transformers for single coils with capacitance couplings will also improve results in some cases, though such a drastic step is hardly feasible in converted surplus equipment. The question of I.F. couplings is dealt with in No. 7 of "Pages from a Television Engineer's Notebook," page 69, PRACTICAL TELEVISION, July, 1953.

A receiver so adjusted as just to show "snow" on the raster with the aerial disconnected and the gain control fully advanced probably has as much gain as can be used to advantage *providing* that every stage is operating at the best attainable efficiency. It is still possible, however, that an improvement in the overall performance can be made by rearranging the method of contrast control or by adding subsidiary controls to the main control already fitted.

Each stage in a high-gain receiver, besides adding its own quota of noise to the final output, amplifies the noise passed to it along with the signal from earlier stages. If the contrast or gain control in a superhet is situated in the R.F. section of the receiver, and arranged in the usual manner to vary the bias on one or more R.F. stages, the receiver will be able to cope with the great variations in signal strength common to long-range reception. Both the sound and vision signals will be affected by the one control, however, whilst the frequency changer and I.F. stages will be adding the whole of their noise output, no matter what the input signal level may be. If the contrast control is placed in the first stage or stages of the I.F. strip the noise from the R.F. stages and frequency changer will be controlled along with the signal; the vision and sound channels can have separate controls, but the following I.F. stages will still be free to add noise to the circuit. At the same time there may be conditions under which the first R.F. stages or the frequency changer will be overloaded.

A gain control right at the grid of the video amplifier will control the whole of the receiver noise with the signal, but can do nothing to prevent overloading of the R.F. and I.F. sections of the receiver. It is suggested, therefore, that a high-gain receiver might well incorporate all these three controls, the R.F. stage and I.F. stage controls being of the preset type and used as "level" controls with the final video stage control employed as the main contrast control. If this method has a disadvantage it lies in the fact that a video stage gain control must have very short wiring (if the circuit of Fig. 4 is used) so that the control cannot be placed anywhere on the chassis but must remain very near to the video amplifier. A cathode bias control in the video amplifier cathode line could be employed, but where the picture tube is directly coupled to the video amplifier anode, and where frequent variations of contrast are necessary, the changes in tube brilliance consequent upon this method of control are annoying.

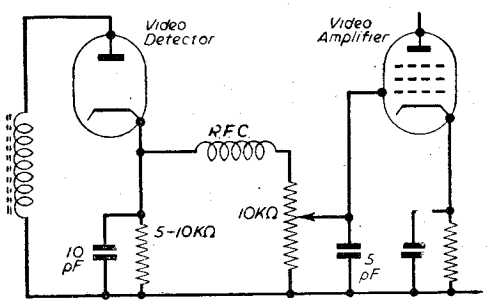


Fig. 4.—Contrast control in the video amplifier stage.

Coil Data

The coil data which follows indicates the number of turns required on a Haynes type screened former of 0.3in. diameter, tuned with iron-dust cores, for the various circuits. In each case the winding is of 32 s.w.g. d.s.c. wire with the turns spaced by the thickness of the wire. Some adjustment by trial and error may be necessary in view of the fact that the circuits are intended to couple into existing stages, for which an average allowance of input capacitance has been made.

Fig. 1.—L1 and L2. No data required, convert existing coil.

Fig. 2.

Coil	Turns: Channel 1	Channel 2	Channel 3	Channel 4	Channel 5
L1	9	8	7	6	6
L2	9	8	7	6	6

Wind coils at opposite ends of former, supporting coupling capacitor and damping resistors between the sidewires.

The circuit of Fig. 3 can be arranged as a pre-amplifier, in which case the dotted connection from the second anode triode, L5, and the coupling capacitor are ignored, the output being taken from L4. If the circuit is built into a receiver then L4 is ignored together with its co-axial output socket, and L3, L5 are arranged as an R.F. transformer, wound on opposite ends of the same former with the coupling capacitor supported between the sidewires. The effect of shunting the windings with 10 kΩ resistors may be tried.

The low input and output capacitances of the triodes make rather large windings necessary; the following data is based on the assumption that stray capacitances are kept well down. If the cores have to be turned right out of the coils a turn should be removed from the main windings.

Coil	Turns: Channel 1	Channel 2	Channel 3	Channel 4	Channel 5
L1	2	2	1½	1½	1½
L2	9	8	7	6	6
	For preamplifier use:				
L3	11	10	9	9	8
L4	3	3	2	2	2
	For use as built-in R.F. stage:				
L3	9	8	7	6	6
L5	9	8	7	6	6

A New INTERLACE CIRCUIT

THE most noticeable defect of a 405 line picture is the line structure, and often this is due to unsatisfactory interlacing of the odd and even lines. In the extreme case odd and even lines become superimposed, giving virtually a 202 line picture. Generally, however, this extreme does not occur and uneven spacing or pairing of lines is usually seen. If the focusing of the picture is improved the lines are more apparent, but it is not satisfactory to overcome the defect by increasing the spot size or defocusing the picture as the definition is degraded. Neither is it satisfactory to view the picture at such a distance that the lines are not seen, since this distance will be more than the optimum for observing full detail of the picture.

The lines are, of course, the dark spaces between the adjacent lines traced by the spot and they can be eliminated by artificially increasing the width of the spot in a vertical direction until the spaces are filled up. This can be done by special auxiliary focusing magnets or coils, but the spot wobble method is more generally known.

It is, however, a mistake to apply these palliatives to a set unless the interlacing of the picture is satisfactory, as both lack of interlace and spot thickening will decrease the definition of the picture.

To obtain good interlace the frame timebase must be synchronised by a pulse with a sharp leading edge which must have a constant time relation to the first frame pulse transmitted. It is difficult to meet this requirement when the synchronising pulse is derived from the commonly used integrator circuit, since this does not produce a sharp leading edge (Fig. 2c). In the simple circuit described an integrated pulse is used to lock the frame timebase reliably, but accurate interlacing is obtained by utilising a sharp pulse derived from the back edge of the first frame synchronising pulse.

The various frame synchronising or interlace circuits in use in commercial and home-built receivers point to the fact that the ideal circuit has not yet been discovered. The circuit to be described, whilst not claimed to be the ideal, has been found to give consistently good interlace which is quite independent of the frame hold setting or contrast control, and has the merit of simplicity and of requiring few additional components and no additional valves. Furthermore, no adjustable control of interlace is necessary as is often the case with other circuits.

The circuit makes use of the combination of two frame-locking circuits, either of which will function independently but which are more satisfactory when used in conjunction as will be explained. The circuit is used with a blocking oscillator, and the two frame synchronising pulses are fed separately to the grid and anode of the oscillator valve via condenser

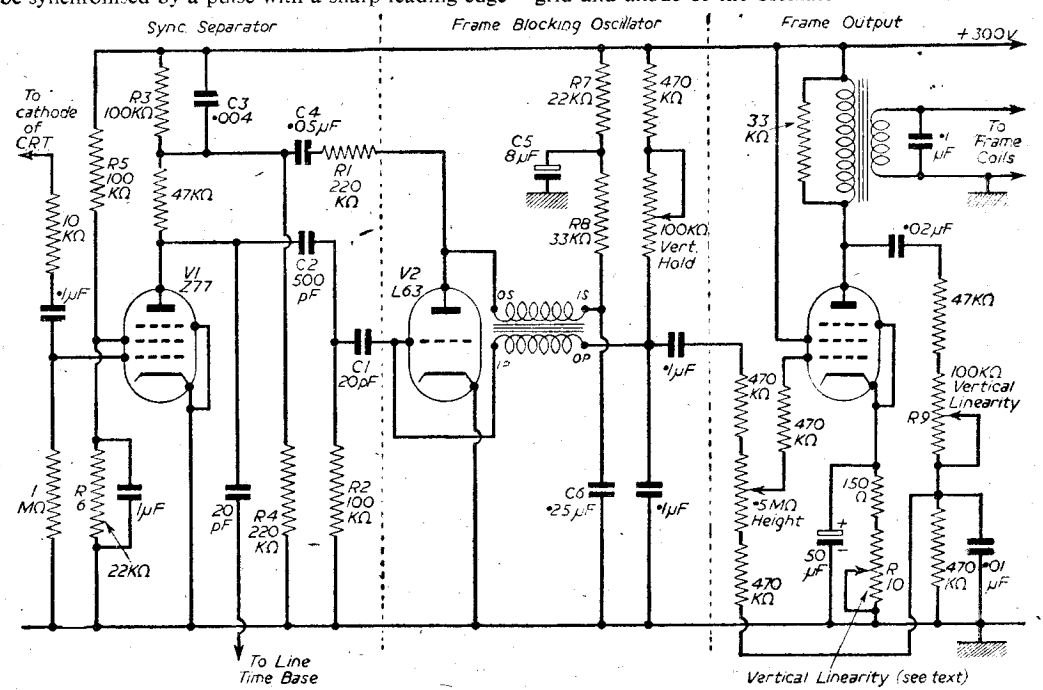


Fig. 1.—The sync separator and frame timebase circuit referred to.

C1 and resistor R1 respectively. The suggested circuit, including sync separator and frame output stage, is shown in Fig. 1.

The sync separator valve V1 is fed with the combined sync and picture signal from the cathode of the tube via a 10 kΩ resistor and a 0.1 μF capacitor. D.C. restoration is effected in the grid circuit, and negative-going sync pulses appear at the anode. The waveform at the output of V1 is theoretically as shown in Fig. 2(a), but in practice more like Fig. 2 (b).

These pulses are passed through a semi-differentiator C2R2 which is intended to tilt the waveform as shown in Fig. 2(b). Due to their short duration the line pulses are hardly affected, but the frame pulses are tilted such that the back edges become prominent, and these constitute pulses with a sharp leading edge required for accurate interlacing.

Back Edge Used

It is usual to lock a blocking oscillator by negative-going pulses applied to the anode of the oscillator, these pulses being converted to positive-going pulses on the grid by the action of the transformer. In the circuit being described, the positive-going pulse of the back edge of the first frame pulse is used to lock the frame oscillator V2 through capacitor C1 connected to the grid of V2. The small value of C1 (20 pF) ensures that a very sharp pulse is applied to V2 and reliable interlacing is thereby achieved. If the value of C1 is increased a slightly stronger synchronising pulse will be given to V2, but if the value is increased unduly the interlace will become less accurate. Some experimenting may be done, and the effect of dispensing with C2 and R2 and connecting C1 directly to the anode of V1 may be tried. These components may be unnecessary in some circuits because partial differentiation of the frame pulses usually occurs in the sync separator or earlier.

The circuit as so far described will give good interlace, but there is a possibility of slipping one frame should a momentary interruption of sync pulses occur, say, when the BBC are switching programmes.

The Second Section

This difficulty is overcome by the second part of the circuit which consists of an integrating circuit comprising R3 and C3 in the anode of V1. The waveform developed across C3 is illustrated in Fig. 2(c) and this negative-going integrated pulse is applied through R1 to the anode of the frame oscillator. This pulse guards against frame slip in the event of the infrequent failure of the back edge of the first frame pulse to trigger the oscillator. The value of the condenser C3 is chosen to give a time constant to the integrating circuit such that a pulse is built up after the oscillator has been triggered by the first back edge pulse through C2. The value of C3 must not be less than .004 or the integrated pulse will build up sufficiently early to trigger the oscillator and disturb the interlace. On the other hand, C3 should not be increased unduly or the amplitude of the pulse will be reduced.

The only reliable test of interlacing is by observation of the picture with the aid of a magnifying glass, although the glass is not necessary with 12in. or larger tubes. A steady stare is essential, and also the picture should be a still scene. Complete loss of interlace appears to occur whenever a picture moving in a vertical direction is displayed. This is due to the eye following the picture and is inherent in an interlaced system.

In conclusion, mention should be made regarding any further deviations from the circuit shown in Fig. 1. There appears to be no reason why any blocking oscillator circuitry should not be used, but if the circuit shown in Fig. 1 is used the following points should be observed. The values of R8 and C6 should not be altered since these affect the frequency of the frame oscillator. If a 200-volt H.T. line is used the components R7 and C5 should be omitted in the oscillator circuit and in the sync separator circuit R3 should be changed to 68 kΩ and R4 omitted. R5 should be changed to 68 kΩ and R6 to 33 kΩ. The condenser C4 may be omitted if the anode

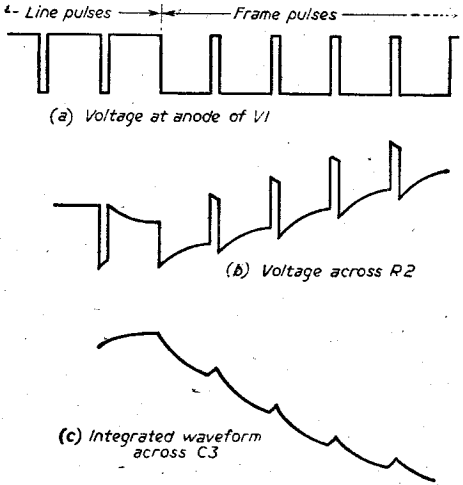


Fig. 2.—Waveform at different parts of the circuit.

potential of V2 roughly equals that at the junction point of C3 and C4 as is the case in the circuit shown. The particular blocking oscillator transformer used by the author is made by Allen Components, Ltd.

Suitable Circuit

This circuit has been used with a multivibrator type of line timebase. Should a blocking oscillator or self-oscillating line timebase be used it may be necessary to pass the line synchronising pulse via a cathode follower as a buffer stage to prevent pulses from the line timebase feeding back into the frame oscillator valve.

Some readers may not be using a blocking oscillator frame timebase in which case the circuit shown in Fig. 1 can be stated to be a quite satisfactory one to adopt. Regarding the output stage ; the control R9 affects the extreme top of the picture, whilst the bias resistor R10 affects the top of the picture more generally. If a high-slope valve such as N37 or KT61 is used, R10 should be about 1 kΩ, but if a valve such as 6V6 is used, a value of about 2 kΩ is required.—E. H. FRANCIS.

HINTS ON CARRYING OUT YOUR OWN INSTALLATION, AND POINTS TO WATCH IF THE WORK IS CARRIED OUT BY A CONTRACTOR

By Simeon Edmunds

MANY instructive articles have appeared in this journal on the construction and use of various types of aerial arrays, but little has been written concerning that most essential sequel to the construction of an aerial, its successful erection and installation. The writer, who has been responsible for numerous professional installations, therefore considers that a few hints and cautionary remarks on this subject will not come amiss.

Many constructors "fight shy" of roof work and engage a local builder, who, while possibly a most capable man as far as structural work goes, usually has the strangest ideas about the requirements of a good aerial installation. Any man who is reasonably fit should have no trouble whatever in carrying out the work, although he cannot expect to compete in speed with professional riggers who, in teams of two, frequently erect six or more fringe aerials in a day, and think nothing of driving 200 miles or so to do it.

Requirements

Assuming that the aerial is to be fitted on an average chimney stack, the first requirement is a ladder of the correct height and usually a roofing or "cat" ladder to support the weight when crossing the roof itself. The ladder should always be secured at the top, if necessary, with a screw eye firmly fixed in the facia board. Never secure anything to, or put any weight at all on, the gutter itself. Having secured the ladder, the cat ladder should be carried up and laid on the roof so that it butts against the ladder itself. Do not rely on merely hooking the end over the ridge of the roof.

The amount of lashing wire needed can usually be calculated and cut off before going aloft by counting the number of bricks in each side of the stack. A brick is 9in. long, and ½in. should be allowed for mortar. Remember that the lashings must be fitted on a corner of the stack which will take the direction of the aerial away from chimneys. If the stack is a large one, corner plates can be teased into place with a stick after they have been secured to the lashing wire by bending over the locating pips. Make sure that the "J" bolts are pulled up until really tight. It is helpful to give the lashing an occasional hammer blow during tightening. When tight enough the wire should give a high-pitched twang when struck with a spanner.

If the mast is longer than about 10ft. and is of light gauge metal, do not pass the feeder down inside or it will slap in the slightest wind. Instead, secure it down the outside with insulating tape. Use tape plentifully and be sure to pull the feeder as tightly as possible between each binding position. "U" bolts should not be pulled up too tightly as light alloy masts are thereby easily deformed and may then snap off at the upper bolt.

