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AND TELEVISION TIMES

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EDITOR
F. J. CAMM

A NEWNES PUBLICATION

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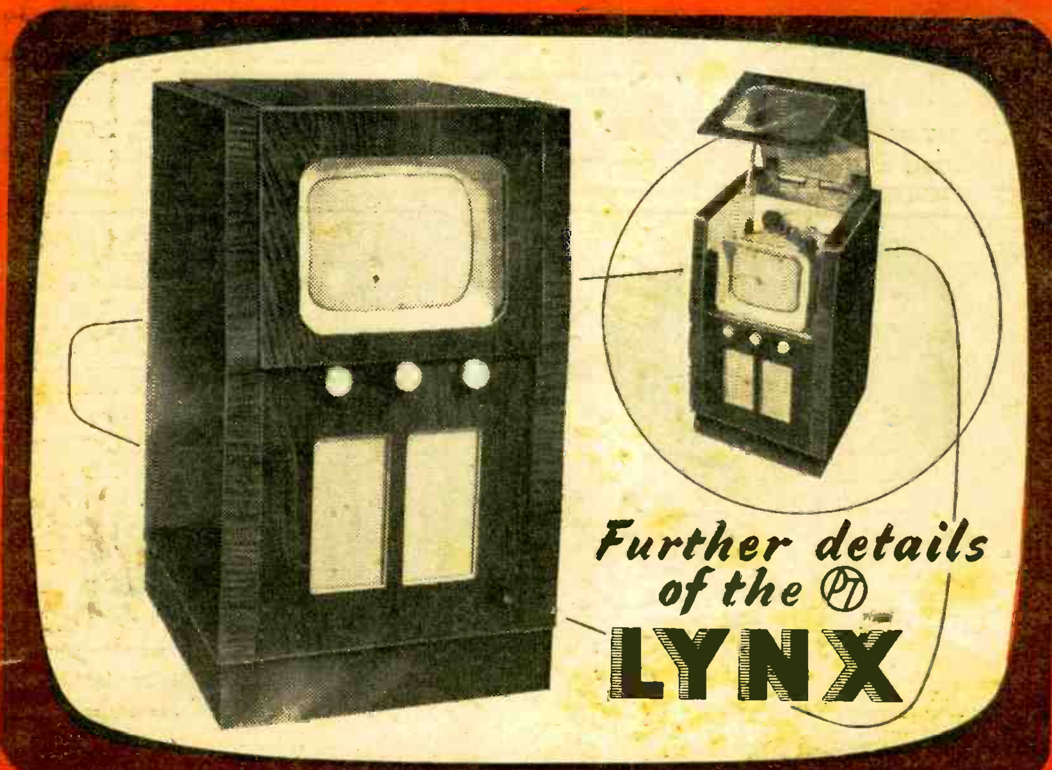

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Pages from a Television Engineer's
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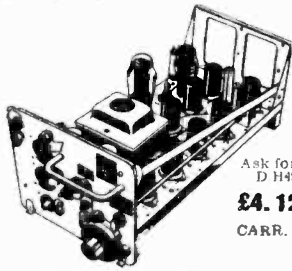

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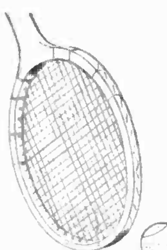

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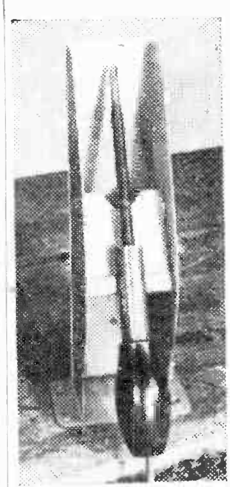

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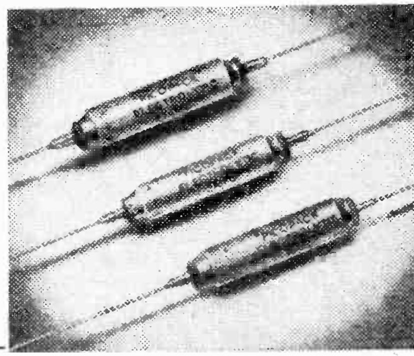

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PRACTICAL TELEVISION
& "TELEVISION TIMES"

Editor : F. J. CAMM

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Vol. 4 No. 38 EVERY MONTH JULY, 1953

TELEVIEWS

The Coronation and TV

FOR the first time in history the Coronation, the most moving of all British pageantry, has been televised. Nearly three million television receivers were switched on and, due to the remarkable work of the BBC television engineers, at least eight times that number of people were able to watch the procession from more than one coign of vantage. In this respect they were perhaps more fortunate than those who had seats along the Coronation route. Future generations, due to modern systems of recording and photography, will be presented with an accurate account of happenings to-day, which is history in the making.

The country owes a debt of gratitude to the BBC for its presentation to this vast audience of a remarkable ceremony which will live in the minds of all who saw it. The Coronation has had a remarkable effect upon the sale of television receivers. Up to the eve of the Coronation dealers all over the country were working long and late installing receivers in the homes of those whose last vestige of sales resistance vanished as the fever of this impressive event developed. Many, having left it too late, were disappointed, but their orders remain on the books of dealers and the sales of TV receivers may be expected to increase from now on for a considerable number of years. The Budget concessions on purchase tax was one of those imaginative touches for which Mr. Butler deserves praise.

According to the official figures for March (the only figures available at the moment of going to press) 90,000 TV receivers were manufactured during that month compared with 72,000 for the same month a year ago. Enquiries show that the figures for April will be even better. The highest monthly total to date is 91,000. Very few receivers remain on the dealers' shelves.

The sale or return system introduced by the trade, under which manufacturers only recorded a sale before the Budget if it had actually been sold to the retailer, accounts, in part, for the rise in demand. On the other hand the output of radio receivers is declining and now stands at a level only slightly above what it was a year ago. For example, in March only 63,000 radio sets were made, which is about half what it was in 1952, and 2,000 sets below the February figure. The monthly average for the first four months of this year is estimated at 65,000 compared with an average for 1952 of nearly 103,000 sets.

INDEX TO VOL. III

INDEXES for Volume III, comprising issues dated June, 1952, to May, 1953, are now available for 1s. 1d. each from the offices of this journal. We advise every reader to purchase a copy of this key to the contents of those 12 issues, whether they have their volumes bound or not. It will enable them rapidly to consult an article or a solution to a difficulty which has been dealt with in our "Problems Solved" feature.

625-LINE TRANSMISSIONS

SIR ROBERT RENWICK, President of the Television Society, recently announced that it would shortly be building an experimental 625-line transmitter, to provide a service to amateurs and the radio industry which will possibly help the export market. Receivers intended for the Continental standard of 625 lines can be better demonstrated and tested on a radio signal under working conditions. With the approval of the radio industry the society has undertaken to operate a suitable transmitter and discussions have taken place with the B.R.E.M.A. on a suitable site and the design of the equipment. It has been made clear that this is an experimental project undertaken for the advancement of television technique, subject, of course, to Post Office approval.

It will transmit still pictures for experimental purposes. The society will have the benefit of advice from the BBC and industry.—F. J. C.

TV for the Beginner—4

A NEW SERIES EXPLAINING THE PRINCIPLES OF RECEPTION FOR THE NEWCOMER TO TELEVISION—THIS MONTH WE DEAL WITH THE TIME-BASES INCLUDING SYNCHRONISING By "Alpha"

(*Continued from page 28 June issue*)

LAST month we dealt with the basic functions of the cathode-ray tube; it will be recalled that the spot on the screen of the tube has to be moved from left to right comparatively slowly and to be returned to the left side of the tube very rapidly. The forward stroke is termed the "scan" and the backward stroke the "flyback." Fig. 14 shows the motion of the beam.

In order to understand the basic principles underlying timebases it is better, perhaps, to consider the case of the electrostatic tube first. In this tube a plate is mounted at the side of the beam and another plate is mounted at the top of the beam. If a voltage which is varying in the manner shown in Fig. 14 is applied to either plate then a horizontal or vertical line will appear on the tube face according to which plate the voltage is applied.

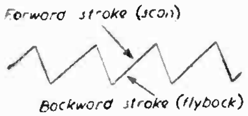


Fig. 14.—Typical scanning waveform of saw-tooth shape.

In order to produce an oblong pattern which will be the shape of the picture the voltage on the side plate must alternate very rapidly while that on the top plate must alternate comparatively slowly.

The required voltages are produced by an oscillating valve, the shape of the oscillations being of the formation shown in Fig. 14—sawtoothed; this type of oscillator is termed a "sawtooth oscillator." The oscillator which functions on the side plate and which therefore produces a horizontal line if working by itself, is termed the "Line Oscillator," while the one which works on the top plate and thereby completes the "frame" is termed the "Frame Oscillator."

Fig. 15 shows both oscillators which are fed from a common power supply, feeding their voltages to the plates. An arrangement like this will produce a square or oblong pattern on the screen which is termed the "Raster."

Now the simple arrangement shown in Fig. 15 will not produce a raster which has completely straight edges as the system is inherently unbalanced. In practice, two further plates are introduced, one opposite the top plate and one opposite the side plate; each plate is usually supplied with a standing voltage termed the "Biasing Voltage" in addition to the oscillating voltage, to assure symmetry and even focusing over the raster.

The plates are termed "Deflector Plates." Those used for the sideways motion are usually referred to as the "X" plates and the ones used for the vertical motion the "Y" plates.

Now the power required to swing the beam which causes the trace on the screen depends upon the sensitivity of the deflecting plates and the value of the voltage used to make the beam. A very high voltage (termed E.H.T. — extra high tension), is required to form the beam and the higher this voltage then the more concentrated will be the beam and the smaller the spot. A very concentrated beam is "stiffer" than one with less concentration—or in other words a beam produced by an E.H.T. which is very high is much harder to move than one produced by a lower E.H.T., so while a high E.H.T. is required to produce a small spot and good definition, this means that more power will be required to move it.

The most effective way of producing this extra power in the case of the electrostatic tube is to use an amplifying valve which is connected to the opposite plate. The valve is fed with a small voltage taken from the oscillator and this voltage is amplified and applied to the opposite plate so that its phase is in the reverse direction to the original. By this means a positive-going voltage on the one plate is assisted by a negative-going voltage on the other. One plate pushes the beam and the other pulls it and an amplified arrangement like this is termed a "Push-Pull" amplifier or sometimes a "seesaw."

Fig. 16 should make the arrangement clear.

It should be appreciated that this section of the timebase is entirely independent of the picture and the raster is produced without any aid from the picture signal.

It is necessary for the beam to move at the same speed as the electron beam in the studio camera;

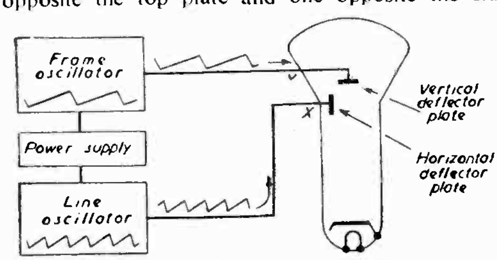


Fig. 15.—Basic deflection circuit.

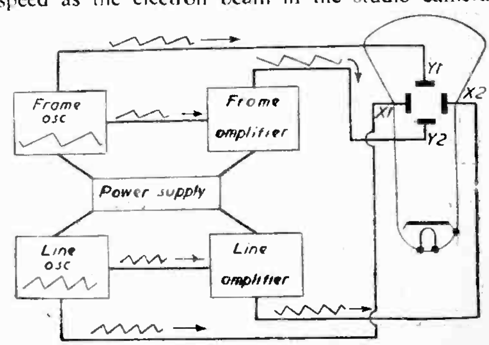


Fig. 16.—Schematic electrostatic deflection arrangement.

to enable this to be done it is usual to make the frequency of the sawtooth voltages variable so that the beam motion and speed can be manually adjusted. In the case of the horizontal circuit the control is labelled "Line Hold" while that in the vertical circuit is labelled "Frame Hold."

Magnetic Deflection

The standard practice with cathode-ray tubes nowadays is to move the beam by external magnetic fields. The beam can be likened to the wire in the armature of an electric motor; when a magnetic field is applied externally the wire will move in a direction depending upon the direction of the magnetic field generated externally and the magnetic field generated by the current flowing in the wire. In practice, due to the physical make up of the machine the wire moves through an arc.

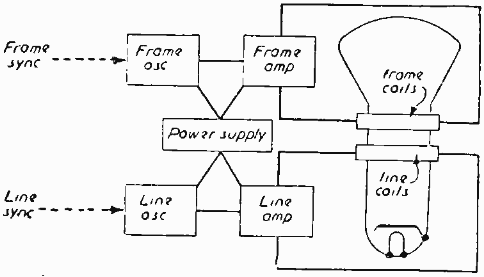


Fig. 17.—Schematic electro-magnetic deflection arrangement.

In a cathode-ray tube we can cause the beam to move in a similar manner by applying an external magnetic field. The magnetic field is produced by passing current through coils situated around the neck of the tube. Like the deflector plates it is usual to have two pairs of coils, one at each side (the Line Coils) and one above and below (Frame Coils).

Magnetic tubes now in general use require much higher voltages for E.H.T. and therefore require quite a large amount of power to move the beam. Heavy currents must be driven through the deflecting coils (sometimes referred to as "Scanning Coils") and this is the reason for the essential difference between timebases for electrostatic tubes and timebases for electromagnetic tubes. In the former we require voltage amplification while with the latter we require current amplification.

The oscillators producing the sawtooth voltages feed into powerful amplifiers. In the case of the line scan a great deal of power is required and special valves have been developed purposely for this job.

Fig. 17 shows the scheme.

Magnetic deflection is more difficult from the design point of view. To produce a sawtooth motion of the beam covering straight lines on the screen the voltage applied to the deflector coils must be of a particular shape—not the sawtooth shape—due to the inductive and other characteristics of the coils. For this reason magnetic deflection circuits appear rather more complicated than those used for electrostatic deflection.

Synchronising

Whatever form of deflection is used it is essential that the movement of the beam be kept exactly in step with the beam in the camera which is being used in the studio. To accomplish this the camera generates a little signal each time its beam comes to the end of a line, and another signal each time the whole frame of the picture is completed. These signals are termed the "Synchronising Signals" or more simply "Sync Pulses."

The actual signal received by the televisor will therefore consist of a varying voltage indicating the lights and shades in the line and a pulse indicating the end of the line followed by the lights and shades in the next line . . . and so on till the complete scene has been transmitted; at this point a signal is sent indicating the end of the frame and the whole process is repeated from the top line.

In order to reduce flicker and to enable the signal to be transmitted on a narrower band the system used in Britain is to scan alternate lines, the odd lines comprising the picture being followed by the even lines, and so on. When reassembled on the tube the lines fit into each other. The system is known as "Interlaced Scanning" and the action is termed "Interlacing."

Fig. 18 shows the scheme.

The actual make-up of the picture signal is extremely complex and a study of it is rather beyond the scope of this article. A general idea of the formation can be gained from Fig. 19 which shows two sequential lines. Peak white representing the peak high-lights of the scene is represented by maximum carrier amplitude; the black parts of the picture are represented by 30 per cent. modulation of the carrier (this is called the "D.C. Level" or "D.C. Component"); the portion of the carrier between this point and zero modulation is used for the sync pulses and is sometimes referred to as the "Blacker than Black" portion.

The complete signal containing picture intelligence and sync pulses is amplified by the vision receiver up to the video output valve; from this point it is usual to feed the signal into two separate paths, one directly to modulate the tube, the other to feed the synchronising circuits.

It will be observed that so far as the C.R.T. is concerned the sync pulses have no effect. At the black level the beam current is cut off and during the sync pulse the grid of the tube is driven heavily negative beyond the cut-off point—the net result is obviously that the beam still remains cut off.

The other path of the vision signal is to the sync circuits. It will be appreciated that we only want the appropriate sync pulse to trigger the timebase oscillator so as to keep it in step with the camera at the studio; a spurious pulse would cause the line to waver and go out of step and the intelligence contained in that line would be lost. A sudden change from white to black along a line will produce a pulse similar to the synchronising pulse and in order to prevent such a pulse affecting the timebase we arrange to separate the pulses from the picture.