Guys

It is wise to use guy wires if the mast is longer than about 15ft. Use a proper mast band and, if possible, four guys, protecting them from chafing if it is necessary to pass over the gutters. If it is only possible to use three guys, try to arrange for two of them to be in the direction from which the prevailing wind comes.

The feeder may be tucked under a corner of the lead flashing at the base of the stack, and a squashed corner plate makes a good protector when passing it over a gutter. Great care must be taken that the feeder is not pinched when fixing with staples or lead-headed wall nails.

Before removing the ladders check that the aerial is pointing in the correct direction by "swinging" it over an arc while an assistant watches the receiver screen and signals when results are optimum. This final bearing frequently differs considerably from that worked out by compass, especially at long distances from the transmitter.

A final warning. Rubber soles such as crepe have the best non-slip properties (never wear leather soled shoes on a roof), but only when dry. The writer has more than once been marooned on an awkward roof by a shower and been unable to descend until it has dried off.

Outside Fitters

If you are unable to do the work and decide to have the aerial erected by one of the many specialist installations services now operating, here is a warning and an appeal.

Most of these organisations are a service to the retail trade. They are operated by both aerial manufacturers and independent firms of "fixers." The procedure is as follows. The dealer, usually as a result of a receiver sale, is asked by his customer to supply and fit an aerial, and he instructs the installation service to erect a specified type on his behalf. The reverse procedure applies, of course, to invoicing and payment.

First, the warning:

High cost of receivers, aggravated by purchase tax and the consequent need to keep "extras" down to a minimum, have resulted in this installation business becoming an extremely "cut throat" one, and it is regrettable that even some quite reputable

manufacturers have resorted to skimping of both materials and labour in order to attract business. The purchaser should therefore insist on being present when the erection is carried out, and watch points, in particular the following :

See that the feeder is not of inferior quality. Some cable manufacturers supply contractors with a " No Name " feeder of very light construction and gauge. A frequent trouble with this is breakage of the centre conductor (assuming coax.) at the dipole box connection. A twisted and taped joint with its consequent losses is sometimes made in an inconspicuous position in order to use up odd lengths of feeder. With semi-air-spaced coaxial feeder particularly, a completely watertight dipole connecting box is essential or water may find its way down the entire length of the feeder.

If a tall mast with guy wires is being fitted, make sure that a proper mast band is used, and insist on a strainer being fitted to each guy. Most firms do not fit either of these unless a customer is insistent. Four guys should always be used if fixing points permit. Check that the mast is upright and that the guys are taut. They must also be protected from chafing if passing over gutters, as already described.

Lashings

Lashings should be secured with heavy lashing wire properly spliced around thimbles at the ends. Do not accept a lashing made by merely taking a round turn over the " J " bolt and then twisting the wire over itself for a few inches. This dangerous practice is all too common, and is the standard method with at least one national firm. If double lashings are used they should be spaced as far apart as is practicable.

Other faults to guard against are lack of protection where the feeder passes over a gutter or other sharp edge, " flying " a long length of lead instead of securing by staples or wall nails, shoddy outlet boxes (or none at all), and erection on a chimney stack other than the most suitable one in order to get the job done quickly. Damage to tiles and slates is not always avoidable, but check for this, if possible by going on to the roof for a close inspection.

If you have a compass, confirm that the direction in which the aerial points is correct. Riggers are usually very good in this respect, but, when in a hurry or working under difficulties such as rain, have been known to make surprising errors. It is also well to check, if possible, the length and spacing of the aerial elements. The writer knows of one case where dozens of " H " aerials of completely wrong dimensions were " worked off " on unsuspecting customers during the Coronation rush by a quite well-known manufacturer's service.

Now an appeal :

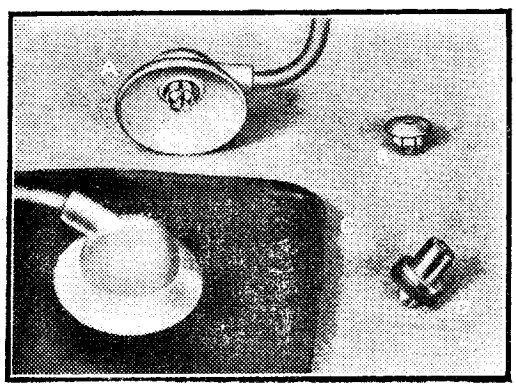
Rigging is always a hazardous and frequently a positively dangerous occupation, calling for a high degree of courage, endurance, physical fitness and skill. Unfortunately these qualifications are not always accompanied by wide technical knowledge or polished manners ; so if your man is lost for words when asked a simple semi-technical question, but shows an astonishing command of the vernacular in the stress of the moment when on a roof, do not condemn him. Although we are often told that " Manners maketh the Man," the virtues of a " Rough Diamond " should never be overlooked.

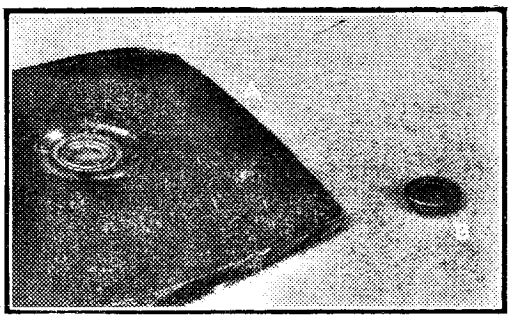
New E.H.T. Connector

MULLARD, LTD., are now producing picture tubes fitted with an improved form of E.H.T. connector, the cavity cap, type CT8. This consists of a disc of nickel-chrome-iron with a recess similar to that of a press-stud. The disc is sealed into the wall of the picture-tube envelope. The flat bottom surface makes good connection with the internal graphite coating of the tube, and the external connection is made by means of a pronged button which clips into the recess (see illustration below).

The new terminal avoids the risk of bad connection ; it cannot become loose or broken in transit or by accident. It eliminates two manufacturing processes—soldering a connector wire to the thimble, and baking the cement to secure the thimble. An additional advantage is that the flush mounting of the terminal and the use of a rubber shroud greatly reduce the chance of corona discharge which sometimes occurs with tubes operated at the higher E.H.T. potentials.

To enable tubes with the new E.H.T. connector to be used in existing receivers, an adaptor is being supplied. This consists, as may be seen in the right-hand illustration, of a thimble cap of standard dimensions, the lower end of which carries six spring prongs which clip in the recess in the new terminal. Between the cap and the prongs are a metal flange and a rubber washer. This adaptor, which can be pushed home in the terminal, will take the normal connector fitted to the E.H.T. lead of a current receiver.





The New Mullard Picture Tube Connector (A and B right), and (left) Adaptor for old type leads.

Electrostatic Television for the Experimenter

SOME INTERESTING DETAILS OF AN AMATEUR'S ACTIVITIES

By A. L. Chisholm

FOR the amateur of limited means, electrostatic TV is an ideal field for experiment, as so much can be done at very little expense. When all the difficulties have been overcome and everything is working properly, the final picture (with 3 kV E.H.T.) is of very satisfactory entertainment value. The author's experience shows, however, that any attempt to make the picture bigger by cutting off the corners is inadvisable because of the resulting loss of brilliance. Perhaps the bigger picture with the necessary brilliance might be possible if the E.H.T. is increased to 4 kV or 5 kV. It is certainly worth trying. The above remarks refer to the VCR97 tube which is the only one with which the author has experience. The following notes on the author's televisor are put forward as they may be of assistance to other experimenters working on the same lines.

As it was intended to convert to a magnetic C.R.T. when funds permit, it seemed unwise to purchase expensive components which would become useless in a few months. Accordingly, as much use as possible was made of materials already in hand, or obtainable cheaply at W/D surplus stores.

The Receiver

This consists of a superhet based on PRACTICAL TELEVISION designs, but having more than average sensitivity. The line-up is R.F., mixer, three video I.F.'s (all EF50's), oscillator (P61), video detector (VR92), video amplifier (EF50), and cathode follower output (half 6SN7, the other half being used as a diode D.C. restorer). This last stage was used to allow of a fairly long lead from the receiver to the VCR97 grid. The sound section consists of two I.F.'s (SP61), detector (VR92), A.F. amplifier (SP61), and output (6V6) with considerable negative feedback. The two-valve sync separator (SP61's) is also mounted on the receiver chassis and sync pulses are fed out to the timebases on flex leads. The receiver has proved very satisfactory, giving excellent results using only a 5ft. flex wire hung from the picture rail as an aerial. The author lives in a suburban area about 30 miles from Kirk O'Shotts, and apart from an occasional passing motor-car there is relatively little interference. Thus, an expensive outside aerial is quite unnecessary. It is much more convenient to use an extra I.F. stage in the receiver, which then has the advantage of being easily portable. Even under these conditions noise suppressors are not required.

The Power Unit

This is on a separate chassis and contains all the mains equipment, including the E.H.T. supply. The H.T. is given by a 400-0-400 volt transformer. By using the scheme shown in Fig. 1, it is possible to obtain from this one transformer a 250 volt supply for the receiver and a 400 volt supply for the timebases. The absence of troublesome voltage-dropping resistances and high-surge voltages on the condensers in the receiver make the complication of this circuit well worth while. Instead of using a special 2,500 volt transformer for the E.H.T. supply, a surplus 500-0-500 volt transformer was obtained very cheaply; this was joined in series with one of the 400 volt windings on the main transformer. With the correct phasing this gives 1,400 volts A.C., which is then rectified in a voltage doubler circuit using a VU113 and an S.T.C. metal rectifier (K3/60) to obtain well over 3,000 volts at the tube cathode. The circuit is shown in Fig. 2. The VU113 heater (4-volt lamp) is

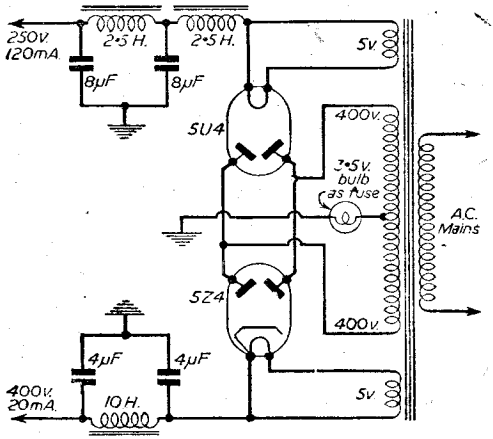


Fig. 1.—Details of the power pack.

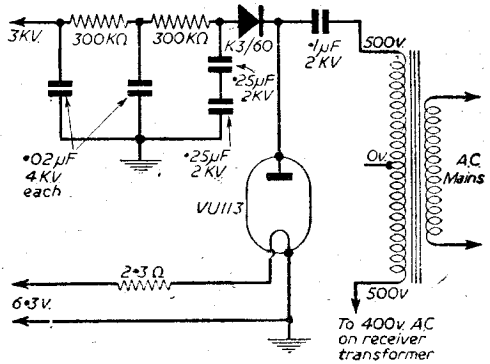


Fig. 2.—Circuit of the E.H.T. unit.

at earth potential and is run off the 6.3 volt supply through a 2.3 ohm resistance. The unusual smoothing circuit was adopted to make use of equipment in hand. It has proved entirely satisfactory. As the total heater current consumption is rather heavy, a separate transformer having two windings, each giving 6.3 volts 5 amps, is used for this. The subdivision of the load between the two windings reduces the problem of voltage drop in the heater leads and interconnecting plugs.

The Timebases

From a study of readers' queries in PRACTICAL TELEVISION, it would seem that many experience difficulty in getting adequate width and height using the conventional two-valve timebases. The author has found that by using three valves in each timebase this difficulty is completely eliminated, and indeed it is quite easy to make the height of the picture equal the diameter of the tube face and still maintain proportional width.

The line timebase uses an EF50 in a conventional Miller Transitron circuit followed by two SP61's as push-pull amplifiers. The valves are connected as anode followers and the resulting negative feedback gives a very linear scan. The width control and the line-hold control are not quite independent, but the effect of one on the other is much less than in the conventional circuits. The whole line circuit is shown in Fig. 3.

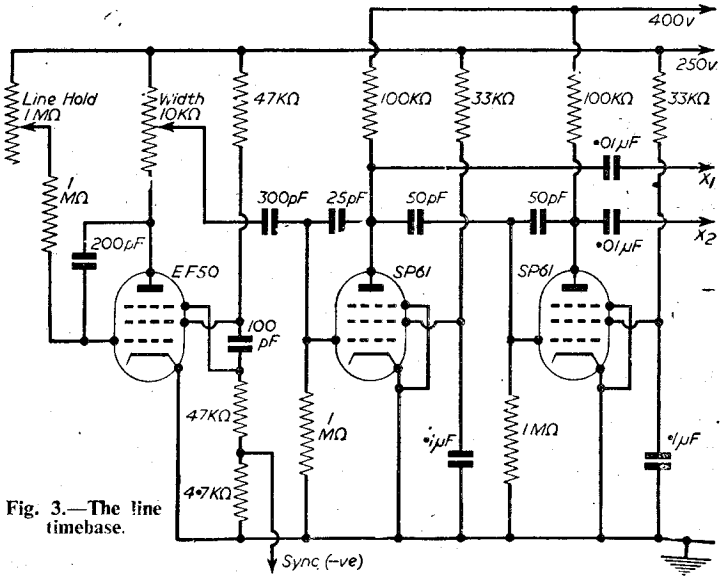


Fig. 3.—The line timebase.

The frame circuit is quite unusual being derived from a radar arrangement (Fig. 4). A 6SN7 arranged as a multivibrator generates negative-going pulses of 1 millisecond duration (the frame flyback time). These pulses are fed to the suppressor grid of an SP61 arranged as a Miller sawtooth generator. Each pulse cuts off the anode current of the SP61 and allows the .005 μF condenser between anode and grid to recharge ready for the next frame scan. This circuit was devised to ensure that the frame generator was completely isolated from the sync pulses except during the frame flyback period. It was thought that

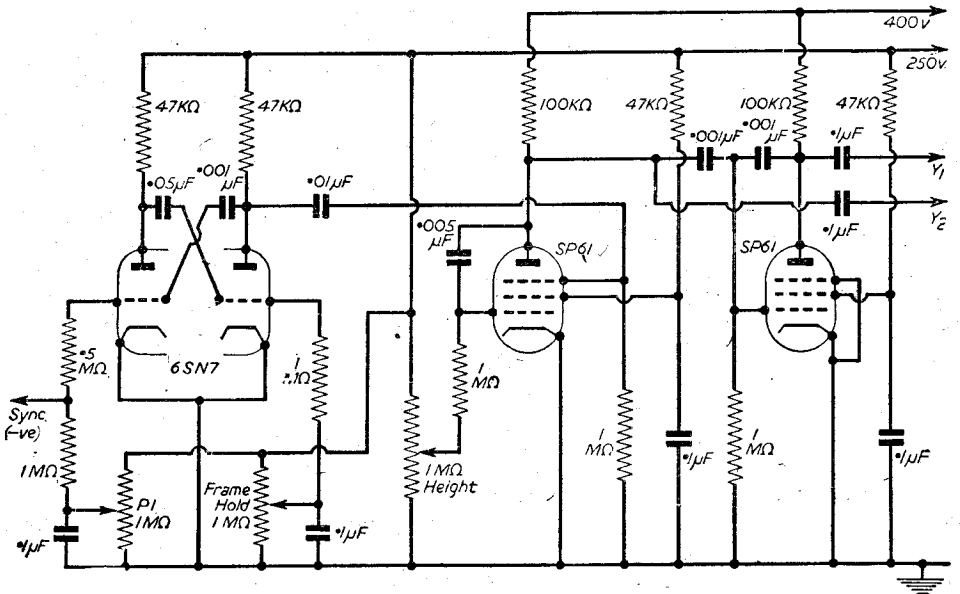


Fig. 4.—Circuit of the frame timebase.

by this means the interlacing problem would be solved. Experience has shown this to be so in practice, and the line structure of the picture is completely invisible. To obtain adequate height another SP61 is used as a push-pull amplifier. The potentiometer P1 is used in setting up the circuit to obtain the correct mark-space ratio of the square-wave generated by the 6SN7.

The VCR97 heater is run from a home-made transformer wound on a 1in. square core. The primary is wound with 42 turns of 20 d.c.c. wire. The secondary is 28 turns of 20 d.c.c. very well insulated from the primary, which is joined to the 6.3 volt heater supply. This construction is much easier than the more orthodox transformer with a 230 volt primary.

New BBC Stations and Aerials

New Stations and Aerials

BETTER television coverage for the Aberdeen and Belfast areas is envisaged by the announcement that the BBC has placed a further order for two three-stack super-turnstile TV arrays.

These aerials, which are being manufactured by Marconi's Wireless Telegraph Co., Ltd., will be similar in general construction to that already supplied and erected by this Company at Pontop Pike, in the Newcastle area.

It is understood that the new aerials have been allocated to Core Hill (Aberdeen) and Divis (Northern Ireland).

In pursuance of the BBC policy to provide as large a service area as possible with the minimum of delay, a temporary transmitter feeding a single-stack super-turnstile array on a 235ft. mast is already operational at Glencairn Road, Belfast. This station, in due course, will be replaced by the permanent site at Divis, which will have a 500ft. mast and the three-stack super-turnstile array, fed by sound and vision transmitters of 2 kW and 5 kW respectively, thus giving an effective radiated power of 5.2 kW sound and 13 kW vision, with a consequent considerable increase in the area of coverage.

Ultimately, the new arrays will themselves be replaced by others of higher gain to provide a still larger service area.

Two kilowatt transmitters (sound) and 5 kW transmitters (vision) for North Hessary Tor (Devon), Rowridge (I.O.W.), Core Hill, Pontop Pike and Divis are also being manufactured by Marconi's Wireless Telegraph Co., Ltd., at their Chelmsford works.

Technical Data

The Marconi three-stack super-turnstile television aerial has been designed to meet the requirements of a simple and efficient aerial having an omni-directional polar diagram.

It is designed for use on any chosen channel between 42 Mc/s and 88 Mc/s, and normally radiates the combined vision and sound output of a television transmitter with horizontal polarisation.

No insulation material whatever is used in mounting the radiator wing to the central column, and the only insulators on the aerial are at the connecting points of the distribution feeders and radiator elements, where no mechanical stresses occur—an important contribution to trouble-free operation.

Quadrature feed for alternative planes of the super-turnstile aerial is obtained by making the branch distribution feeder to one plane of the aerial a quarter of a wavelength longer than that to the other plane. Opposite elements are then fed in antiphase. This system has the effect of balancing out to a considerable extent any departures from the desired impedance on the part of the two branch feeders, and thus enables the complete aerial to present a greater bandwidth with a given reflection factor than do the branch feeders taken separately.

Electrical Characteristics

Gain figures of the three-stack super-turnstiles, relative to a half-wave dipole with a lossless transmission line are given below:

Maximum theoretical gain (db) ...	5.33
Mean theoretical gain (db) ...	5.10
Distribution feeder loss (db) ...	0.09
Actual gain (db)	5.24
Actual power gain	3.3 4
Power handling capacity (kW) ...	22.5

Medium-power Stations

The BBC announces that contracts for the provision and erection of the masts for the transmitting aerials at the permanent medium-power television stations at Rowridge (Isle of Wight), Pontop Pike (near Newcastle-upon-Tyne), and North Hessary Tor (South Devon), have been placed with British Insulated Callender's Construction Co., Ltd., 21, Bloomsbury Street, London, W.C.1.

Similar contracts for the provision and erection of masts for the permanent medium-power television stations at Divis (Northern Ireland) and Core Hill (near Aberdeen) have been placed with J. L. Eve Construction Co., Ltd., 17, Hillside, London, S.W.19.

All the masts will be generally similar in construction and with the exception of that for North Hessary Tor, which will be 750ft. high, they will have a height of 500ft.

Design work on these masts is to start immediately.

Crystal Palace Station

It is also announced that the contract for the first stage of the building work at the new London Television Transmitting Station at the Crystal Palace has been placed with Messrs. Higgs & Hill, Ltd., Crown Works, South Lambeth Road, London, S.W.8. Work is starting immediately.

MORE ABOUT BAND III

FURTHER NOTES ON THE ADAPTATION OF EXISTING RECEIVERS FOR RECEPTION ON CHANNELS 8 AND 9

By W. J. Delaney (G2FMY)

INCREASING interest is being shown in the modification of existing receivers for use on the proposed new commercial frequencies, and there still appear to be a number of misapprehensions concerning the work involved and the best way of carrying out the necessary modifications. So far only two channels have been allocated on the higher frequencies. These are to be known as Channels 8 and 9, and the respective frequencies are 186 to 191 Mc/s and 191 to 196 Mc/s. Channel 9 (191 to 196 Mc/s), has been allotted to the London area, but the northern area may be sub-divided into two sections, one making use of Channel 8 and the other sharing the London frequency. Discussions are still going on concerning powers and actual locations, so that no definite information can be given, and as already mentioned in these pages there is still the possibility of F.M. being utilised for the sound section. Assuming, however, that the new transmitters will employ the same timebase and modulation systems there would only remain the problem of how best to make use of existing receivers.

It has already been pointed out that in most cases an " adaptor " unit or separate plug-on unit could be added between the aerial and the receiver to tune in the new stations. But here again there are some complications. An existing aerial will not give the maximum performance, although it is quite probable that in localities close to the transmitter it could be used without modification. The reader should, therefore, be prepared for the possibility of having to erect another aerial for the new frequencies, and until it is announced whether the new transmitters will use vertical or horizontal polarisation the aerial cannot be erected. In looking for a position for the aerial, it should be remembered that the unused Band 1 aerial may act as a reflector and produce ghost images, or even in some localities act as a parasitic element absorbing the majority of the new signal. So again the viewer must wait for more definite information before anything can be done in this direction.

Receiver Modification

So far as the receiver is concerned, however, it is possible to carry out tests and experiments, especially if access can be gained to a good signal generator capable of putting out a local signal at the new frequencies. The majority of commercial receiver manufacturers have already decided on the best way of adapting their receivers, and firm policies have been announced to the Trade. There are still a number of receivers used for the reception of the London transmitter, which are of the straight, or T.R.F., type, and unfortunately these will not be easily adapted. Theoretically, every coil must be changed but if the receiver is considered, along with all other Band 1 models as fixed-tuned to a given frequency, it should be possible to fit a frequency-changer stage in front, so that the new signal can be converted into whatever frequency the existing receiver is designed to cover. In the case of commercial receivers with five-channel tuners, it may be found, for instance, that converting to, say, Channel 3 may cause interference with a neighbour's receiver. Furthermore, if the existing receiver is already a superhet, then the new unit will have to deliver an output which will cover both vision and sound and this is not too simple. If, however, the new converter is designed to produce only the vision and sound I.F. of the new station, these could be arranged to be the same as the I.F.s at present employed, and the output could then be taken to the first I.F. stages in the existing receiver, thus cutting out the existing frequency changer and avoiding certain circuit difficulties.

Break-through

If it is remembered that whilst the receiver is in use the existing Band 1 station may be on the air, it will be appreciated that any circuits in the receiver which are tuned to this station may pick up the signals and provide a background which may not be easily removed. The fitting of the old-fashioned wave-traps or rejector or acceptor circuits in the new converter may be quite useless in some areas, as the local Band 1 station may be picked up on the inter-circuit wiring—known as shock-excitation. Unless the receiver is totally enclosed in an earthed metal box it will be impossible to prevent this trouble. Therefore, in such a case the elimination of the existing frequency-changer stage may not only be desirable but essential. There is one alternative which will remove all doubts and difficulties in every case, and that is the employment of a complete new vision and sound strip. This would preferably be complete with its own power pack, which would be quite modest as an output of only a few milliamps at 160 to 250 volts (according to the types of valve used) would be needed, plus the necessary heater supply, and this would be used to replace the existing strip. Two alternatives are available here—the strip could end before the video stage or could include that stage, and thus would be plugged into the last stage or connected direct to the tube. The exact arrangement would depend upon where in the actual construction the sync pulses were taken off. A simple short length of coaxial with plug and socket arrangement could be used to make the change, and the unit would not be expensive. The use of rotary switches would not be desirable to make the change in such a case, and it is unlikely that one would want to make quick changes from one station to another, although the changing of a pair of plugs would not take any appreciable time. There is quite a lot to be said in favour of this separate receiver arrangement as it could be bench tested without interfering with the rest of the family's enjoyment of existing transmissions, and could finally be plugged in with the certainty that it would function satisfactorily right away. It would, of course, be desirable that when plugged in, the existing vision and sound section should be rendered inoperative by breaking the H.T. feed and thus avoid interaction between the two circuits, and also remove risks of breakthrough.

(*Concluded on page* 528)

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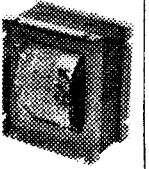

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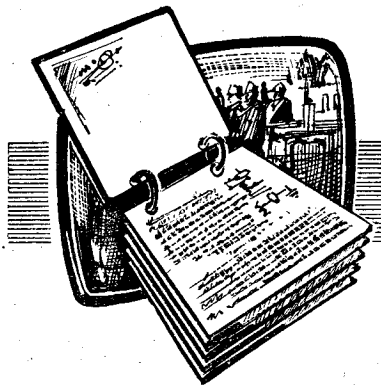


Pages from a TELEVISION ENGINEERS Notebook

15.—GHOST IMAGES

ONLY in situations within a mile or so of a transmitter can the normal television aerial be dispensed with and a piece of wire, such as often serves as an aerial for broadcast receivers, be used instead. The writer has seen perfect images on a televisor using a few feet of ordinary wire plugged into the aerial socket, but this took place within half a mile of Alexandra Palace, and even then certain movements of people within the room caused slight variations in the picture contrasts.

Like the broadcast receiver, a televisor requires a good aerial system if it is situated farther than a few miles of the transmitter. In fact, the television aerial has to be considered with much more care than even the best of broadcast systems because of a phenomenon which is peculiar to the very high frequencies involved, that is, the problem of reflected waves. If a wave which has travelled a few hundred feet farther than the directly received wave by reason of it being reflected, or "bounced," from some nearby structure, is permitted to enter the receiver system, the picture is distorted by the presence of a ghost image which often results in the blurring of all vertical lines in the image.

With the present system of 405 lines, 25 frames per second picture, the spot on a 12in. tube moves at a speed of roughly 1in. in 9μseconds. In the same time, a radio wave in space will travel about 1.7 miles; therefore, if a direct and a reflected wave arrive at the receiver input terminals, and the reflected wave has travelled a distance of 1.7 miles farther than the direct wave, a second image will appear on the screen, the displacement between them horizontally being about 1in. This ghost image may or may not be of the same polarity as the proper image, but this is a question of phase and need not be considered at this stage.

As the distance travelled by the reflected wave becomes more nearly equal to that of the direct wave, the ghost image moves nearer and nearer to the proper image, until, at small distance differences, say, a matter of a few hundred yards, the ghost begins to blend into the main picture content and its true nature tends to be lost. The effect then is that of a picture in which all vertical lines are fuzzy and no amount of tuning or focusing will affect the seeming lack of definition. It is in such a case as this that a ghost image is confused with poor receiver alignment, and the set is blamed for an effect which originates outside the house.

Further, due to the phasing conditions mentioned above, a near ghost image will give the appearance of white after black (or vice versa), a fault which is often blamed on to the video amplifier characteristics.

From all this, it is apparent that the aerial system, its nature and its orientation, must be such that only one signal, the direct wave or a single reflected wave without any direct signal at all, is received from the transmitter concerned. In cities and towns where the site may be surrounded by gas works and steel-framed buildings, the problem is often very acute and the elimination of one or more ghost images is often quite impossible. However, this does not excuse any lack of thought in the aerial problem in any location, because a poorly erected or badly designed system can readily produce ghost images even in a district where possible reflecting objects are not in evidence.

Reflections on the Feeder

Let us consider first of all the feeder cable, which may be coaxial or twin-wire, connecting the aerial proper to the receiver. For short lengths of this cable run, say, up to 50 yards, the possibility of trouble on account of poor matching, is small, but for lengths greater than 100 yards, the problem of an accurate match at the receiver becomes more difficult. Ghost images which then appear on the screen are not the result of an indirectly received wave, but the result of a signal which is reflected from the aerial input coil back to the aerial, and then back again to the receiver input coil, the actual displacement being proportional to the time taken to make the double journey. For a 100 yards of cable, the distance is 200

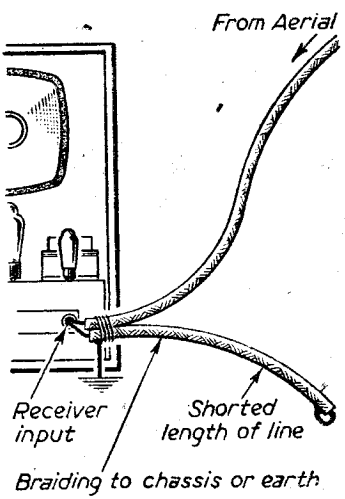


Fig. 1.—The use of a shorted length of line in a stub form of tuning to improve the cable-receiver match.

yards, and as the velocity of the wave in cable is only about 0.8 of that in space, the total effective distance travelled is about 220 yards, sufficient to produce a smearing ghost just to the right of the main image. In a severe case, of course, the wave will be reflected back and forth along the cable several times before it is sufficiently attenuated to become insignificant, and then the presence of several ghost images is evident, gradually fading away to the right of the main image.

Twisted pair feeders are not common in this country and most feeders of similar form are made up as parallel twin wires, screened or unscreened as the case may be. The attenuation of such lines is fairly high if the length exceeds several wavelengths (an average wavelength is about 18ft.), and at 60 Mc/s may well be 2 db. per wavelength, but this is much better than that of twisted pairs. Normally the match at the aerial end cannot easily be modified, as the cable is made up into nominal 70 ohm impedance, and is connected directly into the dipole. This end is of little importance, however, if the receiver end match can be made efficient, and it is here that some degree of control is possible.

In receivers designed for parallel-wire cable, the use of two small series condensers, one in each wire, and connected close against a centre-tapped coupling coil, is feasible to cancel out the reactive part of the input impedance. A purely resistive input component is not always desirable, however, and a small residual inductance has been found to be of value in certain cases.

In some circumstances the signal picked up on an unscreened twin-wire line may exceed that picked up on the aerial elements themselves. This is of no consequence if the receiver input is properly balanced to earth, but an unbalance of any appreciable magnitude will lead to trouble from ghosting, particularly if long lengths are involved. In this respect, the higher attenuation of a twisted pair will often attenuate the reflections before multiple images can result. The use of screened cable is, of course, the best solution to this aspect of the problem.

With twin-wire cable, therefore, the use of a well-designed input circuit having a small inductive component and a good balance to earth is desirable; in addition, the use of a screened form of cable is often of value.

Coaxial cable is supposed to be self screening, but this is seldom the case, and in severe instances pick-up on the outer covering can lead to trouble; a double-screened form is then useful, but on the whole is not necessary. When such cable is connected to a balanced device such as the normal dipole, a special section to enable the balanced aerial to be matched to the unbalanced line is strictly necessary, but again no serious difficulty arises if the receiver match at the other end is good. A mismatch here can often be corrected by shorting and earthing the cable at the receiver end, and tapping into the line with a further short length of the cable a few feet from the earthed end. This, in effect, is equivalent to adding a shorted length of cable in parallel with that already wired into the receiver from the aerial. This shorted length can then be cut by trial and error until a position is reached where the signal input is high and free from reflections. A length of about 5ft. is a useful length to begin with, and Fig. 1 shows the general idea. Sometimes the use of a 68 ohm resistor in place of the short-circuit is of value.

Some further notes will be given next month of ghost elimination by aerial design and orientation.

VALVE BASES, CAPS & HOLDERS

New British Standard—B.S.448

AFTER many months of patient negotiation and discussion, representatives of the leading trade associations and of the Service and Government departments directly concerned have prepared a new and impressive edition of British Standard 448—Electronic-valve Bases, Caps and Holders. This brings up to date the 1947 version of the standard by including many new types of valve bases and holders. The standard now effectively covers the whole range of contempoary production, and the detailed specifications have been expressly drawn up so as to meet the requirements of all types of valve bases and holders for both civilian and Service applications.

The main purpose of B.S. 448 is, of course, to schedule the agreed physical requirements for valve bases, caps and holders necessary to ensure both a good mechanical fit and satisfactory electrical contact between mating parts. The standard requires that, generally speaking, the accuracy of the individual components should be checked by means of precision gauges, the dimensions and tolerances for which are given in the standard.