A further point is that the pulse required to keep

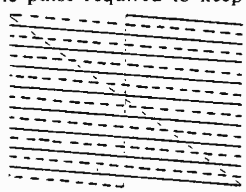


Fig. 18.—Diagram illustrating the formation of an interlaced raster.

the line scan in step is somewhat similar to that required for the frame circuit, and it is possible to find that line pulses are upsetting the frame oscillator.

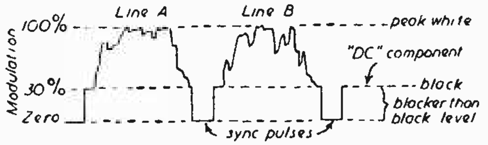


Fig. 19.—A portion of the vision signal waveform.

The result is an upset in the frame circuit affecting the frame hold and a loss of interlace. The sync pulses therefore have not only to be separated from the picture intelligence but also to be separated from each other.

The separation is accomplished with a valve circuit which is termed the " Sync Separator ; " this valve (or sometimes, valves) disentangles the sync pulses from the picture and they are then fed through shaping networks to their respective timebases. The shaping networks form the pulses into a shape suitable for triggering the line and frame oscillators.

The pulses necessary for the line oscillator are shaped in a " Differentiator " which is the term given to that particular kind of network, while the frame pulses are shaped in an " Integrator." Both the differentiator and integrator are merely a particular combination of resistances and capacitances.

Fig. 20 shows the scheme.

D.C. Restorer

The D.C. level, or in other words the level at which black is fixed, is rather important, as it forms the dividing line between picture intelligence and sync pulses. It is essential that this level is maintained in the sync circuits. Unfortunately it is not always possible to effect direct coupling between video output and the sync circuits, but coupling has to be made through a condenser. The condenser obviously blocks the path of the D.C. and steps must be taken to restore it.

There are two general methods employed to accomplish this : one is to arrange that the sync separator valve performs automatically its own D.C. restoration and the other is by inserting a diode in the circuit so as to " fake in " the D.C. level. The latter is termed a " D.C. Restorer " and it can be either a diode valve or one of the modern crystal diodes.

Phase Reverser

The phase reverser (sometimes inaccurately referred to as the cathode-follower) is used mostly in electrostatic circuits. It is a valve circuit arranged so that correctly polarised (or correctly phased) signals are fed to the sync circuits and to the C.R.T.

An example for the necessity of this stage is where it is required to modulate the grid of the tube and at the same time to provide a signal of opposite phase to the sync separator. To modulate the grid of the tube it is necessary to have a vision signal in which the picture content is positive and the sync pulse is negative, while most sync separators require a positive sync signal with a negative picture content.

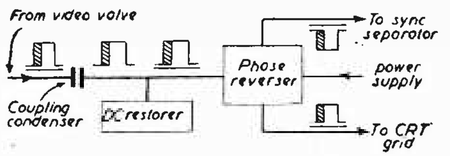


Fig. 21.—Illustrating the meaning of phase reversal.

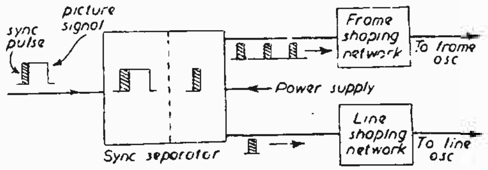


Fig. 20.—Diagram illustrating the action of the sync separator.

The phase reversal takes place with the aid of a simple triode and signals of one phase are taken from the grid, while signals of opposite phase are taken from the cathode.

Fig. 21 shows the scheme.

OBITUARY

Mr. Alfred W. Hall

ALFRED WEEDON HALL, who died on May 22nd, 1953, at the age of 60, was one of the band of engineers who assisted Mr. C. S. Franklin in developing the Marconi short wave beam system for world wide radio communication in the 1920's. He was trained as an electrical engineer, and after two years work in the power field, he joined the Marconi company as a test-room assistant in January, 1913. In 1917 he was given a commission as Sub-Lieut. R.N.V.R. and assigned to naval duties in Canada.

After demobilisation in 1919 he joined the staff of Mr. C. S. Franklin working on the spaced frame system of reception at Letterfrack and Towyn. In 1921 he was put in charge of the Birmingham end of the experimental duplex radio telephone link between Birmingham and Hendon, which operated on 15 metres with directional aerials. Thus began his association with short wave communication which was to last for over 20 years. When interest shifted to the development of long distance communication on short waves in 1922 he assisted Mr. Franklin on the short wave transmissions from Poldhu to the Marchese Marconi on the Elettra. This involved the development of a high power (10 kW) transmitter for waves below 100 metres with good frequency stability. His grasp of sound principles of mechanical and electrical design was a great advantage. He worked in London and Poldhu until 1925. During this period the transmitters for the beam contract were designed and the advantages of directional aerials were established.

Between 1926 and 1928 he installed beam transmitters in Canada and the United States.

Mr. Hall then returned to Chelmsford to take up the work of designing short wave transmitters under the direction of Mr. Franklin. This was his main work during the next 12 years, and produced the line of SWB transmitters of which the SWB8 and SWB11 are the best known. He installed a short wave radio telephone set in the S.S. *Homeric* (1929) and later (1932) in the Italian liner *Conte Rosso*.

He leaves a widow but no children.

Standard Test Pattern Generators

SOME CONSIDERATIONS OF DESIGN

By Edwin N. Bradley

CORRESPONDENCE arising from the publication of the writer's simple "Telesquare" test pattern generator circuit shows that there is a very real interest in, and desire for, a more complex instrument—a standard test pattern generator. Such a generator must present not only a clear pattern capable of showing normal receiver failings such as poor focus, non-linearity and the like, but it must also provide correct synchronising pulses with interlacing. More than one correspondent would like the generator to present not a geometrical pattern so much as a "picture" type of pattern akin to the well-known test card C. It is the aim of this present article to show something of the necessary circuitry and techniques required for such a standard generator and to demonstrate the fact that a home constructor's design for such an instrument would be suitable only for rather deep pockets.

A "picture" test pattern must be ruled out of court immediately on the grounds of cost. At the present time there is only one method by which such a pattern could be obtained with anything like satisfactory results—by the use of a "Monicon" or "Monoscope" tube. (These are trade names, the Monicon being made by Messrs. Cathodeon Ltd., Church Street, Cambridge, and the Monoscope by Messrs. Cinema-Television Ltd., Worsley Bridge Road, S.E.26. It is possible that other similar tubes are on the market.) These tubes operate on the monoscope principle in that they are similar to the tubes used in television cameras; instead of having transparent ends with targets on which external scenes can be focused they have, however, targets on which a test pattern such as test card C is reproduced. When the tube is scanned the video output is controlled by the target image so that on the receiver screen is seen the image incorporated in the tube. The expense of the monoscope tube itself is only part of the total expense of such a generator. The tube must be scanned perfectly if the output pattern is to be of use, so that highly accurate and linear timebases and deflecting coils are necessary whilst it is essential to generate well-shaped and correctly timed synchronising pulses.

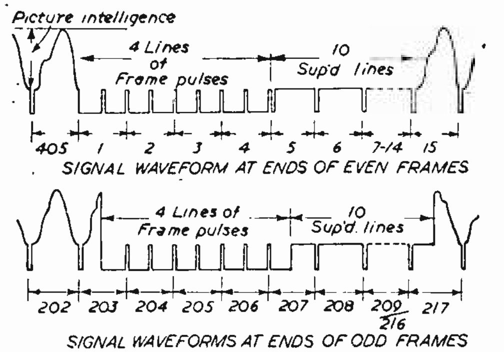


Fig. 1.—The standard BBC television waveforms.

It might be argued that a "picture" test pattern could be obtained more cheaply by scanning a transparency before a photo-electric cell in the manner of some amateur transmitted stills. The same problems still have to be overcome—the scanning must be linear and, moreover, must be interlaced (many amateur television transmitters dispense with interlacing) whilst the type of scanning tube, its brilliance, its persistence, the photo-electric cell employed together with its sensitive amplifier all present points of difficulty which must be overcome. It is for such reasons that the majority of test pattern generators show a simple arrangement of lines and tones on a correctly synchronised raster.

BBC Waveform

If the operation of the test pattern generator is to be understood a clear idea of the waveform transmitted by the BBC is required. Sections of this waveform are shown in Fig. 1. Starting at line No. 1 it will be seen that broad negative pulses known as half-line pulses are transmitted for four lines to synchronise the receiver frame timebase, these eight broad pulses being integrated into a single rising pulse to fire the frame timebase. These four lines are followed by a further 10 lines during which a black level and line sync pulses are transmitted, the black bar thus received blanking out the receiver frame timebase flyback. The line intelligence or picture starts at the fifteenth line and continues to be transmitted until the 203rd line when both the black level and line sync pulses, together with picture intelligence, are suppressed for a further series of four lines during which another eight frame sync pulses are transmitted. The black level and line sync pulses are then resumed for a further 10 lines, after which picture intelligence is continued halfway along the 217th line. Because the odd frame starts its scan halfway across the screen the lines of that frame must fall midway between those of the even frame to give a correctly interlaced picture. It is, therefore, essential in any standard signal

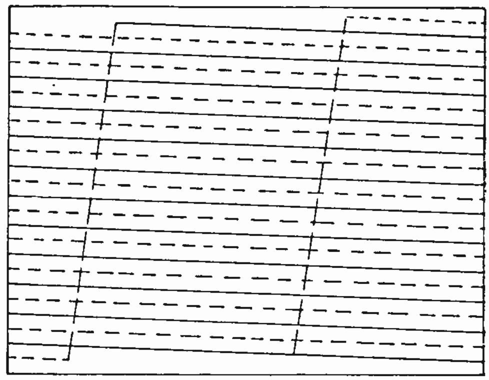


Fig. 2.—The interlaced half-frames.

generator to arrange for a similar series of sync pulses. Given correct synchronising impulses practically any type of signal or picture intelligence could be superimposed. The building up of a synchronised raster is shown diagrammatically in Fig. 2. Solid and dotted lines indicate the two interlaced half-frames with the interconnecting flybacks shown as dashed lines.

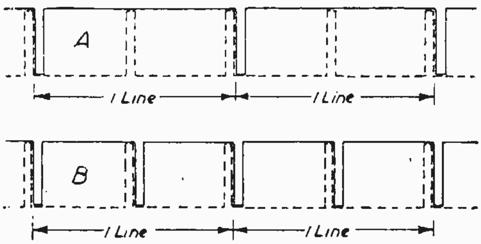


Fig. 3.—The relative timing of frame and line sync pulses.

Basic Requirements

The basic requirements of a standard test pattern generator can now be listed.

1. Because it is necessary to transmit half-line pulses for the frame synchronisation the signal must be built up of half-lines. The line frequency of a 405 line raster at 50 half-frames per second is 10,125 lines per second, or 20,250 half-lines. The basic circuit of the generator must therefore be a 20,250 c.p.s. square wave or pulse oscillator.

2. The BBC is locked to the national grid so that the frame frequency is in phase with the mains supply. If this were not so the smoothing of some receivers might have to be increased for hum bars would drift up and down the screen. Under the present circumstances any slight hum which is present remains stationary on the picture as a slight shading, which might be unbearable were it free to drift, when at the same time steady frame synchronisation and interlacing would most probably be upset. It may, therefore, be considered essential for the main 20,250 c.p.s. oscillator to be locked to the 50 c.p.s. mains supply with the lock switch controlled. If receiver hum is suspected opening the lock switch will soon make a hum bar evident.

3. The broad frame sync pulses are "hidden" for 198½ lines of the half-frame by the black level (30 per cent. of the full amplitude) which is in turn broken by the line sync pulses. The relative timing of the frame sync and line sync pulses is shown in Fig. 3a. It would appear to be permissible in a test pattern generator to employ half-line line sync pulses timed as in Fig. 3b. If this were done the line sync pulses could be derived from the half-line frame sync pulses without the need for a separate oscillator, and in view of the fact that the black level and line sync pulses must be suppressed during the four frame sync lines the use of 20,250 c.p.s. line sync pulses should not prove a disadvantage, nor cause incorrect line pairing or mistimed firing of the line timebase.

4. For a simple pattern such as that shown in Fig. 4 the line intelligence generator can be locked to the line sync circuit and can consist of a simple square-wave or pulse generator giving, say, five visible vertical bars. An odd number is desirable in order that there may be a central black bar over the unwanted line sync pulse in the centre of the line scan, as in Fig. 5. For five vertical lines the generator must run at 60,750 c.p.s. to give six bars, one of which is lost in the flyback. The width and timing of the generator pulses, if the pattern is to be truly standard, must be as shown in Fig. 6 where the details of the front and back porches are shown.

5. The frame intelligence, which can consist of a number of horizontal bars, is most conveniently made a switching waveform which will cut off the line intelligence at regular intervals. One of these intervals must be that during which the frame sync pulses and suppressed lines only are to be transmitted, once in each half-frame. In this method of operation it is convenient to make a slight departure from the BBC waveform, the line intelligence being suppressed for 13½ lines rather than 14 lines. At a basic switching frequency of 250 c.p.s. it is then possible to interrupt the frame by five black bars of which four are visible, as in Fig. 4. The fifth serves as a frame sync suppression and blanking bar. The black bars must each be 13½ lines in width with 27 line spacings between them, giving a final correctly interlaced raster of two half-frames of 202½ lines each.

As an alternative the line intelligence can be switched off for 14 lines and on for 188½ lines by a gate circuit, the frame intelligence being a separate signal and consisting either of a suitable number of black bars or, as in some commercial generators, of a "step wedge" showing a number of distinct tones between white and black.

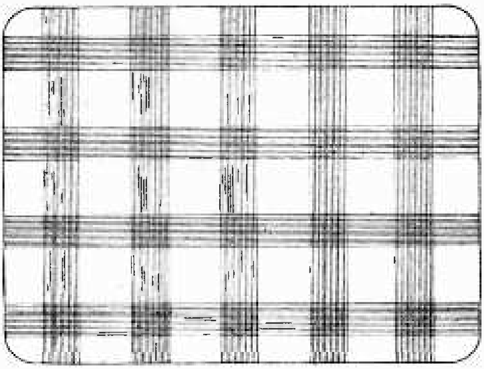
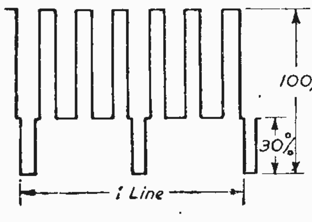


Fig. 4.—The suggested test pattern.



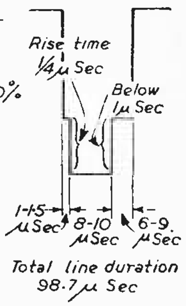


Fig. 5 (left).—One line of the suggested test pattern waveform. Fig. 6 (right).—Porch and line sync pulse details.

6. As each component of the final carrier modulation is added to the other components it must be levelled off for correct amplitude and, perhaps, D.C. restored so that pulse tops, etc., maintain their correct levels. The black level must be set to 30 per cent. of full modulation, the sync pulses dropping to 0 per cent. or very nearly (the carrier cut right off) with the line intelligence bright-ups established as the 100 per cent. amplitude. The final modulation waveform must modulate the carrier to 100 per cent. without distortion and the carrier itself provided by a simple, tunable oscillator must be stable and should also be capable of modulation by a plain note for sound section checking, although it is not absolutely essential to include sound channel checking in a pattern generator which is primarily for checking timebases and vision arrangements.