Loose-leaf Form

An important change in the physical presentation of this new edition of B.S. 448 is that it has been prepared in loose-leaf form. The early pages provide the information common to all types of valve bases and holders; and each individual type of valve base is then given a completely separate section, in which the data specific to that type is recorded.

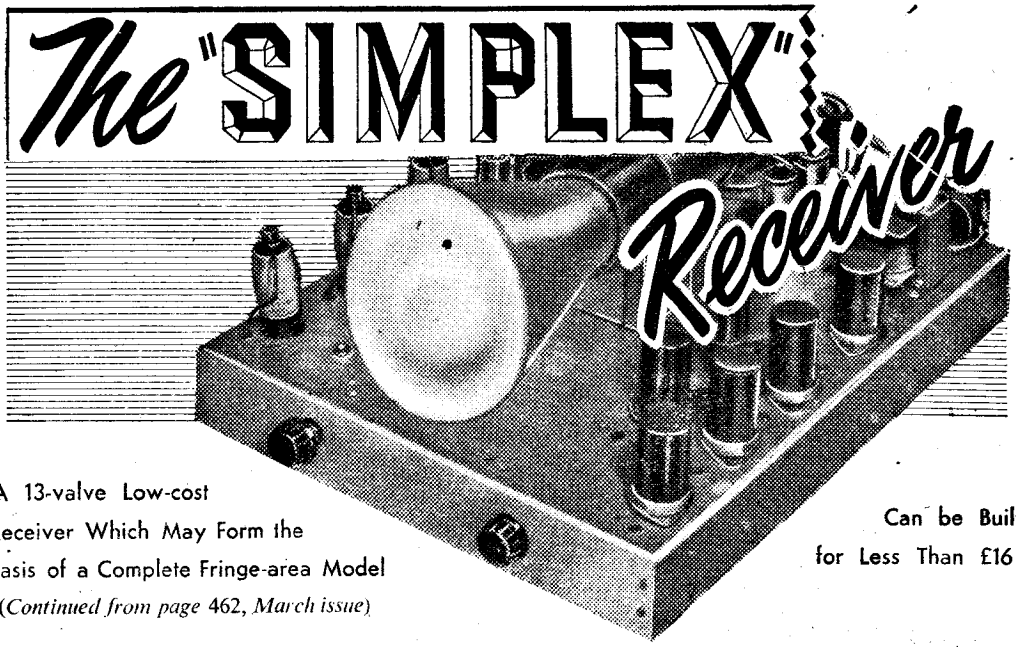
The B.V.A. symbolic names of the bases (e.g., B7G) have been adopted as the titles to these sections, which are arranged in sequence according to the number of pins on the valve bases. The loose-leaf arrangement, together with a uniform method of sub-dividing the information presented within each section, will permit the easy replacement of new sections and, when necessary, the addition of fresh material within any one section.

The industry organisations whose technical representatives helped in the preparation of this standard included the British Radio Equipment Manufacturers' Association, the British Radio Valve Manufacturers' Association, the Radio Communication and Electronic Engineering Association, the Radio and Electronic Component Manufacturers' Federation, the British Plastics Federation, together with representatives from the BBC, General Post Office, the professional bodies, and the relevant Service and other Government departments.

Copies

Copies of the new edition of British Standard 448, which is priced at 22s. 6d., including the loose-leaf binder, can be obtained from British Standards Institution, British Standards House, 2, Park Street, London, W.1. Each copy of the standard as issued includes an official order form for the supply of additions and amendments to B.S. 448 as they are published.

The "SIMPLEX" Receiver



A 13-valve Low-cost Receiver Which May Form the Basis of a Complete Fringe-area Model

Can be Built for Less Than £16!

(*Continued from page* 462, *March issue*)

IT is convenient to allow a quarter of an inch all round the edge of the chassis so that it can be turned up and a raw metal edge avoided.

When the chassis has been constructed the screens can be made out of the same material though they must not be fitted at this stage (Fig. 3).

After the chassis has been made, the sound and vision receiver valveholders should be bolted in position, followed by the aerial socket and then L1 coil form, fitting tag strip 1 under the bolt holding the coil form (this is done at each R.F. stage). Note each 2-way tag strip has one tag earthed by the bolt holding the tag strip.

Wire the L.T. positive line (i.e., the " live " side).

Wind the secondary of L1 as given in the coil data (Fig. 2) using 22 s.w.g. bare wire and taking the ends of the wire directly to their terminal points.

The spacing between adjacent turns is given as 2 mm. which is approximately the diameter of the wire.

Wire the coaxial from the aerial socket to L1 and note the method of earthing the sheathing at each end.

The primary of L1 is now wound using insulated 22 s.w.g. wire and making adjacent turns touch each other. The very first turn should touch the last turn of the secondary.

All coils are wound in a clockwise direction.

Wire the cathode of V1 and screening circuit and then erect the first screen. Fit L2 coil form with tag strip 2 under one bolt and then wind the coil.

To wind the coil take two equal lengths of 28 s.w.g. wire enamelled and silk covered. For Channel 1 2ft. of wire for the primary and the same for the secondary will be required, while for Channel 5, 18in. of wire is necessary in each case. Intermediate channels will require intermediate lengths.

Note that these lengths are not the exact lengths of the coil, but allow a certain percentage for wastage and ease of winding.

One of the wires is soldered directly to pin 3 of V1 and the other to pin 7 of V2; now mark the latter wire by making a little loop in the free end so that it can be identified when the coil is wound.

The two wires are now placed parallel with each other and touching, and carefully wound round the coil form in a clockwise direction. This must be done with care so that the wires do not overlap at any point, the top wire remaining at the top through all the turns. Each turn must lie in contact with its neighbour.

The wire with the small loop is taken directly to the earthed tag 2 and the one without the loop to pin 2 of V1. The remainder of this part of the circuit should be wired in accordance with the blueprint, and the second screen should then be erected. Note that the connection to pin 2 of V3 is wrongly connected in Fig. 1. The blueprint is correct.

Work now proceeds on L3 and the same procedure is followed. The contrast control should be fitted and wired in the circuit with coaxial cable, and the coupling coil for the sound section then wound on L3.

It is wound with 22 s.w.g. insulated wire in a clockwise direction. One end is earthed to the common earthing tag of the section and the other to the centre conductor of the coaxial cable which links the circuit with the sound section.

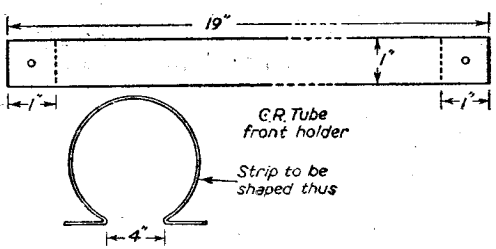


Fig. 5.—Details of the tube holder or support.

Wind the coil in the same manner as the primary of L1.

Note the method of earthing each end of the coaxial cable as shown in the blueprint.

The screen can now be fitted.

L6 should now be fitted and wound in a similar manner to L1. The coaxial cable is connected to the insulated turns forming the primary. (The secondary must be wound before the primary as in L1).

The next step is to fit L4. It should be wound in a manner similar to L2.

The rejector coil L7 should be wound next and C8 mounted across it. The coil and condenser can then be fitted in the chassis and wired in position.

One point to note in connection with this coil is that it is not required for the London transmitter and can therefore be omitted, together with C7 and C8.

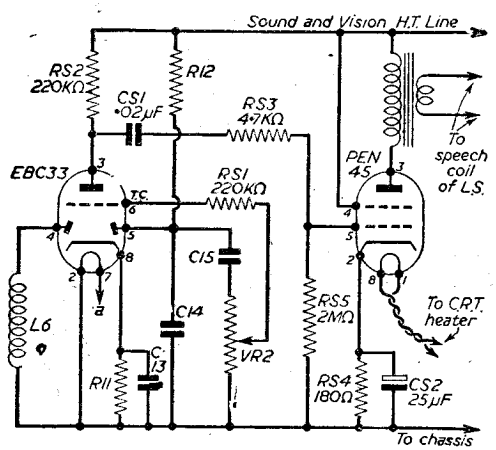


Fig. 6.—The separate sound section which will be described next month.

L8 should now be wound in accordance with the data. A 1 watt resistance of high value can be used as a former for it, or a piece of ¼in. dowel rod.

If desired a boost choke such as is used in the View Master can be employed in this position.

The next step is to wire the video output stage, leaving only the coaxial cable leading to the timebase.

The Sound Receiver

The screen between the sound and vision stages should now be erected (Fig. 4d) and then the remainder of the first section of the sound R.F. stage can be wired.

When this has been completed the remaining screen (Fig. 4b) is erected and L6 fitted in position.

The secondary of L6 is wound in bare wire taking the bottom end to earth and the top end to pin 3 V7. Now wind the primary in insulated wire, two turns wound in the same direction as the secondary. The bottom end goes to pin 3 of V6 and the top end to pin 2.

The remainder of the sound circuit is then wired and the output taken via C15 to the volume control.

This completes Stage I and all wiring should be thoroughly checked before proceeding to Stage II.

STAGE II

The Timebase

Fit the valveholders of the timebase and insert a soldering tag under the bolt as shown in the blueprint.

V8 holder is fitted on the side of the chassis in a similar manner to V4.

Wire in the "live" side of the heater circuits. Fit the 14-way tag strip.

LIST OF RESISTORS, CONDENS

RESISTORS

R1 220Ω	R16 1MΩ	ΦR31 100KΩ
R2 4.7 KΩ	R17 100KΩ	R32 2MΩ
R3 220Ω	R18 10KΩ	R33 2MΩ
R4 4.7KΩ	R19 47KΩ	R34 470KΩ
R5 4.7KΩ	R20 10KΩ	R35 470KΩ
R6 4.7KΩ	R21 33KΩ	R36 2MΩ
R7 4.7KΩ	R22 47KΩ	ΦR37 470KΩ
R8 68Ω	R23 680KΩ	ΦR38 2MΩ
R9 220Ω	R24 1MΩ	R39 180KΩ
R10 4.7KΩ	R25 47KΩ	R40 2MΩ
R11 4.7KΩ	R26 47KΩ	R41 2MΩ
R12 2MΩ	R27 4.7KΩ	ΦR42 47KΩ
R13 1MΩ	R28 470KΩ	R43 1.5KΩ (4w.)
R14 6.8KΩ	R29 2MΩ	
ΦR15 10KΩ	ΦR30 100KΩ	

(Φ = 1 watt the remainder are ½ watt)

CONTROLS

VR1 25KΩ Contrast	VR7 2MΩ Line H
VR2 2MΩ Volume	VR8 100KΩ Shift
VR3 100KΩ Height	VR9 100KΩ Shift
VR4 100KΩ Width	VR10 500KΩ Focu
VR5 25KΩ Linearity	VR11 100KΩ Brill
VR6 2MΩ Frame Hold	

(All above can be pre-set, except VR1 and VR2 requires S.P. switch).

The coaxial cable from the video output should now be run and then the whole of the timebase should be wired in accordance with the blueprint starting with V8 circuit and working through to V13 mounting the various components as they are required.

C29, 30, and 31 should be left until the work on top of the chassis is commenced.

Note the position of the width control which can be

LIST OF COMPONENTS

STAGE II—Timebase

Valves :
3 SP61
1 EA50
1 6J5GT (or equivalent triode)
1 6SN7

Resistors (Φ = 1watt. Remainder ½ watt)
3 1 MΩ
1 6.8 KΩ
2 10 KΩ
1 100 KΩ
4 47 KΩ
1 33 KΩ
1 680 KΩ
1 4.7 KΩ
1 470 KΩ
2 2 MΩ
1 10 KΩΦ
2 100 KΩΦ

Condensers (350 v. wkg. unless stated otherwise) :
1 50 pF
4 0.01 μF
4 0.1 μF
1 0.005 μF
2 100 pF
3 0.1 μF 2.5 Kv.

Potentiometers (all carbon, pre-set)
2 100 KΩ
1 25 KΩ
2 2 MΩ

Valveholders :
3 Mazda octal
2 International octal
1 EA50

Sundries :
1 tag board, minimum 14 ways
3 valve caps for SP61's

STAGE III—Power Eq

Resistors :
1 1.5 KΩ (4 watts minim
1 47 KΩ 1 watt

Selenium Rectifiers :
2 Sentercel K3/40
3 Sentercel RM3

Condensers :
3 0.1 μF 2.5 Kv. wkg.
1 32 + 32 μF 450 v. wkg.
1 16 + 8 μF 450 v. wkg.

Smoothing Choke :
10 Henries, minimum cu

Transformer :
Standard inputs, 50 cyc

Outputs :
350v.-350v. 150 mA.
6.3 v. 5 A.
5.0 v. 3 A. (Note this v
4.0 v., for details see te

one of the pre-set type. It is mounted under the top of the chassis.

When the whole of the circuit has been wired it should be thoroughly checked before proceeding to Stage III.

Note that C23 must be placed well clear of the chassis and supported by its own connections. If it is mounted too near the chassis it may cause the frame circuit to be rather non-linear.

NSERS, CONTROLS AND RECTIFIERS

CONDENSERS

C1 500pF	C14 0.001 μF	C27 0.1 μF
C2 500pF	C15 0.1 μF	C28 0.01 μF
C3 500pF	C16 0.1 μF	C29 0.1 μF 2.5 Kv.
C4 500pF	C17 0.01 μF	C30 0.1 μF 2.5 Kv.
C5 500pF	C18 0.1 μF	C31 0.1 μF 2.5 Kv.
C6 500pF	C19 0.1 μF	C32 0.1 μF 2.5 Kv.
C7 5pF	C20 50pF	C33 0.1 μF 2.5 Kv.
C8 15pF	C21 0.01 μF	C34 0.1 μF 2.5 Kv.
C9 15pF	C22 0.1 μF	C35/36 32 + 32 μF 450 v.
C10 25μF 25 v.	C23 0.005 μF	C37/38 16 + 8 μF 450 v.
C11 500pF	C24 0.01 μF	C39 0.1 μF
C12 500pF	C25 100pF	
C13 25pF	C26 100pF	

(All above 350 v. wkg. unless stated otherwise).

Hold
ft Hor.
ft Vert.
ocus
rilliance

VR2.

RECTIFIERS

MR1 Sentercel K3/40
MR2 Sentercel K3/40
MR3 Sentercel RM3
MR4 Sentercel RM3
MR5 Sentercel RM3

Now proceed to Stage III.

STAGE III

Power Equipment

The most important work here is to modify the transformer for 4 volts instead of 5 volts. The work is quite easy if the following detailed instructions are used. If you can obtain a transformer meeting the specification, but with the additional facility of having the 5 volt winding tapped at 4 volts, these instructions can be ignored.

Modifying the Transformer

First take off the shroud or mounting brackets and withdraw any bolts holding the stampings together. Now slip out the stampings one at a time taking note of the way in which they are stacked. They should be placed in a pile so that the bottom one of the pile is the first stamping withdrawn, and the top is the last stamping. It will be found that they are mounted in pairs, a pair being formed of either one " T " and one " U ", or one " E " and one " — ".

When the stampings have been removed unsolder the wires going to the terminal tags (if any should be fitted), and label each wire.

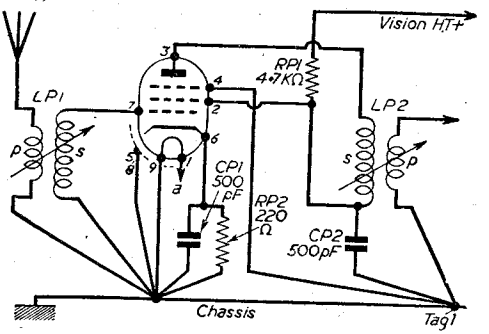


Fig. 7.—This is an R.F. stage which may be added for fringe-area reception. It will be described next month.

Now remove the cardboard cover and the top layers of insulation; underneath will be found the first winding which is probably the 6.3 volts winding composed of between 20 and 30 turns of heavy gauge wire. The labels on the ends of the windings will indicate the voltage of the winding. If it is the 5 volts winding then deal with it as explained below for that winding.

Generally, however, the 6.3 volts winding comes first. The number of turns should be counted and then the winding carefully removed, taking care not to damage the enamel.

The next layer of insulation should now be removed and the winding exposed will be the 5 volts winding. Count the number of turns (somewhere between 20 and 30) and then divide the resultant number by 5. Add one turn to this figure and then take off the number of turns given by the answer.

Example " *A* ".—Total turns is 25. Divided by 5 gives 5. Add 1 gives 6. Number of turns to take off=6. Sometimes the total number of turns will not divide exactly by 5. In that case use the nearest whole number.

Example " *B* ".—Total number of turns is 22. Divided by 5 gives 4⅖. Call this 4, add a turn as before, giving a figure of 5, which means that 5 turns must be removed.

Example " *C* ".—Total number of turns is 24. Divided by 5 gives 4⅘. Call this 5, add a turn as before making the figure 6, and take 6 turns off.

FOR STAGES II, III AND IV

Equipment
imum)
g.
current 120 mA.
ycle
s winding is to be tapped at
text)

STAGE IV—C.R.T. Network

C.R.T. :
VCR97 or VCR517 (VCR517c not to be used)

Resistors
1 2 MΩ (1 watt)
4 2 MΩ (½ watt)
2 470 KΩ (½ watt)
1 180 KΩ (½ watt)
1 470 KΩ (1 watt)

Condensers :
1 0.01 μF 350 v. wkg.

Potentiometers :
1 500 KΩ carbon. Pre-set
3 100 KΩ carbon. Pre-set

Sundries :
4 yds. flex
1 C.R.T. holder
1 strip of ¼in. paxolin, 3in. by 1½in.

When the required number of turns has been removed the new end of the wire should be fitted in the position of the original end.

Now replace the insulation material and cover any break in it with empire tape, or two thicknesses of waxed paper.

Carefully rewind the 6.3 volts winding, fixing the ends as they were originally.

The top insulating layer and outer cardboard should now be replaced. Re-solder all windings to their correct tags: remount the stampings and re-assemble the transformer.

The 5 volts winding has now become a 4 volts winding and the C.R.T. can be fed directly from it.

Mounting the Components

The mains transformer should now be mounted in position. It should come right to the edge of the chassis.

Make the C.R.T. mounting (Fig. 4c), and fit the tube base-holder on it. The two condensers, C32, 33, can now be fitted followed by all the rectifiers.

Note that slots are cut in the C.R.T. mounting base so that it can be slid into position. The final position is so that the front of the C.R.T. overlaps the front of the chassis by about half an inch.

MR1 is mounted underneath the chassis, one end going under the bolt holding the tube mounting and MR2 is mounted above the chassis, the negative end going through a hole in the chassis, the hole being insulated with a rubber grommet.

The smoothing condensers can be mounted in position and the remainder of the power circuit wired up.

C29, 30 and 31 can now be fitted in position. The method of mounting these will depend upon the type obtained. The important point to remember is that both sides of the condenser should be well insulated from the chassis.

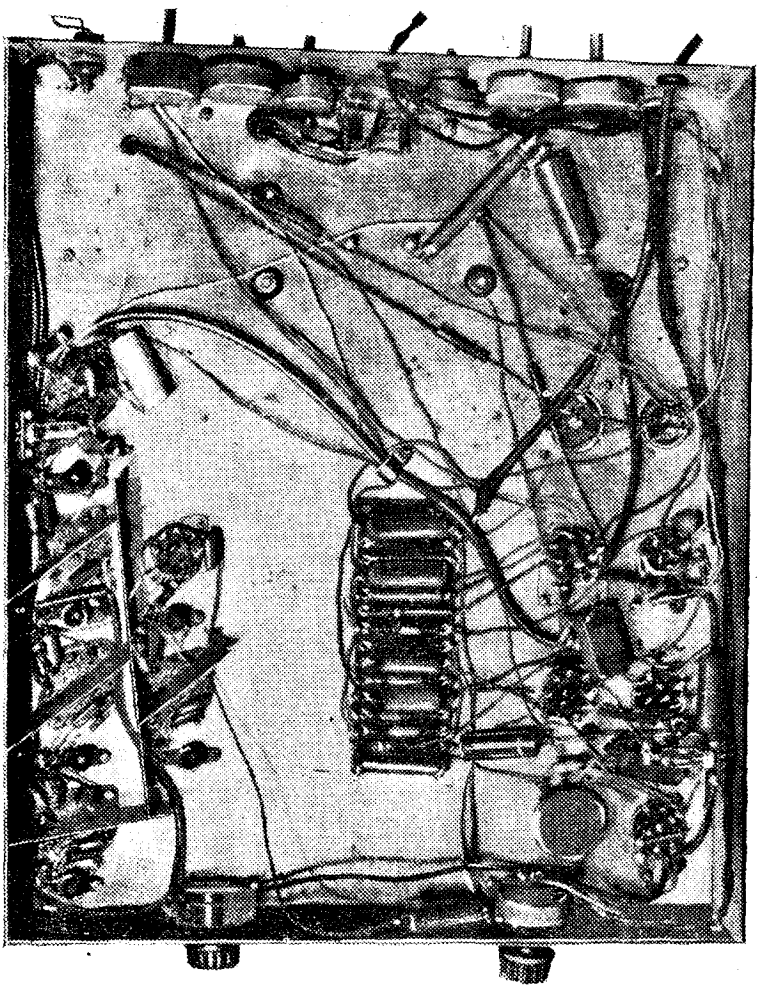
Those used in the prototype had metal cans with bolts at the base; the method of mounting was as follows:—

Holes $\frac{5}{8}$in. were drilled and rubber grommets inserted. The bolt at the bottom of the condenser case was then inserted through the hole and a large washer fitted on the bolt underneath the chassis. A nut was run on the bolt and tightened sufficiently to keep the bolt in position but not so tight as to cause contact between the condenser and the chassis.

The bottom connections of the condensers were then wired to their respective timebases.

The dropping resistor R43 is mounted clear of the chassis on an insulated tag and another insulated tag fixed to the C.R.T. mounting supports the resistor in an upright position.

Complete the wiring of the power section and check it carefully before proceeding to Stage IV.



Underside view of the chassis, showing the small number of components which have to be wired.

STAGE IV

C.R.T. Network

This is the final stage and work is commenced by mounting the brilliance and focus controls. These are fitted on the $\frac{1}{4}$in. thick paxolin strip in the position indicated on the blueprint, on top of the chassis. Small metal brackets can be made to fix the strip in position.

Fit the shift controls and then wire up the complete network, mounting the resistors, etc., as work proceeds. Use well-insulated wire on the E.H.T. line.

(To be continued)

FAULT SYMPTOMS

THE CAUSES OF COMMON FAULTS, AND METHODS OF CORRECTION

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

(*Continued from page* 441, *March issue*)

SOMETIMES a leak develops from the element of a pre-set control associated with the frame timebase circuit to chassis. Such a leak does not always affect the performance of the generator generally. This point was revealed to the writer while investigating an Ekco model TS114 for an unstable frame. The fault was finally established to be due to a leak between the frame linearity control and chassis—replacing the control cleared the symptom.

No Line Lock—Frame Hold Normal

It is general practice to supply the line generator with sync pulses derived from the anode of the sync separator valve via a series capacitor shunt resistor combination. Such a network is depicted by Fig. 39(a), and is often termed a differentiating circuit.

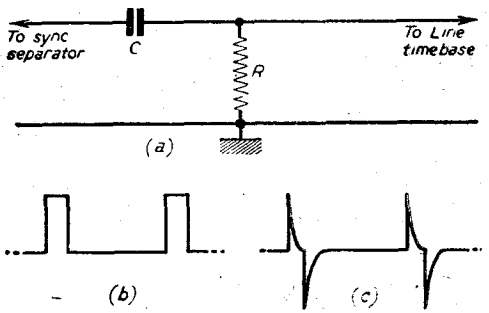


Fig. 39.—A basic differentiator circuit is shown at (a) and line sync pulses at (b), while (c) shows how the pulses are shaped due to the action of (a).

Not only are the line sync pulses subjected to little attenuation by this form of coupling but the pulses also undergo a shaping process, essential for correct "firing" of the line generator. This is illustrated by the waveforms at Fig. 39, which show at (b) a positive-going line sync pulse at the anode of the sync separator valve, and at (c) its modified shape developed across the resistor R.

The action of the circuit is such that the uncharged capacitor C offers little impedance to the leading edge of a pulse: the current in the resistor R and therefore the volts drop across it are at maximum. As time goes on, however, C charges exponentially and the potential across R falls. A virtual change of input in the negative direction is provoked by the trailing edge of the pulse, and the potential across R is thus changed instantly from a positive to a negative magnitude, which is again followed by an exponential return to zero. For optimum operation of this circuit the value of the time constant formed by RC must be appreciably smaller than the 10 microsecond line pulse duration.

It is easy to see, therefore, that a change in value of any component associated with the line pulse coupling circuit might severely impair the efficiency of line lock. In receivers where a simple differentiating circuit is used the symptom of no line lock can nearly always be traced to an open circuit differentiating capacitor.

In certain receivers the line generator demands the application of positive-going sync pulses for successful operation, and where a conventional pentode sync separator is employed, providing negative-going sync pulses at its anode, a form of phase reversing section must also be included in the line pulse feed circuit. The G.E.C. model BT7092 is such a receiver, in which a triode valve is used to perform the phase reversing function. Fig. 40 shows the circuit details, and as will be seen the differentiating components, CR, go to make up the grid coupling circuit.

In a receiver of this type we have, therefore, another factor which could fail and cause a loss of line hold. The sudden occurrence of this symptom should immediately lead one to suspect the triode valve for defective emission. On the other hand, an open-circuited anode load resistor would produce a similar effect by blocking the passage of line sync pulses.

Top of Picture Bent to Right

As we have already seen, the repetition frequency of a sawtooth generator in its "free-running" (unsynchronised) state is determined by the time constant factors of the circuit. For instance, the potential on the grid of the generator valve rises exponentially until it reaches a value which "fires" the valve (flyback). This effect we can illustrate as in Fig. 41(a).

The repetition frequency of a synchronised generator is wholly controlled by correct injection of the appropriate sync pulses. The effect being that just before flyback would be initiated—should the generator be free-running—a sync pulse arrives and the valve is immediately "fired." We can clearly visualise from this, then, that the correct setting of hold control is such that in the free-running state the generator frequency should be very slightly lower than the sync pulse frequency. A line sync pulse

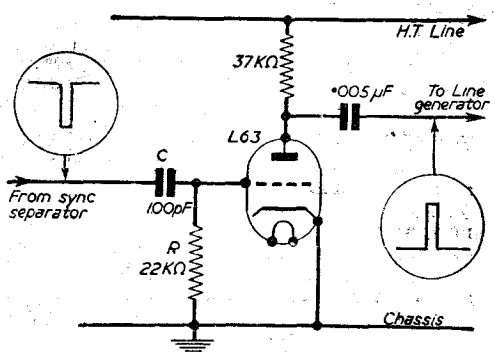


Fig. 40.—The line sync inverter section of the G.E.C. model BT7092 receivers.

exercising complete control on the repetition frequency of the generator during a normal line scan is shown by Fig. 41 (b).

During the framing pulse period, which generally comprises eight 40-microsecond frame pulses radiated collectively, the line generator is held in synchronism by reason of the differentiated leading edge of every other frame pulse (see Fig. 42). A condition may arise, however, where the pulse—not necessary for line synchronising—which occurs in the middle of a line scan during the framing period "fires" the generator prematurely. How this undesirable condition may result is depicted at Fig. 41 (c).

Owing to such an occurrence the line generator is momentarily provoked to operate at twice its normal frequency, and its output voltage is reduced to one-half of normal during this period. The line output valve drive and thus its bias potential diminishes as a result, and the first few full amplitude lines at the top of the screen tend to be displaced to the right-hand side. This effect is displayed on the picture-tube in the form that the top section of the picture bends over to the right and is much more noticeable where excessive vertical picture content exists at the top of the screen. Sometimes the bending over is not stable, in which case the top of the picture appears to "wobble" between the vertical and the bent positions.

It would follow, therefore, that since even the pulses which occur half-way through a line scan—remember these occur only during the framing period—possess sufficient amplitude to "fire" the generator prematurely, the overall amplitude of the line sync pulses generally must be far too large. Such is the normal cause of this symptom, and it can be prevented without much trouble by taking steps to reduce the amplitude of the line sync pulses by the inclusion of a simple attenuator, generally in the form of a potential divider system. Fig. 41(d) shows the normal relative amplitude of the sync pulses for correct "firing" of the line generator during the framing period.

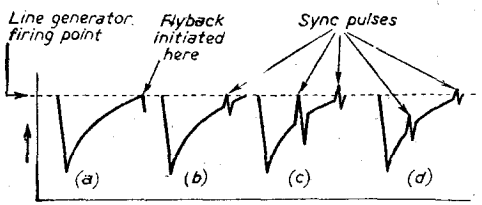


Fig. 41.—Firing points of line generator: (a) free-running, (b) normal synchronised line scan, (c) fired prematurely in the middle of a line scan during the framing period, (d) normal synchronised line scan during the framing period.

Top of Picture Bent to Left

Bending to the left is another common and troublesome fault in the line timebase and, as with the previous symptom, the top of the picture often wobbles in a most disconcerting manner. The bend in this case is caused by a change in the relative amplitude between the pure line sync pulses and those which are used for line synchronising during the framing period. This sometimes results in the line generator momentarily falling out of synchronism during the framing period and giving rise—during its unsynchronised state—to an increased output.

The difference in output voltage of the generator between its synchronised and unsynchronised states is easily realised by considering, for instance, waveforms (a) and (b) of Fig. 41. In (a), the free-running state, the horizontal scan continues until the potential across the time constant capacitor reaches a value sufficient to initiate flyback. In (b), during synchronisation, the line scan is cut short, however, since the line sync pulse initiates flyback slightly before it would otherwise have occurred.

We can see, then, that the line generator falling out of sync during the framing period—at the top of the screen—will provoke an increase in the bias of

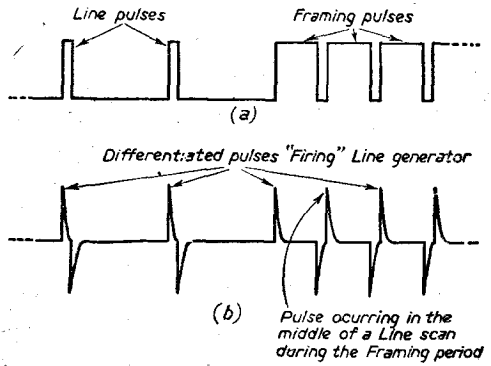


Fig. 42.—Showing the differentiated pulses employed to hold the line generator in synchronism during the framing period.

the line output valve, and this has the effect of displacing to the left the first few lines of picture following the framing period.

The change in amplitude of the sync pulses during the framing period is often caused by a slight variation in mean D.C. level of the composite sync pulse chain when it is conveyed to the line generator through the differentiating network. For it is to be remembered that, although the leading edge of every other frame pulse is differentiated for application to the line generator, the duration of a pure line pulse is considerably less than the duration of a frame pulse.

A sudden occurrence of this symptom should lead one to suspect first of all an alteration in the value of a resistor or capacitor associated with the differentiating, or line sync feed network. A defect in the sync separator stage proper may also provoke the symptom. It is, therefore, advisable, particularly in obstinate cases, to check the sync separator valve for emission and the associated components for value, and it is important to pay special attention to the insulation property of the sync separator coupling capacitor.

Flywheel Synchronising

This section could hardly be considered complete without first looking in at the more recent development associated with line synchronising. Flywheel or auto-synchronising, as this recent added feature is sometimes termed, is now in evidence in quite a number of the more sensitive—fringe area—type receiver. In a large number of cases it represents—from the performance aspect anyway!—a desirable inclusion, for as we have already discovered the trouble with most conventional sync separator stages is that the circuits are not able fully to differentiate between a line sync pulse and an interference pulse.

(*Continued on page* 519)

Such differentiation is rendered even more difficult in areas of poor signal strength owing to the fact that insufficient signal is available at the input to the sync separator to produce a 100 per cent. clipping action. Moreover, it often follows that in high-interference-weak-signal areas, the interference level might well exceed that of the signal, and this factor, coupled with valve and circuit noise, provokes premature line timebase triggering to give rise to the symptom we have already considered of "ragged verticals."