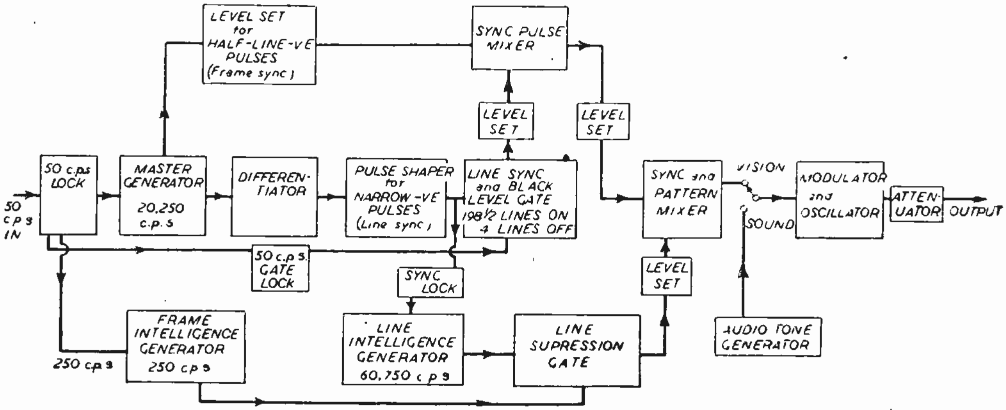


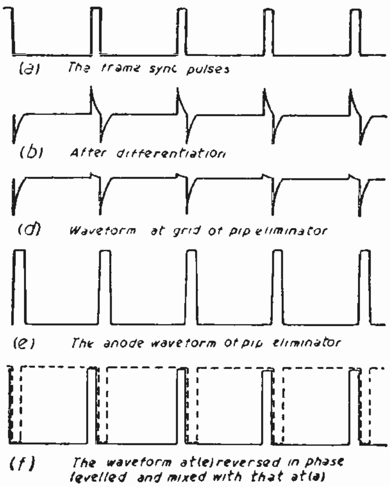
Fig. 7.—One approach to a standard test pattern generator.

Oscillator Locking

Such a list of requirements is formidable, and even apparently simple sections of the circuit drawn up to embody them can present ticklish problems. In the diagram, Fig. 7, showing the block layout of such a circuit, difficulties arise immediately in the locking of the main 20,250 c.p.s. oscillator with the mains. It is clear that the synchronisation here cannot be carried out in a single step (unless a specialist circuit such as a delay line oscillator is employed) and probably the best system to use is a chain of multivibrators. The first multivibrator could multiply by five, locking to the 50 c.p.s. mains and giving a 250 c.p.s. output with which the frame intelligence generator can be synchronised. The second multivibrator could multiply by nine to give an output of 2,250 c.p.s. locked to the 250 c.p.s., and a third multivibrator again multiplying by nine would give an output of 20,250 c.p.s. The multivibrators would require designing to favour odd multiple locking and would need to be very stable not only over very long periods of operation, but also to voltage and temperature fluctuations.

One further method of locking the master oscillator may be mentioned—a 20,250 c.p.s. crystal oscillator could be used and the mains locking totally ignored. The disadvantages of such a system are obvious.

Probably the most satisfactory master oscillator would be a cathode-coupled multivibrator, shown in outline in Fig. 8. This circuit can give an excellent square-wave output, or an equally clean pulse output depending on the value chosen for the common cathode resistor, Rc. Variation of Rc varies the width



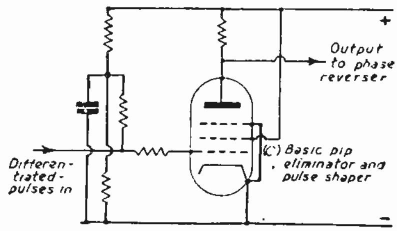


Fig. 9.—Obtaining line sync pulses.

of the pulse obtained, the frequency being controlled by Rg.

If the master oscillator is made to give broad negative pulses suitable for frame synchronisation the line sync pulses can be derived from these by means of a differentiating circuit leading into a "pip eliminator" and a phase reverser. The broad pulses, after differentiation, appear as at (b) in Fig. 9 and the eliminator and pulse shaper shown in basic form at (c), Fig. 9, provide well-formed positive-going pulses. After phase reversal a series of negative pulses can be obtained, timed correctly in relationship to the original broad negative pulses. In this way it appears that it would be possible to lock the frame and line sync pulses together in this approach to a standard test pattern generator.

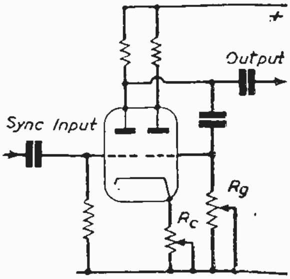


Fig. 8.—The basic master oscillator.

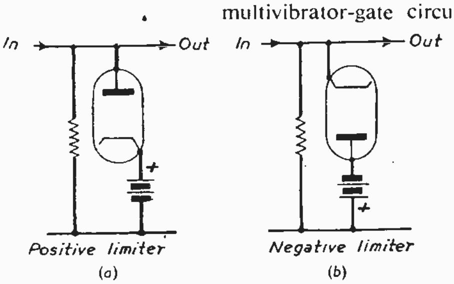


Fig. 10.—The diode limiters.

The level sets shown throughout the block diagram could all be of the diode or double diode type, with battery bias or carefully smoothed and regulated power bias. The basic circuit is as shown in Fig. 10. By making the diode cathode 3 volts positive to earth the valve is non-conducting until the anode is made more than 3 volts positive. A positive-going waveform or pulse rising to more than 3 volts above earth would, therefore, be "clipped" to a 3 volts level—in the case of a random waveform this would result in serious squaring of the top of the wave, but in the case of a well-shaped pulse the extra squaring-off can be nothing but advantageous. To level off a negative-going waveform or pulse it is, of course, only necessary to reverse the valve as shown at (b), Fig. 10, making the anode negative to earth. Combining two such limiters together in a double diode enables both sides of a waveform or envelope to be set to required levels or limits.

In Fig. 11 is shown one form of gate circuit which could be employed for the suppression of the line sync and black level intelligence. Basically this consists of a cathode-coupled multivibrator working at a fundamental frequency of 50 c.p.s. and supplying a pulse input to the hexode section of V1, a narrow negative pulse cutting off this valve for the required four lines after each period of 198½ lines on. It is hardly necessary to add that the timing or synchronisation of this gate, together with the stability and accuracy of its operation, must be perfect.

Although the frame intelligence generator and line suppression gate are shown separately in Fig. 7 these two units could also probably be joined in a multivibrator-gate circuit. In this case the gating waveform would be much closer to a square wave in shape with a fundamental frequency of 250 c.p.s., synchronised with the main 50 c.p.s. lock circuit.

The various waveforms could be mixed in double triode circuits shown basically in Fig. 12. Cathode follower type outputs would prevent unrequired valve gains upsetting the levels to any serious degree whilst the low output impedances so obtained would not lead to deterioration of the pulse shapes. A carefully designed and linear modulator could then impress the overall waveform on the carrier; probably the best method of modulation would be to have an oscillator followed by a small power amplifier or buffer/output stage, screen grid or suppressor grid modulating the latter.

Expensive

It will be realised that the suggested circuits are only one approach to the problem of designing a standard test pattern generator, and that no development work has been carried out along these lines—the writer is not in a position to supply plans or more detailed information. Niether can constructional information be supplied to individual requirements. Sufficient will have been written, however, to show why the prices of commercial standard pattern generators range from £55 to £140.

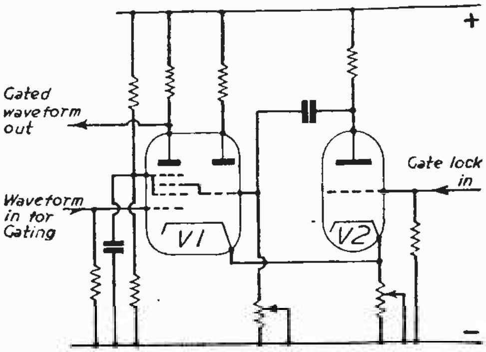


Fig. 11.—A gate circuit.

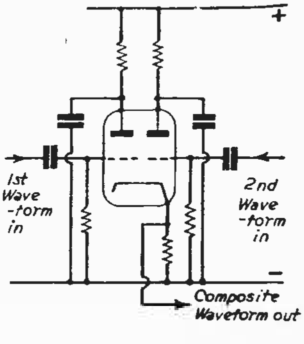


Fig. 12.—Basic waveform mixers.

Experimental Aerials

DETAILS OF STANDARD AND NON-STANDARD ARRAYS FOR THE EXPERIMENTER

By W. J. Delaney (G2FMY)

EVERYONE is now familiar with the simple dipole type of aerial and is aware that some such device is essential for the reception of television programmes. Unfortunately, there are still many misconceptions regarding the "best" aerial for a given area, and now that certain BBC transmitters are using horizontal polarisation the opportunity arises for some experimental types, some of which have met with success in America where, of course, this type of radiation is standard. A horizontal aerial is much easier to erect than a vertical, and can be given better support, whilst the form of radiation reduces some types of interference. However, before going into the different schemes which may be tried it is as well to reiterate the main requirements of the aerial. First, a dipole or half-wave aerial is required, and this may be shaped to various arrangements to give different results. Secondly, to improve signal strength and/or to reduce certain types of interference a shorter rod may be placed in front of the dipole to act as a director, whilst a longer rod may be placed behind the dipole to act as a reflector.

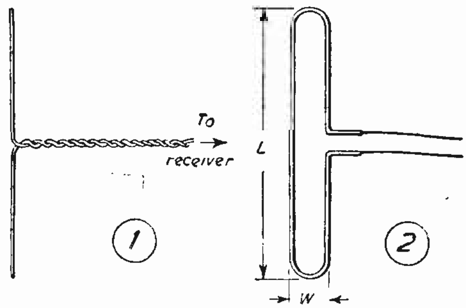
In all these cases the lengths and distance separating the reflector and director may be experimented with, and although it can be shown mathematically that a definite relation is "correct," it is often found that in a particular situation some departure from theoretical correctness will result in improved reception conditions. By this is meant better signal-noise ratio or improved bandwidth, or better sound compared with vision.

Aerial Lengths

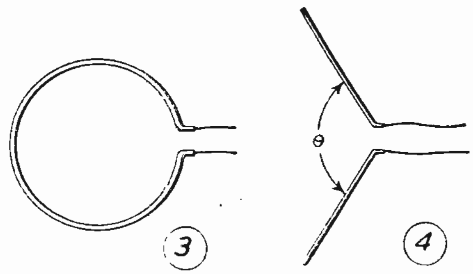
The length of the dipole need not necessarily be fixed—it may be cut for the centre of the vision band, the centre of the sound band or a position mid-way between the two. Again, this depends upon local conditions and the receiver in use, etc. The simplest "makeshift" aerial which can be adopted to find the optimum length is that made from ordinary twin lighting flex. The two lengths are untwisted at the end to give approximately the right dipole dimensions, and this may be attached to the wall of the room with cellulose tape and the twist taken away at right angles to the receiver. By adjusting the twist so that the two arms of the aerial are shortened or lengthened the results may be clearly seen on the received picture. Similarly, the wall upon which the aerial is placed will enable the twisted portion to run off in different directions and will show clearly that the best results are usually obtained when the aerial is between the receiver or direction of take off and the dipole itself. Also, the distance which the twisted lead is taken at right angles before changing direction may also be found critical.

Round or "V"

The dipole may, of course, be bent to an alternative shape, and again it affects bandwidth as well as directional properties. A common form of aerial which gives very good results consists of a dipole bent into a circle, and again the effect may be tried of bending the free ends round until they are about three or four inches apart, and of bending the rod or tube round and taking the lead from the adjacent ends. Instead of bending the two halves round to circular form they may be simply bent away from the vertical to form a sharp "V," or continued to an angle of 90 deg. to form the well-known "X" aerial. Both the latter arrangements may be provided with directors or reflectors of a similar angle, and for the horizontal transmissions some interesting arrays may be made up. For vertical transmissions the addition of elements means that cross bars have to be fitted, and the complete arrangement then becomes very heavy and unwieldly. For a horizontal array of the same type, however, a much easier assembly is possible, and a form of aerial which is popular in the U.S.A. is shown in Fig. 5. This is based on some of the U.S.W. aerial arrays used during the war and consists of a dipole fitted in front of a 90 deg. "solid" reflector. In Service arrays the reflector is usually made from wire netting or even solid sheet metal,



Figs. 1 and 2.—A dipole made from ordinary lighting flex and a folded dipole. L and W may be varied to find the best combination.

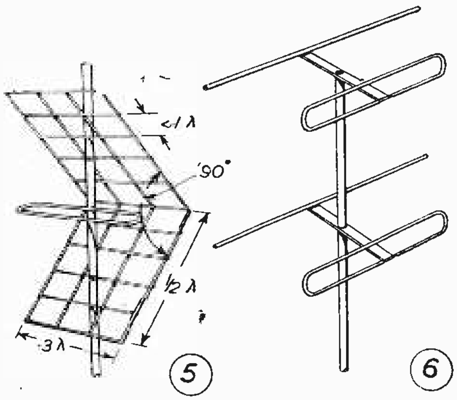


Figs. 3 and 4.—A circular and a "V" aerial. The angle θ may be varied to find the most suitable one for the receiver and locality.

as the frequencies dealt with are very high and the dimensions thus become quite small. For the television frequencies the aerial may be folded to reduce the overall size, or alternatively cut to a quarter wavelength, and the reflector may consist of lengths of rod supported by strip metal or a wooden framework. There is some interesting ground for experimental work with this type of aerial, the principal requirements being given on the drawing (Fig. 6). The spacing between the elements (which are fitted to form a right-angle) should be .1 wavelength, whilst their length should be .3 of the wavelength. Each side of the reflector should be half wavelength, and, of course, the supporting mast to which the reflector is fitted must be of wood. It will be seen that this form of aerial is much easier to erect for horizontally polarised transmissions than for vertical, but for those who are interested it could be tried out experimentally, making everything half the proportions just mentioned, and supporting the arrangement by a mast half-way between the dipole and the reflector, a horizontal wooden rod being used for the attachment of these. A wooden framework covered with wire-netting (half-inch mesh) has been tried experimentally, cut to a quarter wavelength, with a folded dipole, and in north-west London the Sutton Coldfield transmitter has yielded quite a good picture.

Stacked Arrays

A further advantage of the horizontal radiations is that a number of elements may be stacked one on top of the other to give improved bandwidth and better directivity and a simple idea is shown in Fig. 6. This is merely two folded dipoles one on top of the other, each provided with a reflector. The spacing between the two arrays should be half or quarter wavelength, but again, as mentioned earlier, experiments may be tried with odd measurements. This stacking is often carried out in U.S.W. aerials to quite a large assembly, but as the television frequencies call for rather large dimensions the



Figs. 5 and 6.—A folded dipole with 90 deg. reflector, and a stacked array of two folded dipoles with reflectors.

array will become unwieldly unless the overall dimensions are reduced by using one quarter or even one-eighth wavelength dipoles with proportionate spacings. The reduction in dimensions will result in a falling off in efficiency either in bandwidth or strength, but the effect of the multiple elements may off-set the loss and result in an improvement.

Three New Mullard Valves

THE Industrial and Communications Department of Mullard Ltd., have recently made available three high-performance double triodes on the Services Preferred B9A (Noval) base. They are the ECC81, ECC82 and the ECC83.

These valves have been developed to meet most of the double triode requirements likely to be encountered in normal circuits. They should prove of considerable interest to designers of industrial electronics and telecommunications equipments for both home and overseas.

The ECC81, which is the direct equivalent of the American type 12AT7, is noted for its extremely high mutual conductance, and finds particular applications in grounded-grid and cascode R.F. input stages working up to 300 Mc/s.

The ECC82 (12AU7), has a low amplification factor (μ) and an anode dissipation of 2.75 watts. These factors tend to make it particularly suitable for use as an R.F. oscillator or frequency multiplier.

The ECC83 (12AX7), is characterised by its high amplification factor (μ), and is designed for use as a resistance-coupled audio amplifier or phase splitter.

All three valves have their two triode sections completely separate, with the cathodes taken out to separate pins. Their heaters are centre-tapped allowing the two sections to be wired in series or in parallel.

Further details are obtainable from the Industrial and Communications Department, Mullard Ltd.

Book Received

"WIRELESS and Electrical Trader Year Book: Radio, Television and Electrical Appliances," 1953. 24th edition. Published by Trader Publishing Co., Ltd., 264 pages.

Since the "Wireless and Electrical Trader Year Book," was first published in 1925, it has become firmly established as the retailers' invaluable reference book to the radio and electrical industries.

In the 1953 edition, data of practical use to dealers in the new television areas and general reference and technical information have been carefully selected. Features include condensed specifications of current 1953 commercial television receivers (with such valuable facts as valves used, I.F. values, etc.), and information on valve and cathode-ray tube base connections, with over 200 valve base diagrams. These are invaluable to radio and TV engineers.

A new feature, re-introduced at the request of readers, is the Mains Voltage Directory and covers all the principal towns in Great Britain. The comprehensive list of the I.F. values of commercial radio receivers which have been marketed during the past five years has been revised and extended.

One of the principal aims of the Year Book is to assist traders to keep abreast of the constant change in the names, addresses, telephone numbers and products of the firms engaged in the radio and electrical industries.

A BEGINNER'S RECEIVER—5

AN EASILY-BUILT SUPERHET CIRCUIT, UTILISING AN EX-GOVERNMENT UNIT—R3170A

By B. L. Morley

(*Continued from page* 18 *June* 1953 *issue*)

HAVING completed the wiring so far, the next point is :—

13. Wire 33K Ω and 33 pF tag 1 of new tag strip and earth.

14. Mount a new four-point tag strip adjacent to previous tag strip, and wire tag one of previous tag strip to tag one of the new tag strip ; connect 0.01 μF between tag 1 and 4.

15. Wire 300 pF between tag 3 and earth.

16. Wire 1 M Ω between tag 4 and last tag of first tag strip in the sound section. From this latter tag an 0.05 μF is wired to earth and also from this tag a wire is taken to the bottom end of L16.

17. Wire the crystal diode between tag 3 and 4 of new four-point tag strip. When soldering, insert pliers between crystal and soldering tag to divert the heat.

18. Wire 33K Ω between tag 2 and 3 and connect 0.001 μF tag 3 to earth.

19. Run screened wire from junction of 0.001 μF and the 33K Ω to 0.1 μF fitted on front panel adjacent to the volume-control ; the other side of this condenser is wired to the top of the volume-control. The bottom end of the control is wired to earth and the centre to the grid of V13 via screened wire.

20. Connect a 3M Ω resistor (or 1M Ω plus 2.2M Ω) from H.T. common to tag 3 (crystal diode).

21. Fit three-point tag strip under bolt holding the rectifier valve.

22. Wire 47K Ω between anode V13 and tag 3 and strap screened grid, suppressor grid, and anode of V13.

23. Fit 22K Ω tag 2 to 3 and fit 0.1 μF decoupling condenser tag 2 to earth. Wire H.T. common to other side of the 22K Ω.

24. Run a short length of coaxial cable from 0.05 μF condenser whose other side is connected to the anode V13 to the 33K Ω grid stopper whose other end is connected to the grid of V14. Use the centre of the cable and earth the braided cover.

25. Fit 470K Ω grid V14 to earth and fit two 470 Ω resistors in parallel between cathode and earth. Wire 25 μF electrolytic between cathode V14 and earth. This condenser is mounted in an upright position and the negative and wire passed through an existing hole in the chassis and back again through another nearby hole to an earth tag.

26. Wire in the output transformer and wire the auxiliary grid to the H.T. positive. Connect one side of the transformer secondary to earth and take the other via a short length of coaxial cable to the output Pye socket on the front panel.

27. Wire 180 Ω and 500 pF cathode of V10 to earth.

28. Run a wire from junction of L16 and its 500 pF condenser to the local/distance switch on the front panel, and earth the other side of the switch.

29. Connect an 8 μF condenser between the H.T. rail and earth. The condenser is mounted in an upright position in a similar manner to the cathode decoupling condenser on V14. It is located by the mains transformer adjacent to the last heater choke nearest the front panel. The positive side of the condenser goes to the H.T. rail connection fitted on this choke.

This completes the wiring of the sound section. Fig. 20 shows the wiring diagram.

The Power Pack

There is nothing difficult in the wiring of this portion. The 350 Ω 10 w. resistance occupies position previously taken by 1,500 Ω 10 w. resistor back panel. The 6.3 v. winding is centre-tapped, but the centre tap should be ignored : one side of the winding is earthed and the other taken to the L.T. common. The mains input is taken via the volume-control switch.

For the novice a wiring diagram is given in Fig. 21.

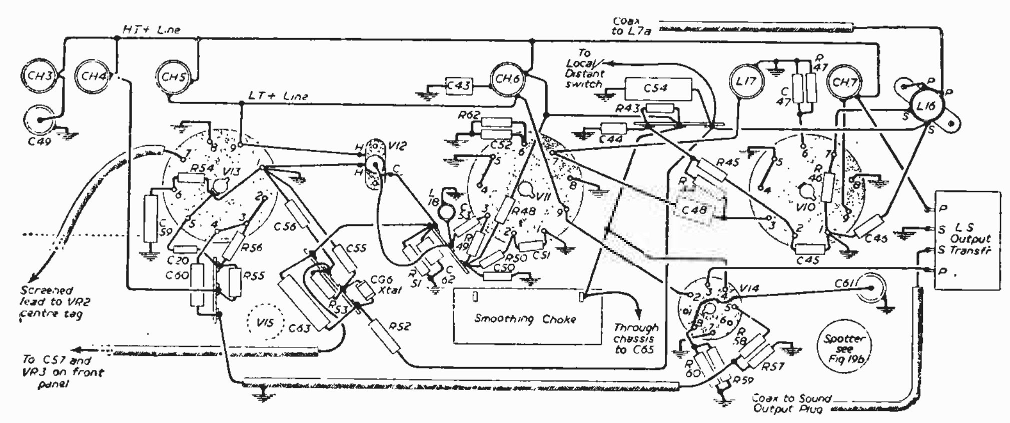


Fig. 20.—Wiring details of the sound section.

Alignment

Before switching on the circuit should be checked for leakages between H.T. and earth, and H.T. and L.T. The mains can then be connected and the set allowed to warm up.

It is necessary to use a good aerial, and for fringe reception two directors plus dipole and reflector are strongly recommended. For those using the set nearer to the transmitter an H aerial will suffice.

A loud speaker should be connected to the Pye output socket and connection made between video output socket and the timebase/tube network which is being used.

Contrast control should remain at zero and volume at maximum.

The cores should be set level with the tops of the coils forms, but the existing vision I.F. cores should not be touched. The oscillator trimmer (C10) should be slowly adjusted using an insulated instrument, and at one point either the vision or sound signal should be heard in the loudspeaker. The vision signal sounds like very rough mains hum. Whichever is picked up first, the cores of the sound I.F.s should be adjusted for maximum volume.

If the vision signal is heard on the loudspeaker first, then the position of the trimmer should be noted and the trimmer further adjusted to bring in the sound. Once the sound has been obtained, then L1, L2, L4, L6 should be adjusted for maximum volume.

It should now be possible to turn up the contrast control and to receive the vision signal on the tube. Any adjustments to the timebase should be made at this stage.

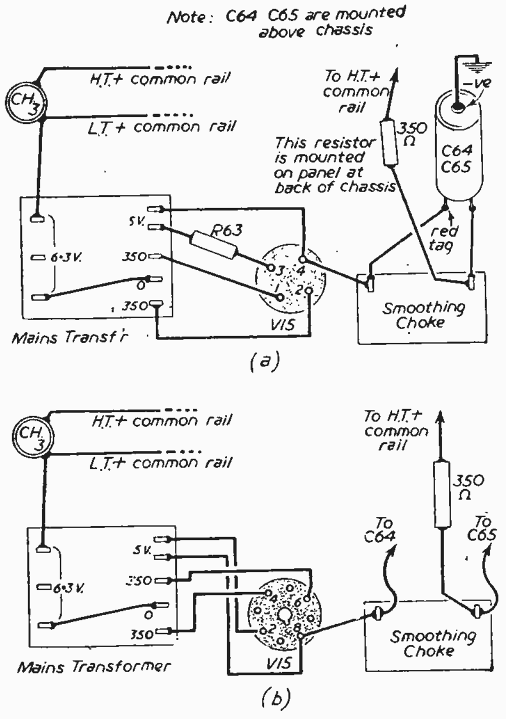


Fig. 21.—Wiring details of the power pack (a) is for a VU39A and (b) for a 5U4G.

Having obtained the picture, then all the coils previously mentioned should be adjusted for maximum volume of picture signal. L3 should be adjusted for optimum results, though the position of the core will not be found to be critical.

The next step is to adjust the oscillator trimmer until maximum picture signal is obtained (the quality of the picture should be ignored at this stage and also anything which is happening to the sound; it is a good idea to turn the volume right down so that it does not influence one's adjustments to the picture).

The "video coupling" control should be at minimum so that the minimum valued condenser (500 pF) is across the cathode of the video valve.

The next adjustment is important. With brilliance and focus controls correctly adjusted (brilliance control at a position where the plain raster just disappears when contrast is at zero), then the "volume" of the picture signal on the tube is noted and the oscillator trimmer is adjusted towards the sound channel (i.e., towards maximum capacity), so that the volume of the picture is reduced by half. This is the correct position for the oscillator trimmer. (The tuning condenser knob should be adjusted so that the fixed and moving vanes are at half mesh before this adjustment is made.)

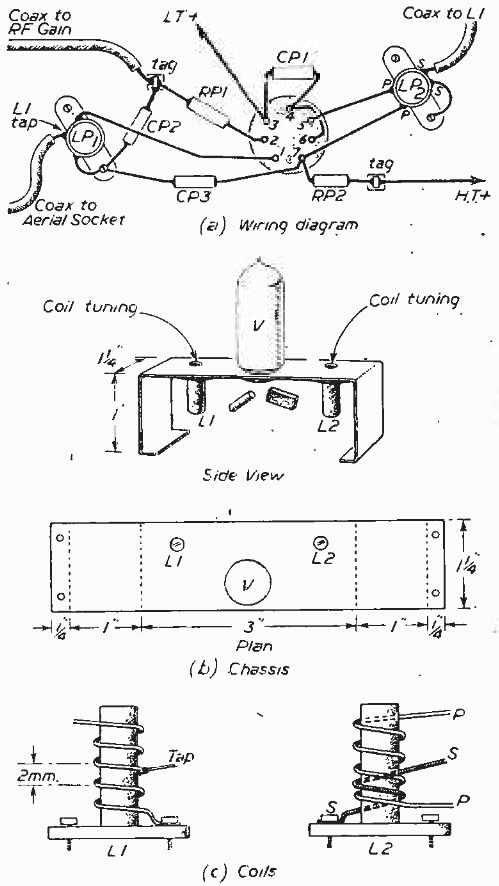


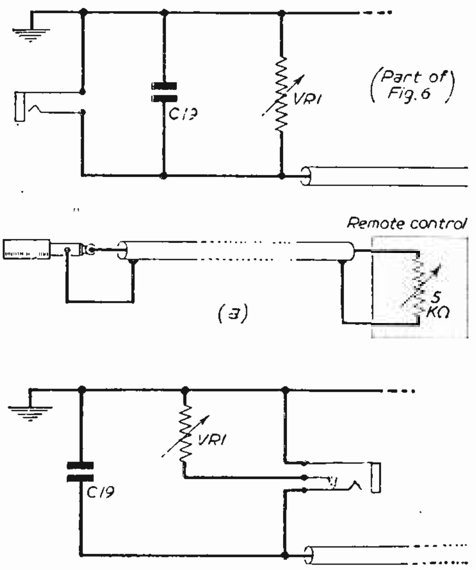
Fig. 22.—Details of the pre-amplifier and coils.

The volume-control should now be advanced until the sound is heard and L16, 17, 18 should be adjusted for maximum volume.

L1, 2 and 4 should be adjusted for picture quality and sound volume.

Snags

The most likely source of trouble will be due to a weak signal. If a signal cannot be detected on the loudspeaker, then connect the video output socket to the P.U. sockets of a broadcast receiver via two 0.1 μF condensers. If the broadcast receiver is switched to "gram" then it should be possible to pick up the



(b) Alternative if a jack with a "break" contact is available preferred

Fig. 23.—Details of the remote contrast control.

signal from the video stage. Due to its broader bandwidth and higher power, it is generally easier to pick up the vision signal than the sound.

The oscillator trimmer should be adjusted so that the signal is picked up. If nothing is heard, tap an earth on to the aerial socket which should result in a click on the broadcast receiver. If this is not heard, then tests must be made at subsequent stages working back to the mixer and then through the vision I.F. section tapping the wire on to the grids of the valves. When the click appears the fault lies between that point and the previous test point.

It may be that the click will be heard in the first instance, and if this is the case try combinations of core positions in the R.F. section combined with fresh oscillator positions.

It is possible that stray capacitances have come into action and this can be overcome by widening the spacing between turns of the oscillator coil turns, or alternatively, closing up the spacing.

If it is found not possible to peak any of the R.F. coils, the same process can be tried with them.

Once the signal has been obtained then it is much easier to tune it to maximum and then try the sound.

In some cases it may be found that either the vision or sound is obtained quite well, but it is not possible to get them simultaneously. It will be possible to find another position of the oscillator trimmer where both vision and sound are obtained together.

The local-distance switch and the video coupling switch are adjusted for sufficient sound and sufficient volume and quality of the picture. Any additional adjustments required can be made by the trimmer.

The Pre-amplifier

If insufficient signal is obtained then the pre-amp can be built, the construction is quite simple and a wiring diagram is given in Fig. 22.

The sensitivity is controlled by an R.F. gain control which is pre-set and is fitted on the front panel.

Tuning is effected by adjustment of the iron cores of the coils. (Note :—Not all the illustrations show the pre-amp).

Remote Contrast

The circuit for the control is given in Fig. 23. It is not strictly necessary but is a real boon in areas where constant fading is experienced, as it enables the picture contrast to be controlled from an armchair. Any suitable jack which breaks the circuit can be used.

Voltage Readings

These readings were taken with an inexpensive meter such as the average amateur might possess and will, therefore, represent an average type of reading.

H.T. output 360v.
H.T. rail 270v.

V1	Anode 200v.
	cathode 1.5v.
V2	Anode 260v.
	cathode 1.25v.
V3	Anode 190v.
	cathode 0.5v.
V4	Anode 250v.
	screen 100v.
	cathode 1.0v.
V5	Anode 210v.
	screen 260v.
	cathode 2v.
V6	Anode 220v.
	screen 260v.
	cathode 2v.
V7	Anode 220v.
	screen 260v.
	cathode 2v.
V9	Anode 200v.
	screen 260v.
	cathode 1v.
V10	Anode 200v.
	screen 250v.
	cathode 2v.
V11	Anode 120v.
	screen 220v.
	cathode 3.5v.
V13	Anode 110v.
	cathode 2.0v.
V14	Anode 230v.
	screen 270v.
	cathode 12.5v.

Total current drawn = 165 mA (this does not include the pre-amp).

Conversion To Magnetic C.R.T.

DETAILS OF TWO EASILY BUILT UNITS BASED ON ELECTROSTATIC TIMEBASES

(Continued from page 16, June issue.)

IT is important that a good earth connection is made between existing and new chassis.

The C.R.T. is mounted on a separate chassis and it was found convenient to use plywood for this. The supports can be made of ⅜in. ply and the baseboard of stronger material (say ⅝in. ply).

Fig. 10 gives the details for the construction of this chassis. If a 12in. C.R.T. is being used, then the measurements will be those shown in brackets.

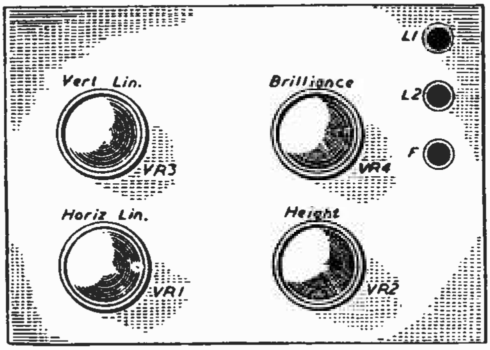


Fig. 8.—Front panel details.