Among other up-to-date refinements the recent addition to the Pye range of television receivers, the V4, embodies a form of flywheel synchronising, frequently referred to as "auto-sync." The relevant circuit details of this feature are depicted in Fig. 43, and though, perhaps, formidable in appearance its mode of operation is quite straightforward and easy to follow.

V1 constitutes the sync separator valve, to the control grid of which the composite video signal is applied through C1. This section follows conventional design inasmuch as the positive going sync pulses drive the valve into grid current, and the resulting charge across C1 is sufficient to place the video portion of the wave-form below cut-off (see Fig. 31). The line sync pulses thus appearing in the anode circuit are differentiated by C2 and R1, and phase inverted by the transformer T1 for direct application to the small metal rectifiers.

Leaving this section for a minute, let us now divert our attention to the ECL80 V2. This valve is primarily employed as the line scan voltage generator, and is wired in the form of a multivibrator using the triode section, and the control grid and screen grid of the pentode section as a second triode with common cathode coupling by R2 and anode to grid cross coupling by C3 and C4. The frequency of operation can be controlled manually by altering the time-constant C4 and R3, where the resistor forms the main line hold control, and the capacitor, also being variable, enables the correct line generator frequency to be adjusted so that it falls in the centre of the range of R3.

The sawtooth voltage appearing across C3 is fed through C5 to the control grid of the line amplifier. Apart from supplying scanning energy to the line deflector coils, the line output transformer also provides a small sampling pulse voltage for application to the metal rectifiers through C6 and C7, and because the winding concerned is centre-tapped, the sampling pulses are in two opposite phases which are balanced about earth potential.

Thus, the two metal rectifiers (discriminating rectifiers) are in receipt of two signals; the sync signal from the sync separator, and the line generator signal from the line output transformer. The criterion for accurate line synchronising is, of course, to ensure that the two signal frequencies are matched, and this is where the discriminator takes over.

How this happens can be realised by assuming for the time being that only the sampling signal voltage is being applied to the rectifiers. Each rectifier is, therefore, receiving a voltage differing in phase by 180 degrees. Both rectifiers conduct equally and the currents in the load resistors R4 and R5 are of similar magnitudes. The resulting voltages are added in opposition, and resolve to provide zero potential at the junction R5, R6.

When both signal voltages are applied to the rectifiers the balance is maintained, but only so long as the phase of the two voltages corresponds. Should the generator frequency start wandering, for instance, the balance will be disturbed, and a control potential will exist at the junction R5, R6, the magnitude of this potential depending on the phase difference between the two frequencies. It is this potential which is utilised, by being fed through R6, R7 and R8, and filtered by C8, C9 and R9, to control the frequency of the multivibrator at the grid of the triode section (the reader can obtain further information on this subject by referring to "Flywheel Synchronising Systems," PRACTICAL TELEVISION, July, 1952, and "The Flywheel Method of Line Synchronising," "British Radio and Television," April, 1953).

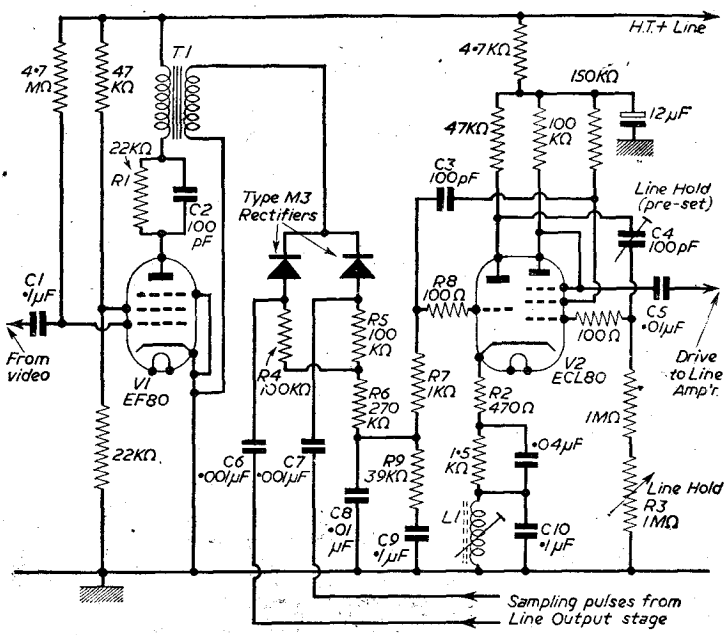


Fig. 43.—The "auto-sync" and associated circuits of the Pye V4 television receiver.

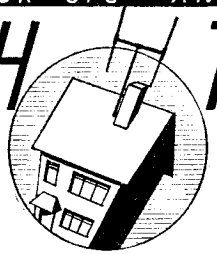
Momentum

A momentum or flywheel effect is given to this system by the inclusion of a tuned circuit, L1 and C10, in the cathode of the generator valve. The tuned frequency is in the region of 8,500 c.p.s., and its oscillatory effect tends to maintain line sync even for a brief period, should the sync pulses fail completely, or should they become distorted due to impulsive interference or other reasons.

(To be continued)

TELEVISION PICK-UPS AND REFLECTIONS

UNDERNEATH THE DIPOLE



By Iconos

VIEWING DECLINING?

WHY is it that the diehard executives of sound radio at Broadcasting House are wearing perpetual broad grins lately? The reason is not far to seek. Though TV licence figures continue to rise and still more sets are being sold, the estimated number of viewers at any given moment is declining rapidly according to the BBC's own viewer research. This startling revelation has been followed by the Army Kinematograph Corporation's announcement that it has decided not to enlarge its television entertainment-for-the-troops scheme. Apparently the popularity of the 300 or so large-tube television sets installed at army camps is waning. The idea of building large screen TV viewing theatres at camps is being postponed if not abandoned. The troops, like the general public, don't bother to "shop" for their television programmes and only too frequently are driven away by dreary documentary items, parlour games or over-long plays. Advance consultation of the published programmes is essential for anyone to get the best out of television, as they do out of any other form of entertainment. The necessity for alternative programmes becomes more and more obvious. With sound radio, at least, the "popular" listening public can (and does) ignore the Third Programme and turn over with confidence to the Light. On the other hand, the regular radio items such as "Take It From Here," "Educating Archie" and "Ray's a Laugh" seem to have attracted more listeners than ever. No wonder the BBC brasshats of sound look pleased with themselves.

MAINTENANCE OR ADJUSTMENT

THE temporary set-back to television cannot all be blamed upon the fact that there is too high a proportion of Third Programme type material in the TV programmes—though this is a pretty universal complaint. There are technical reasons as well. In my opinion, the sets installed in clubs, pubs, hotels, holiday camps and other similar places are almost invariably badly maintained or adjusted. The responsibility for switching-on and turning-up is left to no particular person or, worse still, to the first club member who happens to drift into the television viewing room. Horribly distorted pictures are the rule rather than the exception; the pity of it is that most of the sets are capable of giving good pictures if handled reasonably well. One luxurious and expensive country club which I visited recently, had a fine 17in. television set with a horrible ion burn right in the middle of the picture. The residents blamed the transmission for the fault instead of the set or its adjustment, but they would very quickly apportion the blame if the soup was cold or the beer warm!

CONTRACTING OUT

REGULAR maintenance by qualified engineers from local radio shops could put quite a different complexion on these pub, club and hotel sets. A once-a-week visit under a long term contract would insure against deterioration of set-performance. The immediate replacement of failing tubes or other components would keep the set up to concert pitch. After all, many clubs and institutions arrange for regular and frequent visits by the clock-winder and the piano tuner. If something of this kind isn't done soon, then the club television sets will become mere pieces of furniture, convenient stands for placing the framed photographs of last year's annual outing to Margate. The whole thing is a question of responsibility. On the whole, the home TV sets give a very much better average picture than those in the clubs and pubs; but then, it is usual for someone in the family to take a personal interest in the TV set, its adjustment and its maintenance.

LECTURE BY "REMOTE CONTROL"

WHAT a wonderful example of co-ordinated technical planning is to be found in the design of a modern television outside broadcast unit. Messrs. K. E. Owens and P. R. Berkeley, of the Marconi Company, recently demonstrated to a meeting of the Television Society the practical operation of one of these units of a type supplied to a Canadian television organisation. The huge TV vans were parked in a narrow street outside a private theatre in Wardour Street, and connected up with a medium-sized back-projection TV screen inside. Following the reading of a paper by Mr. Owens, outlining the development of this type of unit, the lecture was continued outside by Mr. Berkeley, who conducted the audience around and in the vehicles via television in the approved Dimbleby manner, explaining detailed points of construction and operation in a most lucid manner. The quality of reproduction on a screen about 7ft. wide was quite amazing, all sense of line structure being lost at a distance of about 12ft. and the definition being of an extremely high order. The 405-line standard was used. Exterior shots of the vans were illuminated by one single 2 kW. Mole Richardson spotlight and very clear views were reproduced in spite of the rain (which was also seen on the screen!). The bulk and complications of these trucks were necessary for dealing with multiple camera units in all situations. The original BBC system of articulated vehicles seems to have been abandoned. Mr. Owens explained to the audience, during the animated discussions which followed, that much more mobile units could be evolved, suitable for rushing out to "hot news" events at short notice; but these were necessarily of simple one-camera type, cutting out the producer-control facilities which are called for in all modern production outside "telecasts." It also seems to be a matter of prestige that the vans shall be conspicuous, like those of the BBC here and the N.B.C. in America.

Used C.R.T. Tubes. Heater cathode short 9in., **45/-** ; 12in., **75/-** ; Ion burn, 9in., **35 -** ; 12in., **55/-** ; P. & P. on each 7/6.

Trimmers, 5-40 pf., **5d.** ; 10-100, 10-250, 10-450 pf., **10d.**

P.M. SPEAKERS	with trans.	less trans.
3½in.		13/6
5in.	16/6	12/6
6½in.	16/6	12/6
8in.	18/6	15/-
10in.		19/6

Post and packing on each of the above, 1/- extra.

Output Transformers. Standard type, 5,000 ohms imp., 2-ohms speech coil. **4/9** ; Miniature type 42-1, **3/3**. Multiratio 3,500, 7,000 and 14,000 2 ohms speech coil, price **5/6**. 10 watt push-pull 6v6 matching 2 ohms speech coil, **7/-**.

Mains Trans. Pri., 200-250 v. Sec., 3, 4, 5, 6, 8, 9, 10, 12, 15, 18, 20, 24 and 30 volt at 2 amps., **13/-**. P. & P. 1/6.

Line and E.H.T. Transformer. 9KVA using ferocart core complete with built-in line and width control. Mounted on Ali-chassis. Overall size 4½in. x 11in., EY51 Rec. winding. P. & P. 2/6, **27/6**.

Heater Transformer, Pri. 230-250 v. 6 v. 1½ amp., **6/-** ; 2 v. 2½ amp., **5/-**. P. & P. each 1/-.

Completely built Signal Generator. Coverage 100 Kc/s.-320 Kc/s., 300 Kc/s.-900 Kc/s., 900 Kc/s.-2.75 Mc/s. 2.75 Mc/s.-8.5 Mc/s., 8.5 Mc/s.-25 Mc/s., 17 Mc/s.-50 Mc/s., 25.5 Mc/s.-75 Mc/s. Metal case 10 x 6½ x 4½in. Size of scale 6½ x 3½in., 2 valves and rectifier, A.C. mains 230/250 v. Internal modulation of 400 c.p.s. to a depth of 30 per cent., modulated or unmodulated, R.F. output continuously variable 100 milli volts. C.W. and mod. switch, variable A.F. output and moving coil output meter. Black crackle finished case and white panel. **£4 19s. 6d.** P. & P. 4/-.

R. and A. T.V. energised 6½in. Speaker with O/P Transformer. 6V6 matching, field coil 175 ohms. Requires minimum 150 mA to energise maximum current 250 mA. P. & P. 2/-, **15/-**.

Battery Charger Kit, comprising metal case 4½in. x 5in. x 4½in., transformer, 230 250 v., and metal rectifier. Output 6 or 12 v. 1½ amp. P. & P. 2/6, **19/6**.

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R.I. MAINS TRANSFORMERS, chassis mounting, feet and voltage panel Primaries 200/250. **300-0-300** 60 mA. 6.3 v. 1 a., tapped at 4 v. 6.3 v. 2 a. tap 4 v., **13/6**. **350-0-350** 75 mA. 6.3 v. 3 a. tap 4 v. 6.3 v. 1 a., **13/6**. **350-0-350** 70 mA. 4 v. 5 a. 4 v. 2.5 a. C.T., **18/6**. P. & P. on the above transformers, 2 - 500-0-500 125 mA. 6.3 v. C.T. 4 a. 6.3 v. C.T. 2 a. 5 v. C.T. 2 a., **27/6**. **500-0-500** 125 mA. 4 v. C.T. 4 a. 4 v. C.T. 4 a. 4 v. C.T. 2.5 a., **27/6**. **500-0-500** 250 mA. 4 v. C.T. 5 a. 4 v. C.T. 5 a. 4 v. C.T. 4 a., **39/6**. P. & P. on the above transformers, 3/-.

Valve Holders, moulded octal Mazda, and loctal, **7d.** each. Paxolin octal, Mazda and loctal, **4d.** each. Moulded B7G, B8A and B9A, **7d.** each. B7G moulded with screening can, **1/6** each. 32 mfd., 350 wkg., **2/-** ; 16 x 24 350 wkg., **4/-** ; 4 mfd., 200 wkg., **1/3** ; 40 mfd., 450 wkg., **3/6** ; 16 x 8 mfd., 500 wkg., **4/6** ; 16 x 16 mfd., 500 wkg., **5/9** ; 8 x 16 mfd., 450 wkg., **3/9** ; 32 x 32 mfd., 350 wkg., **4/-** ; 32 x 32 mfd., 350 wkg. and 25 mfd., 25 wkg., **6/6** ; 25 mfd., 25 wkg., **11d.** ; 250 mfd., 12 v. wkg., **1/-** ; 16 mfd., 500 wkg., wire ends, **3/3** ; 8 mfd., 500 v. wkg., wire ends **2/6** ; 8 mfd., 350 v. wkg., tag ends, **1/6** ; 50 mfd., 25 v. wkg., wire ends, **1/9** ; 100 mfd. 350 wkg., **4/-** ; 100 + 200 mfd., 350 wkg., **9/6** ; 16 + 16 mfd., 350 wkg., **3/3** ; Ex-Govt. 8 mfd., 500 v. wkg. size 3½ x 1½, 2 for **2/6** ; 60 + 100 mfd., 280 v. wkg., **7/-** ; 16 x 32 mfd., 350 wkg., **6/-** ; 50 mfd. 180 wkg., **1/9** ; 65 mfd., 220 wkg., **1/6** ; 8 mfd., 150 wkg., **1/6** ; 60 + 10 mfd., 280 wkg., **8/6** ; 50 mfd., 12 wkg., **11d.** ; 32 + 32 mfd., min., 275 wkg., **4/-** ; 50 mfd., 50 wkg., **1/9** ; Miniature wire ends moulded, 100 pf., 500 pf. and .001 ca., **7d.**

Combined 12in. Mask and Escutcheon in lightly tinted perspex. New aspect, edged in brown. Fits on front of cabinet, **17/6**. P. & P. 2/-.

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Smoothing Choke, 5 henry 250 mA., **7/6**. 250 mA. 5 henry, **8/6** ; 250 mA., 10 henry, **10/6** ; 250 mA., 8 henry, **8/6**.

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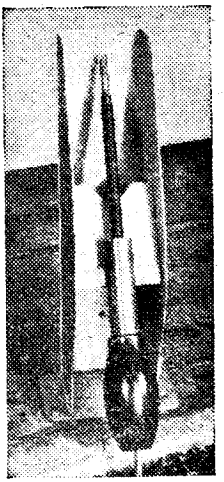

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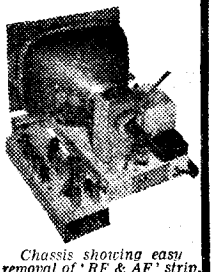

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Television Licences

THE following statement shows the approximate number of television licences issued during the year ended January, 1954. The grand total of sound and television licences was 13,315,969.