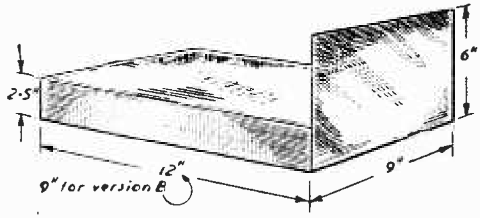


Fig. 9.—Chassis dimensions.

The focusing magnet is mounted directly on the rear support.

In Fig. 11 will be found the details for construction of the C.R.T. mounting. The main body of the tube is supported by the front panel of the tube chassis; the hole is surrounded by a length of ⅜in. diameter rubber tubing which is split down the centre. Rubber draught excluder is a useful material for this purpose.

To support the actual face of the tube, the bracket shown in Fig. 12, which is made out of a strip of aluminium, should be fitted. It is possible to use a commercially obtainable bracket for this purpose which has been especially designed for the View-master. The item is marketed as "C.R.T. front and rear support type Ediswan 72007."

The back support of the tube carries the tube neck and lower down is mounted the connecting socket, which enables the unit to be connected to the timebase amplifier. In the prototype use was made of an I. Octal valveholder in this position, and the base of an old valve was used as the plug end, on the timebase amplifier chassis.

The grid of the tube is fed by a separate wire in the manner mentioned earlier, while the anode feed also uses a separate wire directly from the timebase amplifier chassis. This lead should be well insulated,

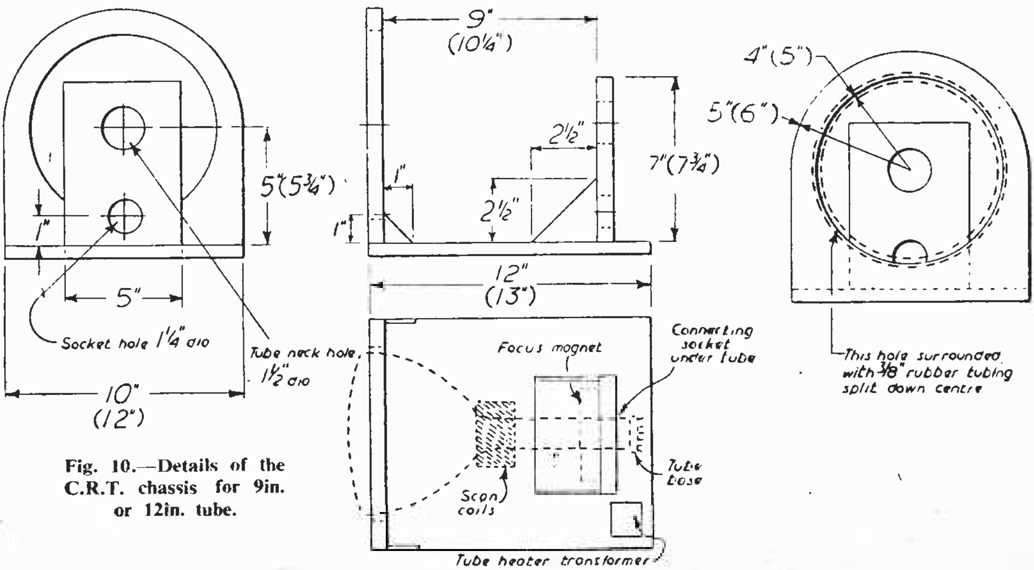


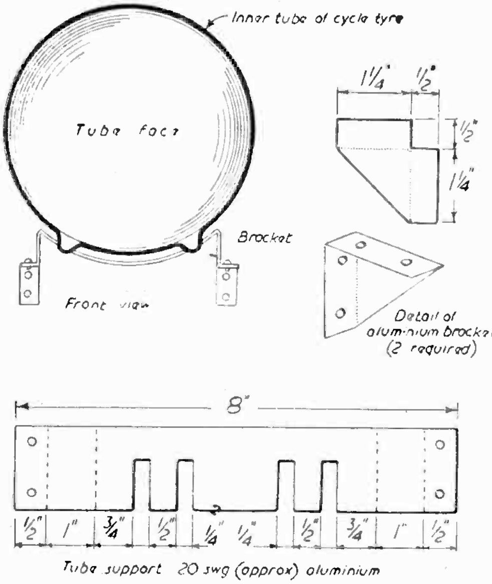
Fig. 10.—Details of the C.R.T. chassis for 9in. or 12in. tube.

and motor-car ignition lead is a good material to use.

The mains input to the mains transformer should be taken via the usual on/off switch of the televisor so that the amplifier comes under the direct control of that switch.

It is not advised that the amplifier be run without the timebase proper being in action.

In Fig. 13 will be found a wiring diagram for the line phase reversing stage which will be fitted in the existing timebase. The actual position of the com-



Figs. 11 and 12.—Details of the tube support, and method of mounting.

ponents is not important provided they are kept clear of the frame circuit.

Fig. 14 shows the wiring of the C.R.T. chassis.

A wiring diagram of the timebase amplifier unit is shown in Fig. 15. The majority of the components are mounted on a paxolin strip under the chassis. The components on top of the chassis are shown in this diagram in a manner to make clear the wiring circuit. In practice the components will be positioned as indicated in Fig. 7 and wiring between top of the chassis and underneath the chassis will be made through drilled holes.

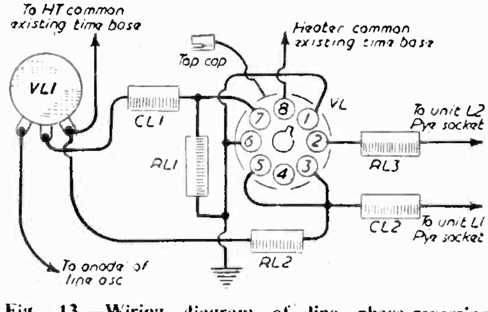


Fig. 13.—Wiring diagram of line phase-reversing circuit.

Anode leads to the E.H.T. rectifiers should be heavily insulated.

It is rather important that no sharp points exist in the E.H.T. wiring, or corona discharge will take place. Soldered joints should be made so that the soldering points are covered with rounded blobs of solder.

For those who will be wiring directly from the theoretical circuit, a theoretical diagram of the power supply is given in Fig. 16.

Testing and Setting Up

Before switching on, the whole circuit should be checked and particular attention whould be paid to shorts or leaks between H.T. positive and heaters, and H.T. positive and earth.

The two units should be connected together and also connected to the existing timebase. It is advisable in the first stage not to connect the C.R.T. but to connect a bulb of suitable voltage rating across the C.R.T. heater supply.

When the televisor is switched on, the bulb should be watched. A fairly strong whistle should be heard coming from the line amplifier, though it is possible for it to be too high for hearing; if the whistle is not heard, therefore, the line hold control should be rotated until it becomes audible.

A check can be made on the complete circuit by connecting the speech coil of a loudspeaker across the line scanning coil (not across the line transformer). It should be possible to hear the line whistle quite strongly.

A similar check can be made for the frame circuit by feeding the frame output into the transformer of a loudspeaker. The frame oscillations should be heard clearly.

Provided that the bulb across the C.R.T. heater supply is still glowing, it will be possible to connect the C.R.T. into circuit. The televisor should be switched off and allowed to cool for at least two minutes before switching on again. The brilliance control should be turned to minimum position (that is, towards the H.T. + rail).

The C.R.T. should be mounted on its chassis and the scanning coils pushed forward towards the screen as far as the neck of the tube will allow. The coils should be fixed lightly so that it is possible to rotate them when the raster has been received.

The focusing magnet should be adjusted so that there is a very small gap existing between the pole pieces, and the fine trimmer on the magnet should be set in its mid position.

It is now possible to switch on again and the screen should be watched carefully. The contrast control should be kept at zero at this point until the preliminary work on the raster has been completed.

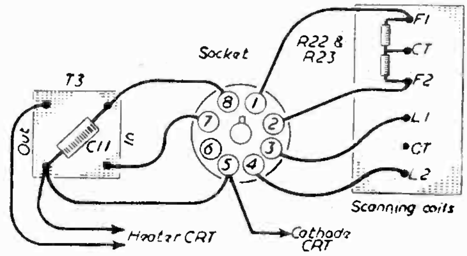


Fig. 14.—Wiring diagram of the C.R.T. chassis.

After allowing time for warming up, the brilliance control should be advanced slowly ; this should cause a blurred patch on the screen. The patch should be resolved into a raster by loosening the screws of the focusing magnet and sliding it forward or backward until optimum focus without cut-off is obtained. The focusing screws on the magnet can then be adjusted for maximum focus and any final vernier adjustment made by the focusing trimmer.

The scan coils should be rotated so that the raster is square on the screen.

If a shadow is cast by the magnet on to the screen, then a slight movement of the magnet from its dead central position can be made by the adjusting screws at the rear. This adjustment should be made with the greatest care so as to avoid making the edge of the magnet bear on the neck of the tube. A fracture at this point is quite easy to make !

Having obtained a clear raster, then the brilliance control should be reduced so that the pattern is just extinguished, and the contrast control advanced to produce the picture pattern on the screen. Operation of the Line Hold and Frame Hold controls should resolve the picture.

The next step is to obtain correct height and width. Height and vertical linearity controls should be adjusted in conjunction with each other to produce a picture of the full height, without distortion. Width and horizontal linearity controls should be adjusted so as to produce full width without distortion. If a bright white line appears at the bottom of the picture then operation of the line form control will eliminate it.

If the picture is upside-down, reverse frame coil connections. If left to right, reverse line coil connections.

This completes the adjustments.

Snags

The foregoing shows what should happen. Sometimes, alas, things do not work out quite so easily ! Some of the more common forms of trouble will now be dealt with.

Nothing Seen on the Screen

In this case check that the heater of the tube is glowing. If this is in order, check the E.H.T. circuit by bringing a *well insulated* screwdriver close to the anode connector on the tube. A series of sparks should be drawn off from the anode. If this is not the case, then check back through the E.H.T. section.

(*To be continued.*)

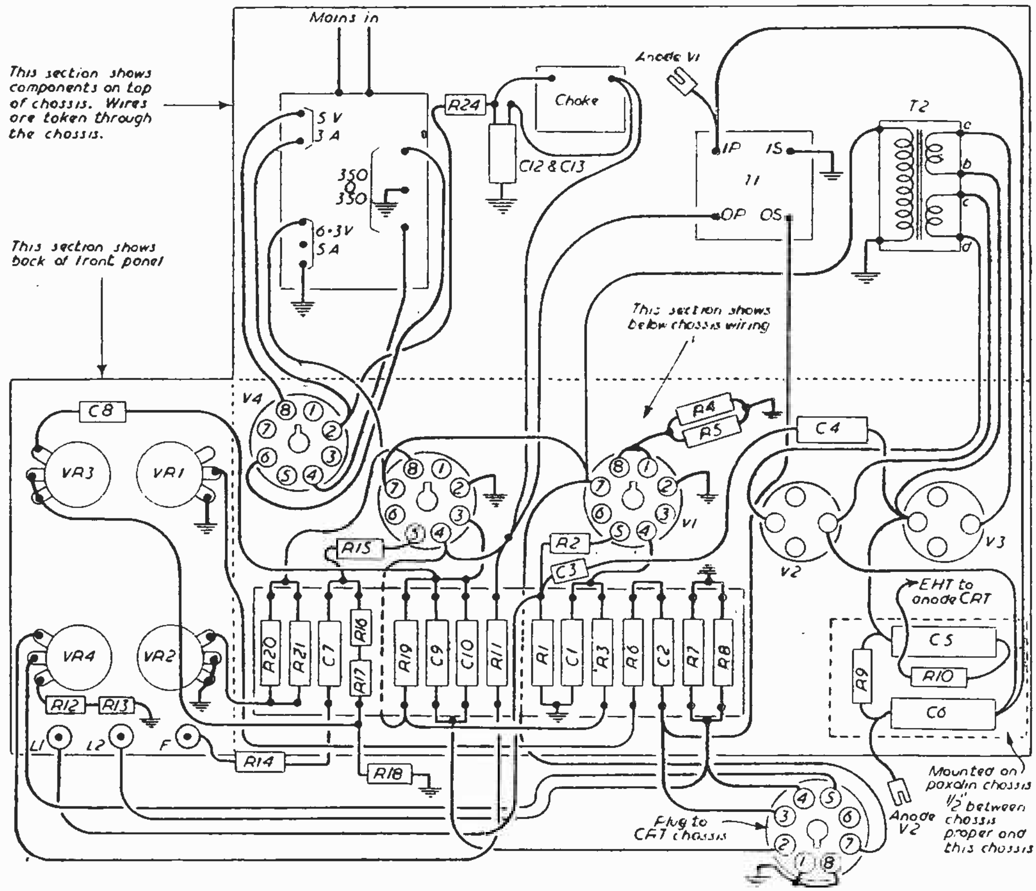


Fig. 15.—Wiring diagram of the unit.

Pages from a TELEVISION ENGINEERS Notebook

7.—I.F. AMPLIFIER COUPLINGS

ALTHOUGH the I.F. interstage coupling for home-constructed televisors has, in the main, taken the form of the single-tuned stagger circuit, most of the other common systems can be incorporated by the amateur and in many cases a greater gain can be obtained for a given number of valve stages and requisite bandwidth. Tuning, however, is generally more critical with other forms of coupling, even when a signal generator is available, and a visual indicator consisting of an oscilloscope and wobbulated oscillator is the most satisfactory means of obtaining accurate alignment.

This latter fact alone has tended to popularise the stagger-tuned single coil type of coupling for the home constructor, and most amateur receivers employ two or three staggered circuits with a final single over-coupled transformer stage at the detector. This method assists in obtaining a wider and more uniform response curve when the number of I.F. stages is restricted to three, and the overall alignment is a comparatively simple procedure, only a signal generator being necessary.

Transformer Couplings

The systems of I.F. coupling found in commercial designs take the form of single-tuned staggered circuits or double-tuned bandpass and over-coupled transformers. Transformer coupling will give a greater gain than any system of single coil tuning, and this form of coupling is therefore most popular in commercial receivers where the number of I.F. stages is usually restricted to two. Fig. 1 shows the various forms so far mentioned, together with one or two modifications for particular purposes.

With any form of transformer coupling, as at Fig. 1(b), there are the following obvious advantages: the output and input circuits of the stages concerned are effectively isolated, the need for a coupling condenser and resistance is eliminated; and as a result of the very low time-constant of the grid circuit, strong interfering pulses do not choke or seriously impair the gain of the stage.

The method of winding over-coupled transformers for vision receivers is often that of the bifilar form, this construction being a pair of coils that are actually interwound with each other; sometimes one winding is wound directly on top of the other, a thin layer of waxed paper being inserted between the coils. The end result is the same, the very close proximity of the coils producing a transformer with a coupling approaching unity. The completed component is then effectively a single coil having the same characteristics of resonance as a single layer unit, only one tuning core being necessary.

The response curve of such an over-coupled system, however, is vastly different from that of a single-tuned circuit; Fig. 2(a) shows in full line the double humping that occurs whenever critical coupling is exceeded. The broken line is that of a single-tuned circuit.

As the coupling between two circuits is increased, the response curve, which is a single sharp peak for very loose coupling, broadens and flattens at the top and just at the point where two humps are beginning to appear, the circuits are said to be critically coupled. Fig. 2(b) shows the effect of the changes in coupling in this way. Two tuning

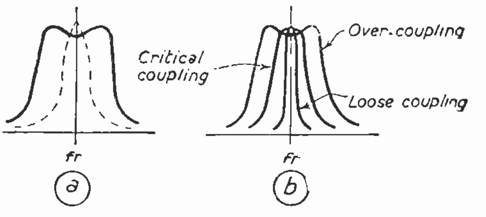


Fig. 2.—Response curves showing the effect of different degrees of coupling.

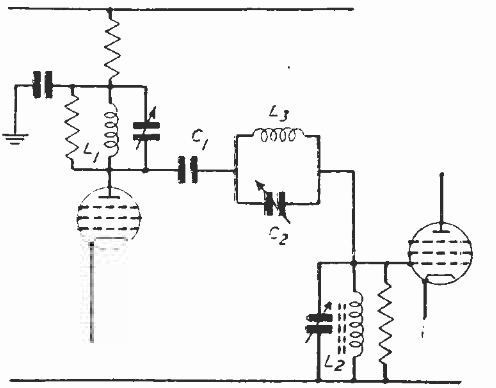


Fig. 3—Coupling using 3 coils made up as shown in Fig. 4.

cores are used when the circuits are under-coupled, or only just exceeding critical coupling.

Bandpass Couplings

Coupling in a circuit such as Fig. 1(b) or (c) is, of course, obtained by means of the mutual inductance between L_1 and L_2, which provides a coupling impedance that is common to both circuits. The same results can be obtained from such a circuit as Fig. 1(d) where the coil L_m provides the necessary coupling between L_1 and L_2, these latter not being in physical proximity to each other, i.e., no mutual coupling. The value of L_m can be made equal to the value of mutual inductance between the windings of Fig. 1(c) when critical coupling is achieved, and the end result is the same in both cases. Using such a coupling coil as L_m has an advantage of facilitating control of the actual amount of coupling, as it is generally easier to tune this inductance than it is to physically alter the spacing between the coils of Fig. 1(c) to change the mutual inductance.

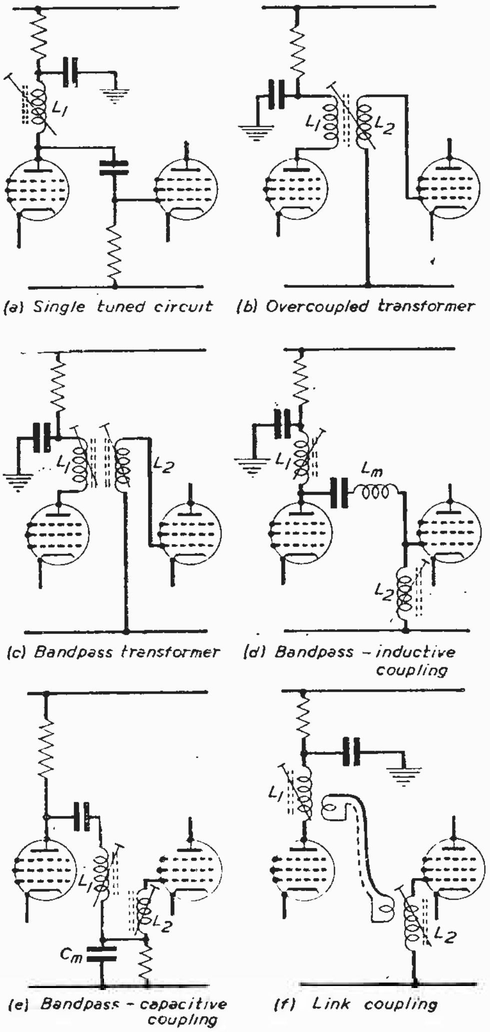


Fig. 1—The various types of interstage coupling.

Capacitive coupling can, of course, be employed

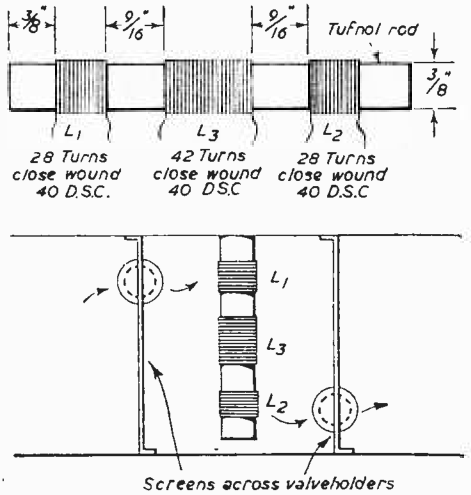


Fig. 4—Details of coil construction and mounting for the arrangement shown in Fig. 3.

between the two circuits as shown in Fig. 1(e), but there is a reduction in the stage gain, other things being equal.

Link Couplings

It often happens that there is a considerable physical spacing between two stages in a television receiver due to economy of layout or other factors, and a form of link coupling then becomes necessary in order to couple the circuits concerned to each other. Such physical spacing most generally occurs between the mixer and the first I.F. amplifier, and a length of coaxial line is used to bridge the gap.

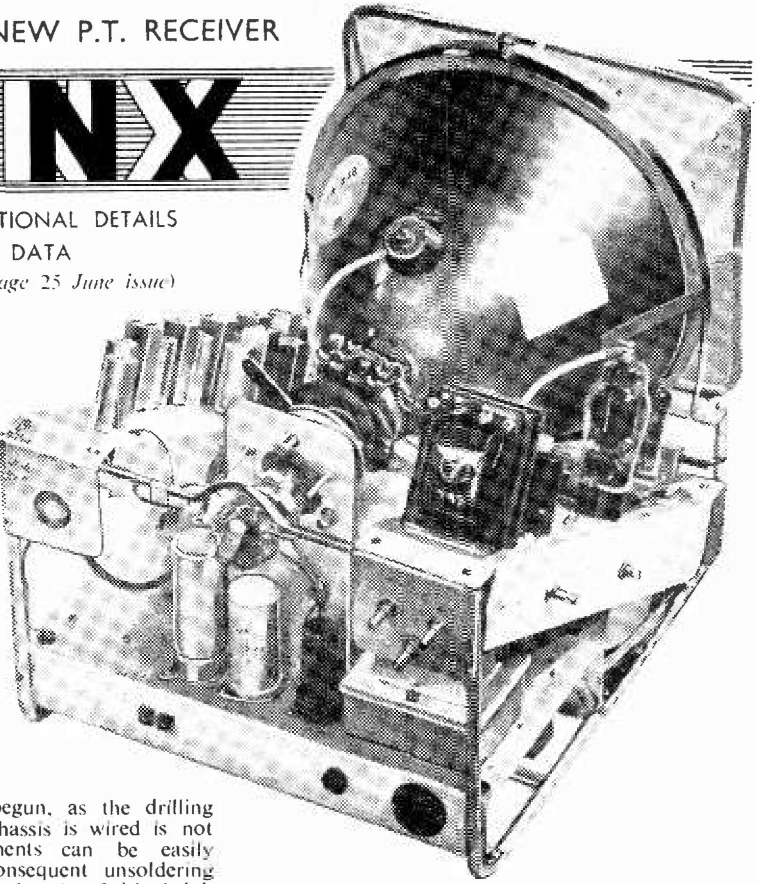
Obviously, such a line cannot be connected directly across high impedance points such as anode and grid connections as the capacity, probably some 20 to 30 pF per foot run, would shunt these impedances. The capacity is neutralised by the use of low-impedance coupling coils (two or three turns overwound on the main inductances) at either end of the cable, so presenting the proper terminations. Such a link, Fig. 1(f) showing the general arrangement, tends to minimise the possibility of break-through of adjacent signals as only resonance signals will be transferred. There is negligible loss of signal over such a coupling link, but the capacitive loading reduces the reactance of the mutual element that controls the coupling between L_1 and L_2, and hence the bandwidth is restricted. This can be compensated for in practice by the expedient of staggering the tuned circuits slightly towards the opposite extremes of the pass-band ; this leads to a reduction in gain, but this can in general be tolerated.

Link coupling is common practice between pre-amplifiers and the input terminals of the main television receiver.

(Concluded on page 88)

THE NEW P.T. RECEIVER

The LYNX



FURTHER CONSTRUCTIONAL DETAILS AND COIL DATA

(Continued from page 25 June issue)

EARTHING is made across to a tag under one of the fixing bolts in cross member (a).

The completed strip is screwed to the two horizontal side rods by two 6 B.A. bolts and nuts at each side, as shown in Fig. 4.

Assembly and Wiring

When the construction of the main framework has been completed, and the three main chassis fitted and checked for fixing, etc., as already detailed in the previous article, the actual assembly of the components and the wiring can be commenced. It cannot be over-emphasised, however, that all fitting work should be completed as far as possible before wiring is begun, as the drilling of additional holes when a chassis is wired is not only awkward, but components can be easily damaged in the process. Consequent unsoldering and replacement tends to make the finished job untidy and, in addition, adds to the time and cost expended in the construction.

The order in which the separate chassis are wired is immaterial, but it is as well to work methodically, completing one before turning to another. This lessens the possibility of wiring errors.

The chassis requiring most care and patience in wiring is the vision-sound strip, and a layout and wiring diagram of this unit is given in Fig. 1. Nearly all the underchassis wiring is shown here, together with the essential measurements of valveholder spacing, etc. All holes are ⅝in. diameter with the exception of V2 which is ¾in. The drilling details for the Haynes screened coil bases are given in the inset, these being positioned exactly between the valveholders where indicated. Note that L16 has only two outlet holes, this coil being a prepared polystyrene type screened by a shortened can.

The underchassis dividing screens are made of 20 s.w.g. aluminium sheet, bent and drilled as shown in detail in Fig. 2. The positioning of these screens is shown in the layout figure, bolting to the main chassis being with 8 B.A. nuts and bolts.

Wiring should be carried out with regard to both the main theoretical diagram (Part 1) and the layout figure. Although nearly all wires are shown on the latter, the wiring to C12 R13 is left out for clarity (a tag strip is mounted on the side wall for these components), and the incoming aerial lead to C1 is not indicated for a similar reason. It is essential for all wiring to be short, and the earthing points should be used as the drawing indicates.

The heater run is kept well into the bend of the chassis throughout, but the H.T. rail is made up of stiffish bare wire (18 s.w.g.) and is run so as to stand about 2in. above the chassis: resistances R17, R13, R8, R7 and R3 then pass down to their respective valve pins or points of connection. Care must be taken to ensure that this H.T. rail does not short-circuit to the dividing screens.

Other points of note are: the coils L5, L14 and L15 are mounted horizontally, and should clear the chassis by about ⅛in., the screened lead from R12 to the contrast control should be cleated to the chassis wall, as shown, to avoid accidental shorting to other parts: the aerial coaxial input lead should be similarly cleated along the outside of the opposite chassis wall: all outgoing leads, heater, H.T., etc., should be left of adequate length for the time being.

The Coils

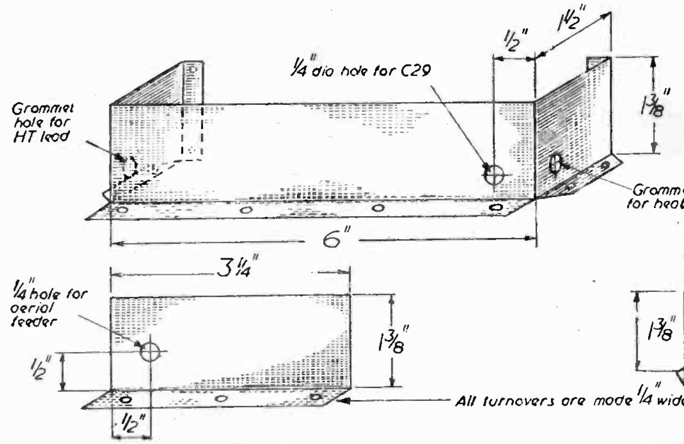
The coils are wound to the details given in Fig. 3 and the winding table. The assembly of the coils is self evident, and details have been given in other articles. The coil end numberings shown correspond to the numbers given on the theoretical circuit diagram and also to the coil base numbers: no difficulty should, therefore, be experienced in this direction.

I.F. transformer L17-L18, has the tuning condenser(s) mounted in the screening can.

Condenser C8 which is 6.8 pF shunts the oscillator coil only for the London frequency; on all other channels it is omitted.

Time-base chassis

The time-base chassis is similar in construction to the vision strip, except for dimensions of width and



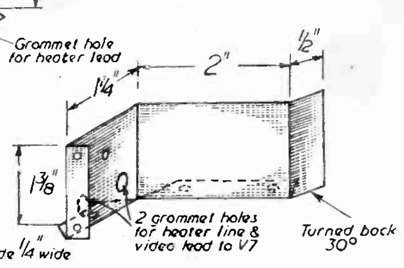


Fig. 2.—Details of the underchassis dividing screens.

Three condensers are mounted in the L8, L9 and L10 L11 coil cans, and some care is necessary in mounting these. A spare eyelet in the top bakelite plate is used for the C14 to L9 and C19 to L11 connections, and both C13, C15 and C18, C20 should be of the flat silvered-mica variety so that they can be accommodated in the space between the side wires without the possibility of shorting to the cans when these are fitted. The can fixing lugs are bent under the base when the coil is completed and two fixing bolts secure both can and former to the chassis when mounted. Where brass cores are specified, 0 B.A. brass studding is cut into ⅜in. lengths and slotted for a screwdriver at one end.

The oscillator coil is made from ⅜in. diameter polystyrene rod, the fixing being by a 6 B.A. tapped hole at one end. Trimmer C7 is embedded into the polystyrene by careful heating of the support, and short lengths of 16 s.w.g. wire are similarly pushed through the former to provide end anchoring and the tapping point of the main winding.

The sound take-off and first trap coil L16 is wound on a length of ⅜in. polystyrene which is threaded to take an iron slug. The polystyrene is tapped throughout its length and the base is made from a piece of ⅛in. thick paxolin sheet into which the former is pushed and glued. Fixing holes (2) and coil end outlet holes (2) are drilled in the base to the same dimensions as the Haynes coils, and one of the Haynes screens is cut down (length about 2in.) and shaped at the bottom to cover the coil. This lower coil screen is necessary to clear the tube bulb when the chassis is mounted in position. This coil, and also the sound

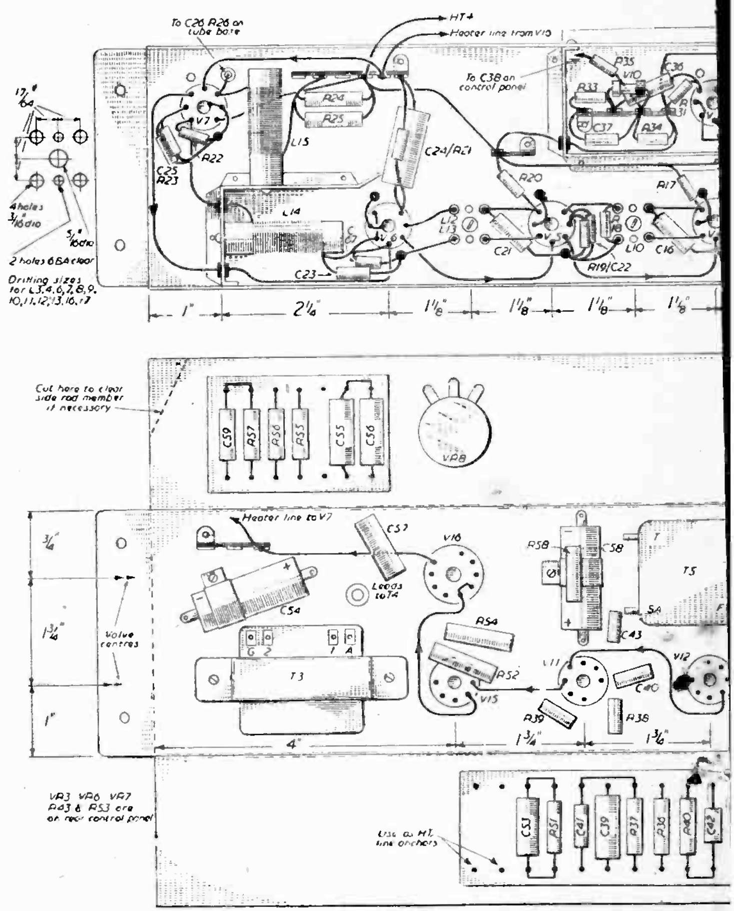


Fig. 1 (top).—Layout of the vision-sound strip, with wiring

depth. The wiring is not so important in this unit, and provided the general component layout shown in Fig. 4 is followed, no difficulty should be experienced. The principal dimensions are given in this figure, and the heater wiring run is shown, together with the layout of the two tagboards which are mounted on opposite walls, standing off from the latter by about ¼in. to avoid the possibility of short-circuit.

The line transformer T6 is mounted below the chassis, and five holes are drilled in the chassis to allow the terminal row to pass through to the upper surface. The actual transformer should be used as a template for this, the fixing holes also being drilled for this component. The large side terminals should clear the side wall easily.