Region	*Number*
London Postal ...	905,849
Home Counties ...	338,922
Midland	613,287
North-Eastern... ...	402,658
North-Western ...	425,442
South-Western ...	129,530
Wales and Border ...	148,318
Total England and Wales	2,964,006
Scotland	132,892
Northern Ireland ...	8,746
Grand Total	3,105,644

Orkney too Far

IT is reported that the reception area of the proposed transmitter at Inverness will not extend as far as Orkney and Shetland.

Sets for the Soldiers

THE Army Kinema Corporation, which controls and runs 239 cinemas for the Services in this country and overseas, has begun a rental television service for Army camps in the United Kingdom.

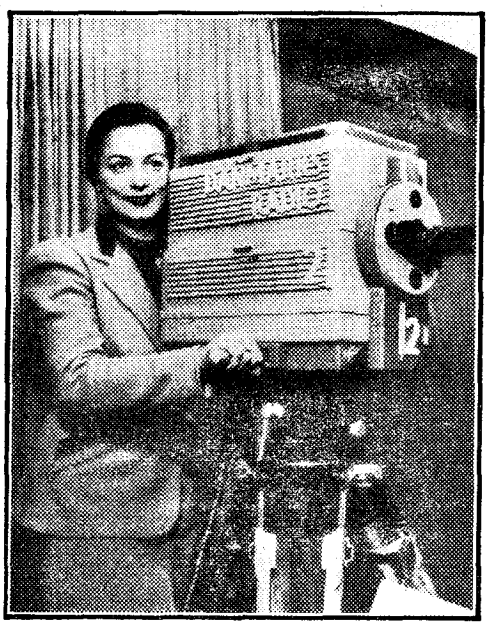
Some 200 television receivers have been bought by the Corporation, including large-screen projection sets and smaller models, which are being let out to units at a charge of approximately £3 a month for the smaller sets and £6 to £7 for the larger types.

Trip to Italy

MR. P. D. SAW, Technical Director of Nera Ltd., is visiting Italy to study conditions in connection with the company's export programme to that country.

Enfield Track

ONE of the clauses in the letting of the new running track at Enfield is that the Council's permission must be sought for the televising of any event on the track.



Learning to handle a TV camera is Danish actress Lily Broberg, who, in addition to appearing on the stage, manages her own theatre in Copenhagen. Television is due to begin in Denmark in July.

Carlisle TV Station

MR. D. GAMMANS, Assistant Postmaster-General, announced in the House of Commons recently that a new television station was to be constructed near Carlisle to serve Cumberland and parts of the South of Scotland. He said that the station would be one in a programme of nine to be built in the next few years.

No site has yet been chosen and it is expected that the transmitter will receive the Kirk o' Shotts signal, add to or subtract from the frequency, and send out a stronger signal.

Dr. D. C. Espley

DR. D. C. ESPLEY, O.B.E., D. Eng., M.I.E.E.., Chief Engineer (Telecommunications) to the Research Laboratories of The General Electric Co., Ltd., has recently been elected a Fellow of the Institution of Radio Engineers with the citation: "For his creative contributions to microwave and television techniques in England."

" Keep the Theatre Alive "

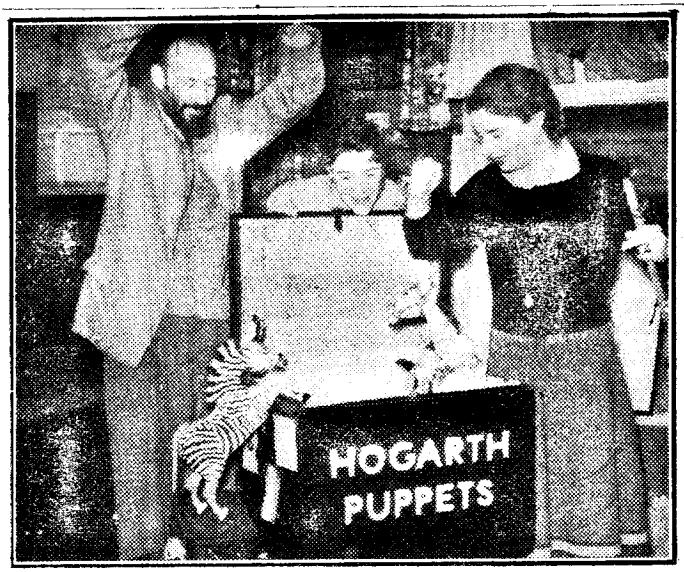
WHEN he returned recently from a visit to the United States to study TV programmes and production methods, Mr. Ronnie Waldman said: "It must be the duty of British television to keep the theatre alive in this country or we will kill our own feeding ground."

Most of the American television stars, he said, had gone into television following many years of training and experience in variety houses and sound radio. Now that television had practically killed the music hall in America, many people were wondering where the new generation of comedians and entertainers was going to come from. Mr. Waldman spoke of the good quality of the colour transmissions that he had seen during his stay, but considered the average black-and-white picture on American screens to be slightly inferior to that in this country.

Worth Waiting For

WHEN seaman Leonard Balchin, of Liverpool, docked at New York, he learnt that a large store on Fourteenth Street was offering a television set for £2 9s. 7d. to the first three customers on a certain morning.

The previous evening was a stormy one, but seaman Balchin stood outside the main doors all night in the rain and earned himself a cheap receiver and a great amount of publicity in the New York newspapers and as a guest on a TV programme.



Jan Bussell, creator of Muffin the Mule and Zebbie the Zebra on Children's Television, packs his puppets in preparation for his visit to South Africa. With him are his daughter Sally and his wife Ann Hogarth, who helps " pull the strings."

Danish Service

DENMARK is to have its own television service which will be run by the Government, starting in July this year.

At present, test programmes are transmitted four times a week from the Radio-House, but soon the corporation will move to its own Television Palace from which the regular daily programmes will come.

Two-channel Receivers

TELEVISION sets designed to receive BBC transmissions and commercial programmes are expected to be on the British market by the end of this year. They will cost about £10 more than existing receivers but outwardly will look the same.

Adaptors for sets in use at present will cost £5 and models with adaptors attached will still be sold by dealers.

Surprise for Theatre Audience

A CABINET wheeled on to the stage during the recent National Radio Award Show, at the Scala Theatre, provided a surprise for the audience when it was opened to reveal a television receiver giving a 4ft. by 3ft. picture.

Since the stage had to be kept clear, the receiver was concealed in the wings, to be wheeled on to the stage at the precise moment to show the film sequences, and then rapidly and silently removed again. This operation was carried out twice during the show within a few feet of " live " microphones while the actual performance continued on the stage. This receiver was the new NERA model C48.

In Preparation

PUBLICANS and licence holders in Aberdeen are busy preparing for the day when the BBC's television service comes to the city.

Already they are arranging for the installation of receivers in their bars and lounges for the pleasure of customers. Mr. C. May, secretary of the Excise Licence Holders' Association, has said: " We need not wait until television comes and then make arrangements with the magistrates and police. What I think we should do is have the directors appoint a small committee to confer with the police and the magistrates so that we will have an agreed policy suitable to both sides as to how TV will be operated in licensed premises."

Mobile Radio Alteration

THE introduction of new television programmes, including commercial, has caused owners of mobile radio sets to change their receivers to a different wavelength.

It is estimated that this conversion will cost the 775 licensed owners at least £500,000.

The Royal Return

THOUSANDS of people are expected to line the Thames on May 15 to witness the Queen's journey up the river to Westminster on her arrival home and the BBC sound radio and television services are busy preparing for the broadcasting of the last stage of the Royal Tour.

From the moment the Queen and the Duke of Edinburgh reach the Pool of London in the Royal Yacht, *Britannia*, until they enter the gates of Buckingham Palace with Prince Charles and Princess Anne, TV cameras and sound commentators will help bring the festive scenes to the viewer and listener.

Schools Programmes

IT is stated that most schools in Britain next year will be teaching pupils with the aid of TV.

The BBC has plans in hand for 50 experimental lessons for television and 100 of the 146 local authorities in England and Wales are willing to support the scheme.

Baird Television to Merge

IT is announced that a contract has been drawn up for the merging of Baird Television with Hartley Electromotives and its subsidiary and associated companies.

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.

CORRESPONDENCE

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

FLYBACK SUPPRESSION

SIR,—I must confess to being slightly puzzled by recent letters referring to the elimination of flyback lines. How do these flyback lines appear? Surely, in a properly designed receiver, with the controls properly set, no such trouble should arise.

If the tube is biased at cut-off corresponding to black picture level, then the sync pulse amplitude, which will normally be of the order of 20 volts, will suffice to black out the return traces adequately. The cause of excessive flyback lines arises in the main from the use of long-tailed ex-Government tubes, distorted video signals from the video amplifier and poor D.C. restoration.

In a properly designed receiver, there should be no need for extra suppression, and, in any case, flyback lines are a useful indication of maximum tube bias level (or minimum, if preferred), and prevent the user from over-running his tube.—S. A. KNIGHT (Chelmsford).

TV IN EIRE

SIR,—We very much appreciate your article in the January issue, on receiving conditions in Eire, and suggestions. Unfortunately, constructors here are a "lost body"; we have not got your type of shops, and surplus equipment is "frowned upon" by import regulations. I waited five months for an old 1355 (I was lucky).

However, through various channels I managed to complete my set-up, and with excellent results.

Here's the set-up! Argus timebase and C.R. network. Reconstructed 1355 (vision), with home-made R.F. unit. Sound, copied last two I.F.s and output from 1355 plan. Headed by another home-made R.F. unit. Results excellent. All are fed from your two-valve grounded grid amplifier. Imported VCR97 and VCR517C and components from Henry's very prompt. Aerial, the surprising feature. Just a single X (Aerialite). Quite a puzzle to my multi-element pals. There's only three of those X type (single) in Dublin, and no complaints. Well, Editor, thanks a million for the recognition, and hoping for future circuits suitable, such as a super-het. vision; a more expert "sound" similar to my "patch-up," and a C.R. network suitable for the VCR517C.

Thanks for the tuition through your magazines. —CON SCARRY (Dublin).

TV A MENACE?

SIR,—Several letters have recently appeared in your "Correspondence" column under this heading, some supporting this, others denying it, and yet, with all due respect to the gentlemen concerned, it would seem that they have not considered the situation fully.

First, TV is essentially a scientific invention, and as such can be considered a good invention. It has many applications in our technological civilisation, *one* of which is in the field of entertainment; industry, surgery, scientific research, and many other fields of endeavour can all claim a use for it in one form or another.

And yet, even restricting ourselves to the sphere of entertainment, can we simply look at TV and its effects on human activity? It cannot be denied that cinema attendances have fallen, pubs are not doing as brisk a trade as they were wont and the gate receipts at sports fixtures are falling, all being due to TV so it is claimed (and with justification) and with this evidence before us, many readers will immediately say, "Oh, yes, TVs to blame." But is it? Is it not rather the British people who are to blame, for we are considering only the effect on British life and institutions.

And there lies the clue. The British nation, as a whole, is reserved by nature—his house is his castle, etc., and whereas previously one had to go out if one wanted to get visual as well as aural entertainment, now one simply has to flick a switch and get entertained in one's own sitting-room.

Applying this line of reasoning to the Continental nations we would expect that TV would have a lesser effect on the average monsieur or señor—the Continent also being more excitable and sociable than their British counterparts. This state of affairs actually exists as is predicted, allowing for such factors as the novelty of TV in countries such as Italy.

TV can help to solve the problem which has been created as a result of its coming. It can help and does help, as many readers will testify to awaken in viewers the latent interest in many activities as well as providing programmes labelled in the strict sense entertainment.

It all then rests on Mr. John—with a TV set—Bull. If he has his "telly" merely to, as Shakespeare puts it, "beguile the heavy gait of night," and refuses to be instructed or educated, then he deserves the state of isolation which he will find himself in before very long.—ANTHONY S. BAKER (Woodford).

"H" VERSUS THE MULTI-ELEMENT ARRAY

SIR,—The recent letters concerning aerial systems following on Mr. Harknett's recent article promise to provide some interesting practical data. I would like to add a few observations to those already made.

First, it is desirable to mention that it is unwise to employ a critical length of feeder between aerial and receiver (as suggested by Mr. Harknett in his letter) for two reasons. If the feeder is correctly terminated it will not make any difference and, secondly, if it is not correctly terminated, the interference pick-up will be worse due to the fact that the feeder will operate as an aerial, i.e., it has standing waves on it. It is necessary also to emphasise that when obtaining sensitivity suitable for long distance reception, the internal noise of the receiver will determine the limitations, and the restrictions are not due to other sources of interference. That this is so is readily evident from an examination of the screen when "snow" will be seen to be far more in evidence than other types of interference. I hasten to add that I am aware that galactic noise will provide a similar effect, but at the frequencies concerned will be less than valve noise. Mr. Harknett's remarks concerning the equal area of pick up of "H" type aerials and more complicated arrays I am afraid I am unable to follow. Nor do I appreciate his remarks concerning the Polar diagrams of aerials and the remarkable "null" point he claims for the "H" type aerial.

The points made by Mr. Critchley are interesting. One of the main features of a new aerial developed here is the ground plane system employed as a part of the aerial. This ground plane very largely renders

the aerial characteristics independent of the mounting arrangements, as this ground plane virtually isolates the supporting mast from the aerial system. May I also mention that it is not difficult to secure an aerial characteristic which is substantially resistive over a fairly broad bandwidth by connecting across the aerial's centre one or more quarter wavelength shorted stubs. In the aerial mentioned above these stubs also serve as supporting arms for the reflector elements as they operate as perfect, or nearly so, insulators.

Finally, I would like to point out that an "H" aerial is, in fact, an array. One cannot help feeling that if it were not for the fact that mechanically it is a fairly easy rig up, we should have a large number of supporters stressing the superiority of the simple di-pole, and I feel that those willing to involve themselves in the extra trouble resulting from the addition of a few more elements should not be deterred by the claims made for the simple "H." I am sure the radar and BBC engineers are not satisfied with "H" aerials, and I am equally sure that when Band III transmissions commence, even the most reactionary "H" aerial supporter will elaborate somewhat.—S. WEST (p.p. Spencer-West, Gt. Yarmouth).

SIR,—I found Mr. M. R. Harknett's recent notes on "H" and multi-element array aerials most interesting, but I was more interested in his reply (last paragraph) to Mr. Flude's criticisms when he said that he did not consider Northampton with its 500 micro-volt per meter signal from Sutton Coldfield to be a fringe area.

Over a long period in the Northampton area signal strength from Sutton Coldfield has not exceeded 100 micro-volts per metre, and judging by the many complaints received over the past years from viewers, who at times have found it hard to get a picture I think Mr. M. R. Harknett will agree with me that the Northampton area, from the Northampton Area Televiewers' Society's practical experience, can be termed a fringe area.—GEOFFREY T. WILSON (Hon. gen. sec., Northampton Area Televiewers' Society).

COST OF COMPONENTS

SIR,—I would like to draw your attention to a violation of values for which the television trade is responsible. I shall call it "enforced unitization." It is the thin edge of the wedge for which the television people may soon be very sorry unless they reconsider their present policy.

As an unrepairable item a cathode-ray tube should not cost £25. If a housewife were to buy a sewing-machine or a vacuum cleaner, or her husband an engine for his car and be told it was not repairable, I am afraid there would be quite a headache in store for the salesman!

But it seems that the television people cannot (or won't) make a cathode-ray tube that is repairable at modest cost (only one case, replaceable at about half price). Now is it not time to reconsider this form of selling before other trades follow this nefarious practice? In consequence, no spare parts for engines, radios, vacuum cleaners, etc., would be available, only the complete *unrepairable* article.

This would create new economics from which the public are surely entitled to an early warning.—H. TELFORD (Edinburgh, 11).

METER MEASUREMENTS

SIR,—In the section, "Your Problems **Solved,**" of the February issue of PRACTICAL TELEVISION your reader, C. R. Young, requested information regarding apparently low voltages on an "Argus" television.

He stated that he had checked his meter against a good quality instrument. However, even if his meter had checked exactly with the terminal voltage applied to the good meter this does not mean that he could believe the readings given by his meter.

It is likely that he checked the meter using a low impedance voltage supply, and it is also probable that his meter takes at least 5 mA. full scale (I have seen a well-known low-cost universal meter take 30 mA. full scale!).