Condenser C50 has its negative pole connected to the H.T. positive line, and if this component is metal cased, this case *must* be insulated from the chassis, preferably by use of an Insuloid clip.

Above chassis is mounted the frame output

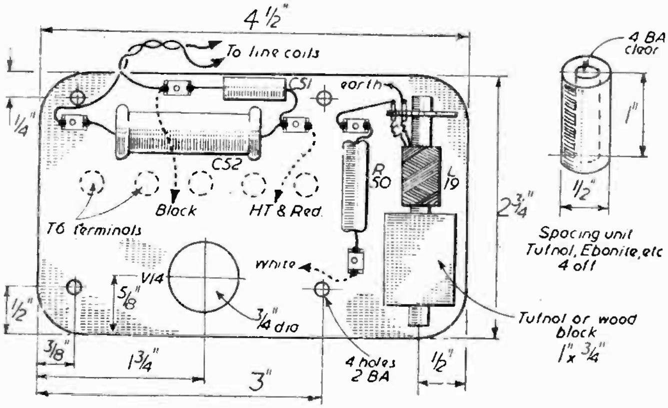
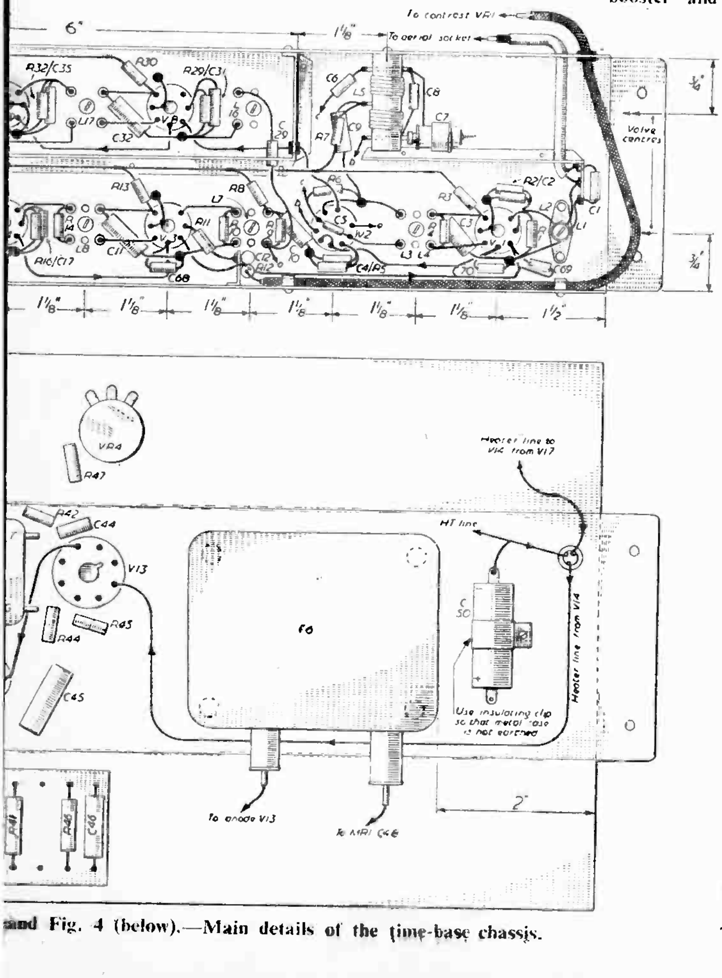


Fig. 5.—Paxolin or bakelite panel which is mounted above to carry booster and width control components.



and Fig. 4 (below).—Main details of the time-base chassis.

transformer (at the rear end as the photographs show), and above the line transformer terminals at the other end is mounted a bakelite panel carrying the booster diode V14, R50 and the width control choke L19, the D.C. blocking condenser C52, and C51 if this is used. Fig. 5 shows the dimensions and layout of this panel, which is made from ⅛in. paxolin sheet. The fixing holes are the same as those of the line transformer, and the bolts securing the latter are used to support the panel, a bakelite or tufnol spacer of the given size being used at each corner to act as a stand-off. The wiring under this panel across to the line transformer terminals is carried out in flexible, well-insulated wires, enough length being used to permit easy connecting, but not enough to create a bunched untidy tangle when the panel is bolted down. The terminals concerned are colour coded Blue, Red, Black, Green and White, and the main circuit diagram shows the connections to these; the other end of the Width winding (opposite to White) is internally earthed to the transformer case.

The Width choke is mounted in a tufnol or hard-wood block measuring ¾in. x ¾in. x 1in. as shown, being wedged into the block firmly, the block itself being bolted to the panel from below by a couple of countersunk 6 B.A. screws. The valveholder of V14 is non-skirted.

At the rear end of the time-base chassis three controls, namely VR3, VR6 and VR7 are mounted together with resistances R43 and R53. The layout of these will be given later. When wired to the main unit, the connecting leads are cut so that there is no more than about an inch or so spare lead between the units. This enables the unit to be fitted to the framework over the rear panel, and bolted down, after which the wires can be tucked in out of sight. Care should be taken to ensure that no shorting occurs between the panel components and other parts, such as C54 or T3, on the main chassis. Space here will be rather limited.

Power Chassis

Little need be said about the power unit chassis; the main dimensions and drilling details will be given next month together with the positions of the components. The wiring is not critical in any way, and the general directions of the chief runs will be shown.

The leads that pass through grommeted holes as indicated are bound into cable forms and are taped to the convenient bars of the main framework until their points of connection are reached.

(To be Continued)

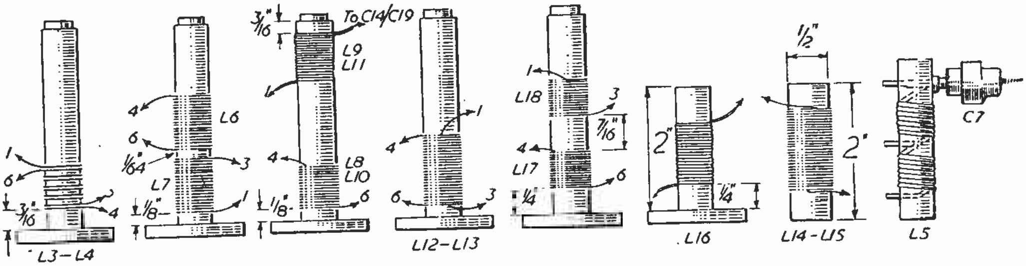


Fig. 3.—Coil data.

Coil	Wire	Turns A.P.	H.M.	K.S.	S.C.	W.	Alignment Frequency	Remarks
L1 L2	36 D.S.C. 36 D.S.C.	1½ 8	1½ 7	1½ 7	1½ 6	1 5½	Vision Carrier	L2 winding spaced by diameter of wire. L1 interwound with L2 at earthy end. Former ¼in. diameter.
L3 } L4 }	32 D.S.C.	7	6	6	5½	5	Vision Carrier Minus 2 Mc/s.	Bifilar wound, each coil side by side but turns spaced by diameter of wire (except S.C. and W. which are close wound).
L5	20 enam.	12	11	10	9	9	Vision carrier Minus 13.0 Mc/s.	Close wound and centre-tapped. Polystyrene ⅜in. former.
L6 } L7 }	38 D.S.C.	70 45					10.5 Mc/s.	Only L7 is tuned from bottom of former by iron core. L6 has no core.
L8 L9	40 D.S.C. 30 D.S.C.	35 20					12.5 Mc/s. 9.5 Mc/s.	L8 has brass core, L9 iron core. C13, C14 and C15 are mounted in the screening can.
L10 L11	40 D.S.C. 30 D.S.C.	57 20					10.2 Mc/s. 9.5 Mc/s.	L10 has brass core, L11 iron core. C18, C19 and C20 are mounted in the screening can.
L12 } L13 }	40 D.S.C.	60+60					11.5 Mc/s.	L13 wound over L12 with single layer of Sellotape or waxed paper between.
L16	20 enam.	20					9.5 Mc/s.	Wound on ⅜in. polystyrene former with iron core. Screening can cut down to cover.
L17 } L18 }	36 D.S.C.	25 25					9.5 Mc/s.	Each winding close wound. The 7/16in. spacing gives critical coupling.
L14	40 enam.	220					—	Inductance 210 μH. Paxolin former.
L15	40 enam.	185					—	Inductance 175 μH. Paxolin former.

NOTE: The suppliers of the coil formers and cans (Haynes Radio) have agreed to supply the necessary brass slugs with the G2 kit.

The Radio Components Show

The Marquess of Donegall Gives an After-the-Show Review of Some of the Exhibits

THIS year's Exhibition at Grosvenor House was the tenth of its kind and by far the most comprehensive yet held. It has always been well organised and interesting but it is becoming increasingly important as electronics continue to perform an ever-increasing range of functions with the necessary precision and efficiency.

All electronic equipment being dependent ultimately on the efficiency and reliability of the component, the manufacturers dealing as they do in microseconds and millionths of an inch, within decreasing limits of size and weight while temperature ranges widen, have a heavy responsibility to mankind.

That the importance of this Exhibition has been widely realised was proved by a phenomenal increase in visiting foreign experts and buyers. The number of exhibitors was 120 and exhibits varied from standard commercial products familiar to us to new and highly specialised components recently developed in the research laboratories. Half the total output of the industry is exported either as loose components or in complete equipments.

Much has been written on account of the impending expansion of television about the 12-channel tuning unit for television receivers. A set fitted with this device will permit a viewer to change his sound and vision to any of 12 frequencies.

This is the first multi-channel tuner made in Britain and is adaptable to very high frequency and ultra-high frequency. It will also enable British manufacturers to enter the American market without buying special tuning units from that country.

Let us now run through a few of the exhibits that I found interesting.

Capacitors

In the field of capacitors the electrical properties of plastic film were being used in new metalised polystyrene capacitors which are now said to be comparable in size with the old paper dielectric types.

There was an improved electrolytic capacitor using Tantalum metal in a neutral electrolyte which gives improved reliability and shelf life and miniature metalised paper capacitors are now made to withstand a temperature range from minus 100 centigrade to plus 120 centigrade.

Aerials

Among the aerials there was a revolutionary type of telescopic rod car aerial giving a wide range of angular adjustments to be fitted at any convenient point on the car, by Antiference, Ltd., and Belling and Lee showed a range of television aerials for American and Continental standards.

There was a new loudspeaker drive unit and horn to improve communication at airports and other large control areas. It has a peak power handling capacity of 120 watts and is fitted with a multi-ratio transformer. This was shown on the Tannoy stand.

Sundries

New moulded magnetic materials have been added. Magnadur is a permanent magnet material of ceramic structure combining high coercive force with high insulating properties. It is said that it can be used where the presence of Eddy currents has previously prevented the use of permanent magnets (Mullard).

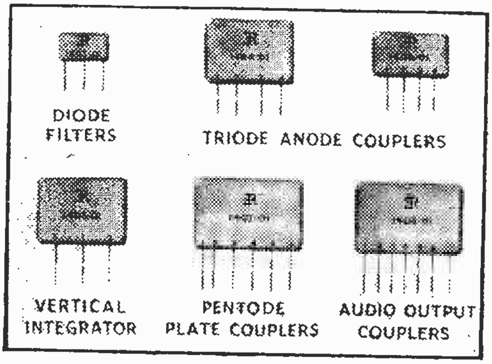
We now come to valves and a new range of 25 mA miniature valves for battery-operated broadcast receivers was interesting, as were the two flat 10 mA sub-miniature valves for hearing aids. Low noise, low hum and freedom from microphony is claimed by Mullards for a high-gain pentode on an all-glass 9-pin base.

Several manufacturers including Diamond "H" Switches and A. F. Bulgin showed improved small switches for mains operation and circuit control. Among these was a new 3-amp. totally enclosed toggle switch and a new D.P. snap-in toggle switch and a range of micro-sensitive switches of reduced size and increased sensitivity.

Many components were said to be the smallest of their kind in the world. One was a sub-miniature volume control with on-off switch for hearing aids. Its diameter was about that of a shilling, by Egen. A midget attenuator was a 21-step fader with scale indicator built into the control knob—1$\frac{1}{8}$in. in diameter (Painton).

Multicore, who again provided visitors with their useful cardboard folder for collected literature, have produced a solder that can be used with an ordinary match.

Almost every stand showed examples of moulded plastics, and other aids to mass-production were ready-made circuits of standard type used in television receivers in the form of printed components on a ceramic-base plate, the whole enclosed in a protective coating and provided with leads for soldering to the remainder of the assembly. These circuits developed by Erie Resistor, Ltd., include anode couplers,

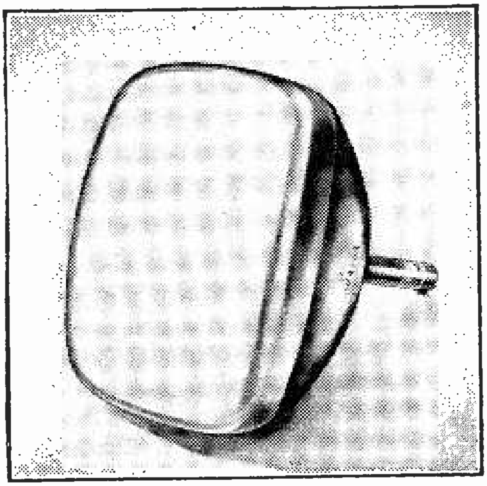


A group of the Erie printed circuit components which will play a large part in modern design.

diode filters and an integrator for scanning circuits.

Unusual types of moulding were those including materials such as mica or glass by Mycalex. They have recently developed a moulding for use in connection with jet engines to withstand a continuous temperature of 400 centigrade. Thermo-plastics, Ltd., had a glass-fabric laminate for special strength and chemical resistance, and Micanite and Insulators have a silicone-bonded hard micanite in sheet and tape form.

There were many new types of plugs and sockets for mains connectors, although I would personally have thought that there were too many varieties already. Also for aerial connectors and inter-chassis connections.



The new Mullard MW43-64 tube. This has a 17in. face and is fitted with a pentode gun.

Speed in assembling components has been taken into account by the use of special fastenings and screws. Standard screws and nuts were supplemented by recess-headed and self-tapping screws. Simmonds Aerocessories, Ltd., in addition to their famous "Spire" speed-nuts, have produced knob-clips and coil-supports for simplifying assembly.

Television Tubes

As might be expected there was a wide range of components for television receivers. Notable among these were cathode-ray tubes with rectangular screens by Mullard, Ferranti and Mazda.

Towards the thorough testing of components and assemblies, Goodmans Industries showed a new model vibration unit which has a total force output of 300lb. for use in the testing of complete equipment.

The largest exhibit was Goodmans' heavy-duty vibrator generator for testing car-chassis, aircraft fuselages or guided missiles under any conditions of vibration. The loudest exhibit was, of course, the Tannoy speaker, equivalent in volume to 20 speakers of previous design in its own size.

The most unexpected exhibits were gold-plated components for contact resistance to avoid the blackening to which silver-plating is subject. The most exclusive was ribbon microphones which only we British can mass-produce.

The Ministry of Supply showed plastics which, having been cooked in the atom-pile at Harwell for a few hours, emerge as virtually new materials. Varying with the amount of irradiation they become stronger, withstand corrosion and can be boiled in water without damage for hours on end.

Plastics treated in the atom-pile offer interesting possibilities. A piece of treated plastic, if heated until it becomes malleable, can be pressed or twisted to any shape and will retain this form when cool. However, if heated again, it "remembers" its former shape and reverts to it. Thus, it may be possible to produce "tailor-made" plastics to suit individual customers.

The Atomic Energy Research Establishment for Civil Defence has produced a new atomic radiation-checking instrument; it is self-contained, measuring 9in. by 3¾in. x 6in., weighing 9lb., and is carried slung over the shoulder in something resembling a war-time military gas-mask case.

The Ministry of Supply's Signals Research Development Establishment showed a new front-line "Walkie-Talkie" measuring 6in. by 4in. x 3in., weighing 2lb. The battery which is carried separately weighs 4lb.