When such a meter is used to test voltages on radio or television receivers, the current taken to deflect the meter causes a volts drop across any load resistance in the circuit resulting in apparently low voltage at the test point.

A good radio meter should not require more than about 50μA for full scale deflection.—A. BARTHOLOMEW (Kirkcaldy).

INCREASING PICTURE SIZE ON 6IN. TUBE

SIR,—I was very surprised to read that Mr. E. G. Warder had difficulty in obtaining sufficient scanning power for his 6in. tube with the voltages he stated. If his tube is not the cut-off type, he will find, as I did, that one of the timebase circuits, using an EF50 and a 6SN7 (one appeared in the December issue), will more than scan the diameter of a normal VCR97.

I quite agree that it is pointless to reduce the E.H.T. voltage in order to fill the tube face and sacrifice the quality of the picture, but this is not necessary if the timebase generates enough scanning power. From my own experience I found that with 2.75 kV. E.H.T. and 380 volts on the timebase, I could obtain far more height than was needed and sufficient width to take the line scan "round the edges of the tube," i.e., to the absolute limit of the screen on three different tubes.

I hope this information will be of value to the writer and also to anyone else who has had this difficulty.—RONALD A. HILL (Liverpool, 16).

MORE ABOUT BAND III

(*Continued from page* 506)

Tuning Arrangements

Amongst announcements already made by commercial manufacturers, one firm has already stated that they propose to adopt the turret type of tuner (see page 443 of last month's issue). A tuner of this type would, of course, be capable of tuning either Band I or Band III stations and as a commercial proposition is ideal, but whilst it could easily be incorporated in a newly designed receiver its addition to an existing receiver will not remove the various difficulties outlined above. Two new valves have already been announced for use on the higher frequencies and undoubtedly new circuit arrangements will make their appearance, mainly because of the fact that at the higher frequencies it will become increasingly important to use arrangements which will reduce the noise which may prove very troublesome on Band III. The Cascode arrangement already described in these pages may become a standard circuit for use in all television receivers.

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

VIEWMASTER SCANNING COILS

Could you please let me know the inductances of the standard Viewmaster line and frame deflector coils and the ratio of its frame output transformer?—R. Forster (Wigan).

As the items you mention are standard commercially manufactured components the details you require are not available and we regret we cannot assist you in this matter.

WRONG MASK

Having bought a second-hand TV (a model Ekco TS46), I find that although the picture is quite good and width is O.K., I cannot fill the mask in "height" without stretching the clock face in test card by ¾in. Can you inform as to cause and possible cure? Could I replace the CRM Mazda 92 with 92A or would the E.H.T. be insufficient, as I think the 92A is aluminised, also can you give me alternative makes and types which I could replace CRM92 without any modifications including bases?—E. J. Walters (East Croydon).

The mask employed in your set is for the old "aspect ratio" (width to height ratio). This was altered a few years ago and thus gives rise to the symptom you described.

It is quite in order to replace the tube in your set by the CRM92A—little difference in picture brightness will be observed. So far as we know there is no other 9in. tube you could use in the receiver without modifications.

LOW E.H.T.

I should be pleased if you would help me with the trouble in my H.M.V. Model 2807A. I cannot obtain any E.H.T. The U35 does not light up, so I take it the heater winding has gone. I have tested the top cap with electrostatic meter and it is in order. I also obtain a glow on top cap of U35. This is not so bright as is obtained off KT36. Meter is a neon type. I have also tested H.T. to KT36, this was 240 volts. I have sent a new line transformer back, as this was faulty. But should like to know if I could do any more testing. The winding has continuity. The scream of the line timebase is there.—A. Smith (Birmingham).

It is very unlikely that the heater winding on the line output transformer is responsible for lack of E.H.T. Try substituting the E.H.T. rectifier valve, for sometimes the heater of this valve has continuity but does not glow, due to insufficient vacuum or other causes. Do not rely on a neon test, but use the spark test as described in "Fault Symptoms," PRACTICAL TELEVISION, September and October, 1953.

WEAK SOUND

I have a Marconiphone VT73DA television receiver, which has recently started to give trouble after three years' constant use, and your valued opinion on the matter would be much appreciated. Some weeks ago the set developed a loud hum on the sound which came on as soon as the set warmed up and went off after the set had been in use for a short time. Now the hum has gone but the sound on full volume is so weak that it can hardly be heard, but improves after a while. I have noticed that it is weaker at certain times, such as the commencement of the children's programme each evening. The sound also becomes distorted slightly at times. I have exchanged the V9277 output valve for a new one, with very slight improvement, I have also changed the V7277 I.F. amplifier valve without any improvement. The variation of the contrast control used to alter the sound but now has no effect. The picture quality is still very good and steady.—John E. Hughes (Newcastle-under-Lyme).

Weak and distorted sound on the Marconi VT73DA is very often caused by the 4.7 megohm resistor in the anode of the sound limiter diode going high in value. You should, therefore, suspect this resistor and replace if necessary.

DRY JOINT

I have a K.B. "17" console model HF60, September, 1952.

The set normally gives good service, but from time to time the vision goes off, closing with a bright white narrow line down the centre. Often a tap on the side of the cabinet will restore picture.

The set will behave perfectly for several weeks, when the same trouble will occur again. I have noticed that the weather is always damp and muggy when the trouble starts. The E.H.T. rectifier valve EY51 does not light up when the trouble starts.—H. Willis (Sunbury-on-Thames).

This fault is caused by a dry joint on the heater pins of the 6U4GT reclaim rectifier valve, or a dry joint on the tags corresponding to the heater pins on the valveholder itself.

THE LYNX AND COSSOR 85K

I have almost completed building the "P.T." Lynx televisor and have decided to use a Cossor 85K C.R.T., which requires a voltage of 9 kV.

Will you kindly let me know the value of condenser No. 51 which I understand determines the E.H.T. voltage?

We enjoy a fairly steady mains voltage of 230 volts A.C. in this area, so I have used two resistors in parallel, each of 500 ohms; 12 watts as mains dropper resistor (69). Is this correct?—A. Dowding (Swansea).

Condenser C51 should be about 300 pF in order to give an E.H.T. output of 9 kV for the Cossor tube, but the precise value is in no way critical. A good quality mica type should be used. Your combination of two 500 ohms resistors paralleled for R69 should be about right for this, and here again some tolerance is permissible.

MODIFYING A COMMERCIAL SET

Will you please suggest a suitable circuit for fitting an efficiency diode to my receiver (circuit supplied) using preferably a 13D3 rectifier?

I have altered the set to fit full-wave rectification to

suit a Valradio converter and find that I lose about 15-20 volts on H.T., this being the reason for wanting to fit diode. The line-scan is about ½in. short of filling screen.

It may help you to know the E.H.T. has been doubled to suit the 15in. tube, Cossor 85K, and the set worked perfectly until I fitted the full-wave rectifier. —R. Rack (Lincoln).

It is not easy to suggest modifications of this sort to commercial receivers, as there is always the possibility that the change will not work properly without considerable experimentation. It is difficult to see how a small loss such as 15 volts on the H.T. rail makes the inclusion of an efficiency diode necessary, and if you have lost scan width it is quite possible that the small H.T. fall is not directly responsible. The type of circuit is not even readily adaptable to the inclusion of an efficiency diode as the problem of grid isolation from the H.T. supply arises, and any changes in this sort of circuit will upset the oscillation conditions and linearity.

REMOVING CONTROLS

I am contemplating conversion of my electrostatic TV receiver to magnetic as per your articles in May to September, 1953, issues, but have one or two queries.

In the "B" version of the frame amplifier you show a potentiometer VRB2 (1 MΩ) presumably as amplitude control, but the modified Miller oscillator circuit includes VRF (100 kΩ).

Are both these controls essential or can one be dispensed with, and if so, which one ?

I am using a C.R.T. CRM123 in the conversion. Will the line flyback E.H.T. circuit provide sufficient E.H.T. for this tube, or shall I require voltage doubling ?

At present I am using a 500 volt transformer to supply the existing timebases. Can I dispense with this and substitute a 350 volt component ?—T. L. Manchester (Newcastle).

It should be possible to dispense with one of the two controls associated with the frame timebase you mention, and the anode load of the oscillator could well be replaced by a fixed resistor. However, it sometimes happens that a twin control enables a better control of frame linearity to be obtained, and for optimum results the two potentiometers should be retained. They may, of course, be pre-sets.

The CRM123 is an aluminised tube, but with the E.H.T. circuit illustrated it is unlikely that you will obtain more than 6 kV as output. You may, of course, fit an efficiency diode ; failing this, you can omit CB2 and RB5 (of Fig. 19), as these two components are only for use with cathode-injected boost.

INCREASING E.H.T.

I have been very interested in the articles written by Mr. Morley in "Practical Television" about the Plessey television chassis.

Do you think it would be possible to modify the line output stage to give increased E.H.T. volts, i.e., 7 kV to 8 kV, in order to use a Mullard C.R.T. MW31-74 to replace the existing Mazda CRM121 ?—Bernard Lees (Eccles).

The Mullard tubes are tetrodes and require a potential in the region of 200 volts on the accelerating anode. This can be obtained by a potential divider in the H.T. line.

It is possible to increase the E.H.T. by a Cockroft Walton multiplier and a SenTerCel high-voltage rectifier could be used for this purpose.

Note that the CRM121 can be replaced by the Mazda CRM123A.

"ARGUS" LINE-HOLD

I am experiencing trouble with the line-hold on the "Argus" televisor. The whole picture slips to the left intermittently so that only about two-thirds is showing and the rest of the tube is blank.

It can be brought into position again by readjustment of line-hold control, but only to slip again, especially when picture is changed at the studio ; also the verticals tend to become bent or wavy.

I have increased the series resistance and decreased the value of control to give wider variation, but this gives no improvement and there is a critical point on the control where the picture can be made to slip from central position. Is this fault due to defects in the line sync circuit, or sync separator circuit ?—J. W. Bailey (Kidbrooke, S.E.3).

You may find some improvement by fitting a 50 pF condenser across C58. C58 should then be adjusted for maximum hold, but care must be taken to avoid too strong a pulse, evidenced by tearing of the picture.

WRONG I.F.

I have just completed building the sound and vision I.F. strips of my TV set. The sound I.F. is 7.5 Mc/s and vision is 11 Mc/s. The converter used is the RF27, using two I.F. coils in the plate of the mixer, 7.5 Mc/s and 11 Mc/s. Are these I.F. frequencies suitable for receiving both sound and vision on a RF27 ? The TV station received is Wenvoe.

Could you give any details, i.e., turns required for 11 Mc/s coils ? The coils are ex-1355 and are ⅜in. diameter with dust core. I have tried taking off five and 10 turns, also as much as 15 turns, but I get no result from the 11 Mc/s strip. The mixer coil is also modified with the stripping and adding of the 11 Mc/s coils. The sound unit works very well, but the vision breaks into regeneration. Would the aerial have any effect on the bandwidth of the R.F. converter, or any superhet receiver ? All coils have resistors across them. I have tried the 11 Mc/s I.F. strip by itself and stations in the 7.5 and 8, 9, 10 Mc/s band come in with great strength.—John L. James (Swansea).

You appear to have your I.F. values mixed. The vision should be 7.5 Mc/s and the sound 11 Mc/s.

The 11 Mc/s requires about 12 turns on a ⅜in. diameter former using an iron core.

The aerial you are using is quite suitable.

To avoid regeneration we suggest you alter the frequencies to the values mentioned above. Check your screening arrangements and decoupling. Try the effect of 4.7 KΩ resistors across the tuning coils.

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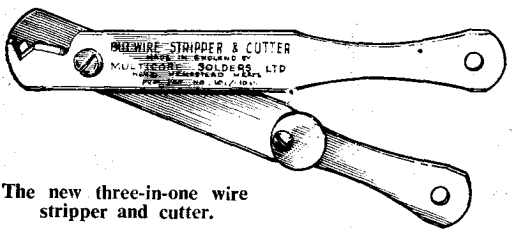
News from the Trade

"BIB" WIRE STRIPPER AND CUTTER

FOR some months Multicore Solders, Ltd., have been experimenting with a view to producing for the retail market an efficient and economically priced wire stripper and cutter.

Mechanical and market research considerations have resulted in a unique three-in-one tool which will be an essential in every tool kit. It will strip insulation from most thicknesses of wire, cleanly



The new three-in-one wire stripper and cutter.

cut wires and will also split extruded flex. Adjustment for various thicknesses of wire and cable is carried out simply by the turn of a screw set in an eccentric disc.

The stripper is being marketed by the Multicore Solders organisation under the registered trade name of "Bib Wire Stripper and Cutter" and retails at 3s. 6d.

The Bib Strippers, which are nickel-plated, are individually packed in cartons, the reverse side of which carries easy-to-follow illustrated instructions. —Multicore Solders, Ltd., Maylands Avenue, Hemel Hempstead, Herts.

CEILING PROJECTOR

ORIGINALLY supplied to special order only, the Ceiling Projector has proved to be sufficiently popular for addition to the standard range of Nera large-screen television receivers as Model P48. It is intended for fixed installations, being suspended from the ceiling, or suitable overhead supports, and projects the picture on to a separate wall screen.

Since valuable floor space is left entirely clear of obstruction, this model has considerable industrial applications. An interesting example of its use has been in the BBC's Lime Grove studios. Here, every inch of floor space is required for scenery, microphone and camera equipment, but the studio audience is able to see the actual transmitted picture on the Ceiling Projector suspended just above the studio floor.

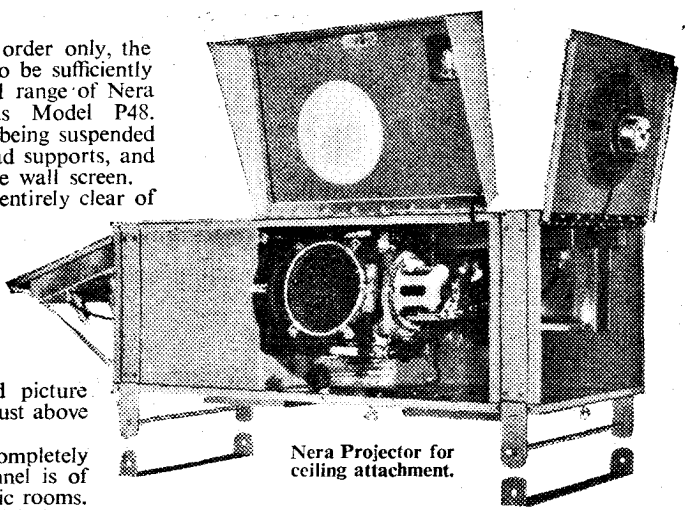
The fact that the equipment is completely inaccessible to unauthorised personnel is of particular interest when used in public rooms. Also the remote control panel, which is fitted at any convenient distance from the receiver, may be operated only by those in authority.

The Model P48 employs interchangeable chassis for the R.F. time-base and power supply units, a method which facilitates rapid servicing, since a complete chassis may be changed in a matter of minutes should a fault occur. The standard Nera remote control panel is fitted, giving complete control over contrast, brilliance, focus and sound volume. This remote control is normally supplied to operate up to 20ft. from the receiver, but this distance may be extended to order as required. The special activated screen (4ft. by 3ft.) enables the equipment, when correctly positioned, to give a brilliant picture under normal room lighting conditions, an important factor when used in public rooms. Ample sound volume is obtained from a push-pull output stage, feeding twin speakers.

The receiver is housed in a strong metal cabinet, finished in attractive grey enamel. Fixing points for suspension are provided, and the side panels are hinged to facilitate easy access to the equipment. Twin speakers are fitted, an 8in. speaker at the side of the cabinet, and a 3½in. speaker facing the screen. The 8in. speaker handles the bass, whilst the 3½in. speaker is fed with the higher frequencies. Price £157 10s., less screen, tax free.—Nera of England, Ltd., Jefferies Passage, High Street, Guildford.

TV REPLACEMENTS AND REWIND MANUAL

A COPY of the new manual under the above title is now available from Direct TV Replacements for 9d. in stamps and a copy of your trade heading or card. Claimed to be the only one of its kind in the world, this gives, in addition to specialised parts for commercial TV receivers, details for carrying out certain servicing work on apparatus. —Direct TV Replacements, 134-136, Lewisham Way, New Cross, S.E.14.



Nera Projector for ceiling attachment.

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