This "Walkie-Talkie" has a range of one and a half miles and was designed for use by men without experience of wireless operation.

To conclude, let us note the progress that has been made by the Radio and Electronic Component Industry over the years. The Industry is producing about two and a half million parts every working day. In 1939, over 90 per cent. of the products of the Industry were used in domestic radio and television receivers, whereas in 1952 many more receivers were made, but they absorbed only 40 per cent. of the output. In fact, half to-day's output is exported.

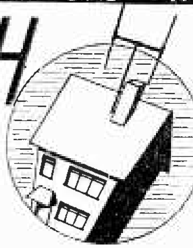
The value of the export of loose components in 1952 was £7.8 million; nearly a third of the value of the exports of the whole of the British Radio Industry; and these figures do not include valves, which, in 1952, were exported to the value of £3.6 million.

Figures of post-war exports of the Industry in millions sterling were: 1946—7.8, 1947—10.2, 1948—11.8, 1949—12.5, 1950—19.7, 1951—22.1, and 1952—24.5. I think all will agree that this growth is a most remarkable achievement in a mere seven years.

It is also interesting to note that India is our largest customer, followed in order by Brazil, the Netherlands, Australia, New Zealand (£400,000 in 1952, being a very high figure for so small a population—equal to the United States or South Africa), Sweden, Belgium, Canada, Malaya, Eire and, by far the least, Argentina with £95,000.

TELEVISION PICK-UPS AND REFLECTIONS

UNDERNEATH THE DIPOLE



By Iconos

BACK PROJECTION

ONCE more this trick background process comes into prominence. Stereopticon (or "magic lantern slide") back projection has been used a great deal at the Lime Grove Studios. Many of the backgrounds have been excellent and the illusion has sometimes been perfect. Occasionally the trick is betrayed by faulty foreground lighting on the artistes standing in front of the screen, and sometimes the lantern slide has appeared flat and hazy. This is usually due to the background plate being photographed in unfavourable light. Producers are apt to take the process for granted. The fact is that the background plate must be photographed under the best possible conditions only, enabling a "robust" and crisp negative to be obtained. The position of the sun is important. A flat, dull scene is generally useless. Nevertheless, the BBC still cameraman often has to shoot plates under bad conditions. However, in the course of time, a library of really good plates will be built up, from which the producer can select his background scenes, when the old magic lantern is called for.

In another category is moving background back-projection in which a film is projected upon a screen behind the artistes. Most popular use of this is for the moving backgrounds of the passing scenery seen through the windows of a train or car. The BBC have recently purchased a Walturdaw "5" projector (made by the precision engineering firm of Moy) which they will use for this purpose. This particular machine is a solidly built job, rather noisy, but capable of projecting an extremely steady picture. It has the additional advantage of having a water-cooled gate, thus enabling a very powerful light to be put through the film without causing warping or distortion of the film base. The intermittent movement is a large Maltese cross which pulls down the picture on a sprocket. For back projection purposes, it is usual to utilise the more intricate claw pull-down with register pins entering the perforations when the film is at rest. Such a movement is extremely steady, but there is little or no tolerance for any shrinkage of film base and consequential change in pitch of perforations. The sprocket gives more tolerance but—in most cases—less steadiness. Nevertheless, the BBC have wisely decided upon a type of machine which will cope with all kinds of film—whether fresh from the laboratory or an old piece from the film vaults.

WIDE-SCREEN TV

FOLLOWING on the heels of the 3-D craze in America comes the pseudoscopic wide-screen panoramic craze. This is boosted as yet another means of combating the effect of TV on cinema box office takings. One of the panoramic systems compresses optically a picture with 8 x 3 proportions into one of 4 x 3 on the film, and re-expands it, also optically, into the 8 x 3 proportion again on projection. A wide and slightly curved silver screen is used, and the projector has a very powerful high-intensity arc. The compression, rather like distorting mirrors in a fairground, makes fat people thin and all objects are horizontally foreshortened on the film by the use of a cylindrical lens on the front of the camera lens. The same thing, of course, could be done with a television camera for any kind of projection TV, though a lot of light would certainly be required for large-screen TV. Conversely, television cameras could be used for compressing the picture on to a telecine recording camera. It seems to me to bring the use of the electronic camera very much nearer for usage in covering newsreel events, film production and instructional films. Perhaps one of the new sponsored stations will exploit wide-screen pictures.

TWO ZOOMS

THEN there is the Zoom lens which two British manufacturers have been working on independently and both of which have found their own special answers. These enable the focal length of the lens to be varied continuously by means of a lever or wheel while the TV camera is in use.

Long shots of huge scenes can be narrowed down to close-ups, e.g., the camera appears to fly through the air from a long shot view of, for instance, London traffic, to a close-up head of a policeman controlling it. It gives a peculiar magic carpet effect, quite different from "tracking" a camera in—which, of course, is only possible on staged set-ups. In Zoom lenses, British manufacturers seem to lead the world and a new and valuable export to the dollar area has been created.

AMERICAN HUSTLE

THE contrast between the British and American temperaments is reflected in the progress of television (and public reactions to it) more clearly than in any other field. In some respects, our cautious approach has had many advantages. Over here, slowly but surely TV passed from its low-definition to a high-definition stage, reaching a point in 1936 where it was considered good enough for a public service to be operated.

In 1937, the foundations of a full public service were laid, without very much fuss or excitement, and the number of viewers rose slowly from a very few thousand to a hundred thousand or so. Without the advantage of the BBC's financial resources to tide over the initial teething stage, American television lagged behind.

But after the war the Americans got going with competitive TV services, and public enthusiasm was speedily whipped up. Millions of television sets were quickly sold and in the space of a few months the new medium became the most powerful informational influence in the country. Soon an American politician's reputation could be made (or broken) in a few minutes by his performance before the TV cameras. His appearance, his mannerisms, or the way he patted a little dog's head, might influence thousands of votes, one way or another. The way he "put over" his policy rapidly became more important than the policy itself. The goodwill associated with first-class programme material was quickly appreciated by national advertisers, who did not take long to evolve a discreet method of "planting" the name of their products. They were successful to such an extent that TV began to overtake the cinema as the most popular form of entertainment. Only the finest films could compete with TV in the home and a large number of smaller cinemas were forced to close down.

3-D AND TV

BY contrast, TV competition has been felt less by the cinemas in Britain, and the weekly or bi-weekly visit to the "flicks" has persisted. Perhaps that is why the various technical stunts such as 3-D, wide screen and the like, are looked upon by American film people as a "shot in the arm" for their box offices. Having exhausted the range of horrific subjects to which the three-dimensional principle (requiring polarised spectacle viewing) seems suitable, the producers turn to wide or super large pictures in colour—in fact, any shape or size which makes the home TV screen look small by comparison. It is pretty hard upon the people in the very front seats, who have to put up with poor definition and graininess, together with the enlargement of scratches and other imperfections—but it is something new and is catching on quickly. Screen shapes vary from the normal ratio of 1 to 1.3 to such elongated aspects as 1 to 2.6, 1 to 2 or 1 to 1.8—in fact, anything to get away from the hated shape of the TV screen which approximates to the old normal movie shape of 1 to 1.33.

"THE PLAY'S THE THING"

3-D and these other devices are finding their way over here, and the novelty appeal of the polarised spectacle systems is having quite an effect. But, once again, British temperament tends to resist changes from established methods, unless such methods add to the prime task of telling a story. The lack of competitive television services in Britain up to now has also proved a blessing to the film people, who regard the possible introduction of sponsored television here with considerable apprehension.

SLAPSTICK TIMING

ONCE again, slapstick comedy has made its impression on viewers. The names of Jewel and Warris have been on the lips of a good many viewers following their diverting performance in "Return It Up," the crazy comedy series. These talented clowns, together with Arthur Askey, "Mr. Pastry" and Harry Secombe, are in the top bracket of TV funny men. Broad comedy of this kind calls for long experience before that more precise sense of timing is acquired. Timing depends upon audience reaction, and the laughter of an invited audience is an integral part of low-comedy radio entertainment, which is a kind of "4-D." The stage, the cinema, sound radio and TV each call for special treatment in manner of delivering "gags," in speed, emphasis and the pitch of voice.

Not many comics are successful in all the entertainment media. George Robey, always a top-liner in variety and revues, never quite made the grade in films. Tommy Handley, ace comic of sound radio, was much less funny on the variety stage and was positively dismal in films. George Formby Jnr. was highly successful on stage, films and records, but seemed a little out of his depth on radio or in musical shows. Of course, I realise that my taste in comics may not be the same as the next man's, but all will agree that the good hearty "belly laugh" induced by these clowns of slapstick is of great physical benefit—bringing about a peculiar relaxation of the body and sense of well-being which is never achieved with the quiet chuckles of high comedy and smart lines.

COMEDY TECHNIQUE ON TV

IN the days before music halls had microphones and loud speakers, it was the custom for the "straight man" of a comic duo to repeat the questions put to him by the comedian. This was in order that everyone in the audience could really hear what it was all about. Pace was slow and "gags" were of the corniest kind—and yet the comic artistes of the day, Little Titch, Harry Weldon, Wilkie Bard and George Robey, made the utmost out of every situation with the ready interpolation of facial movements, dancing or comedy falls.

Public address in music halls is now rarely used in its proper manner, as an "acoustic reinforcement," with the result that most comedians are forced to deliver broad dialogue and gags almost *sotto voce*, which is amplified a thousand times in volume if not in humour. It will be noticed that my "top bracket" TV comics do not tend to put a soft pedal on their vocal antics. Slapstick comedy and its associated gags are most successful when played in the proper robust manner of the old music hall.

WIND-UP AT EQUITY

IT seems that big-screen TV is causing something of a stir in the British Actors Equity, the much respected union of actors and actresses. At the recent meeting, a delegate from American Equity disclosed that as many as fifteen theatres in one urban area in U.S.A. were fitted with large-screen TV and fed by line circuits with entertainment played on one central studio theatre stage. Another alarming situation was created when films made by actors were used on TV, thus displacing the same actors who might otherwise be employed in the TV studios. Equity, both in America and in Britain, demand that the actors shall at least participate in the additional revenues accruing from the electronic duplication of an artiste's work. Already the American musicians have compelled British firms making films for American TV to use music recorded in America. British Actors Equity is likely to enforce clauses in future contracts which do, at any rate, secure additional payments for their members, in proportion to the number of TV stations covered by this exported talent.

These headaches for promoters of TV films do not come from a body of hot-headed political fanatics, but from a union of professional artistes whose officials are elected by secret postal ballot. They look forward to sponsored TV in Britain as a means of providing more work for their members, with competition between the rival "networks" as a situation encouraging the voluntary payment of higher fees.

"YOU CAN RELY ON US"

METAL RECTIFIERS.—Westinghouse, 14A86, 20/- ; 14D36, 11/-; WX3, WX6, 3/9; 36EHT100, 29/4 ; LT52 (12v. 1½a.), 19/6 ; 1 m.a. Meter, 12/6 ; 36EHT40, 21/6 ; 36EHT45, 23/8 ; 36EHT50, 26/- ; S.T.C. Type K3 100, 14/3 ; K3/45, 9/- ; RM1, 5/3 ; RM2, 6/- ; RM3, 7/-.

HAYNES. — Scanning Coils, S914, S914H, S112, 42/- ; S27, 45/- ; Osc. Trans. TQ132, 13/- ; TQ135, 18/6 ; Feed Chokes LUS8F, 23/- ; LUS6L, 18/6 ; Line Trans., TW6/126, TW5/109, 42/- ; Frame Trans., TK10/41, 38/- ; E.H.T. Line Trans., T27, 132/6 ; T31, 50/- ; Amp. Control, VL5, 12/6 ; Tuning Coil Kit, 20/- ; P/pull Output Trans., TK12/61, 38/-.

"Q-MAX" CUTTERS.—Chassis Punch complete with Key, ⅝in., ¾in., 12/4 ; ⅞in., 13/4 ; 1in., 1⅛in., 1¼in., 16/- ; 1⅜in., 1½in., 17/9 ; 1¾in., 19/9 ; 2-3/32in., 31/9 ; 1in., Square, 24/3.

HUNTS' MIDGET MOLDSEAL CONDS.—.1 mfd. 150v., 1/6 ; .02 mfd. 150v., 1/6 ; .005 mfd. 350v., 1/6 ; .01 mfd. 350 v., 1/6 ; .02 mfd. 600v., 1/2 ; .001 mfd. 350v., 1/3 ; .002 mfd. 350v., 1/3 ; Midget Electrolytics, 32-32 mfd., 250v., 2in. x 1in., 9/- ; 16 mfd. 350v., 4/-.

VISCONOL.—.001 mfd. 6 Kv., 6/- ; .001 mfd. 12 Kv., 10/- ; .001 mfd. 15 Kv., 10/- ; .01 mfd. 6 Kv., 10/- ; .1 mfd. 7 Kv., 20/-.

WAX PAPER.—.1 mfd. 500v. (543), 1/3 ; .1 mfd. 750v. (743), 1/6 ; .05 mfd. 350v., 1/-.

HAVE YOU A SWITCH PROBLEM ?

New switches, 2in. Spindles.

Midget, 2p. 2w., 2/6 ; 2p. 3w., 2/6 ; 2p. 6w., 3/6 ; 1p. 12w., 3/6 ; 4p. 3w., 3/6 ; 3p. 4w., 3/6 ; 1p. 3w., 2/-

Standard Yaxley Type (2 banks), 2p. 11w., 7/6 ; 4p. 5w. 7/6 ; 6p. 3w., 7/6 ; 8p. 4w., 7/6.

Standard Yaxley Single Bank, 3p. 3w., 4/9.

NEW toggle switches (pear-shaped Dolly), SP/On Off, 2/6 ; DP On Off, 2/9 ; SP Change-over, 2/9 ; DP/Change-over, 3/6.

ALL COMPONENTS STOCKED FOR LYNX TELEVISOR

MAINS DROPPERS (New).—.2a. 950 ohms, .3a. 800 ohms, 5/- ; Midget, 6/3 ; Linecord, .2a. 100 ohms ft., .3a. 60 ohms ft., 8d. per ft. ADCOLA Pencil Bit Irons, 200-220v., 230-250v. 25/6.

METAL PACKS.—.25 mfd. 350 v., 2/8 ; .5 mfd. 350v., 3/-.

CERAMIC TUBES.—47 Pf., 1/9 ; 10 Pf. 2/6 ; 40 Pf., 2/6 ; 2 Pf., 1/-.

MOULDED MICA.—.001 mfd., CM20N, 1/6 ; .001 mfd., MWN, 1/9.

PICO PACKS.—1 mfd., 350v., 2 mfd. 150v., 10 mfd. 25v., 20 mfd. 12v., 2/6 each.

ELECTROLYTICS.—100 mfd. 350v., 13/6 ; 250 mfd. 60v., 10/- ; 2,500 mfd. 3v., 6/9 ; 2,000 mfd. 6v., 8/6 ; 2,000 mfd. 12v., 12/- ; 1,000 mfd. 6v., 5/6 ; 500 mfd. 6v., 4/- ; 100 mfd. 25v., 4/-.

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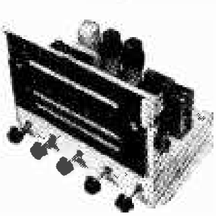

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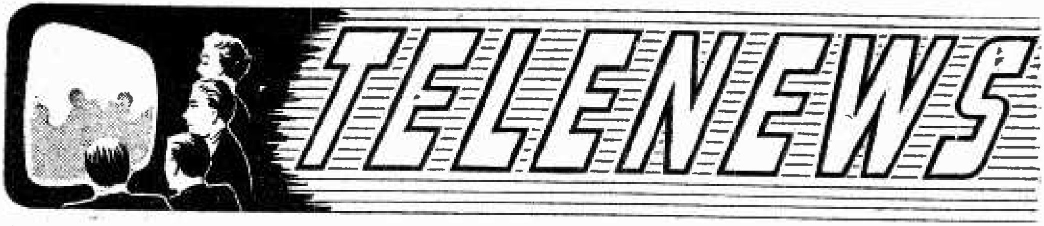


Standby Transmitters

THE BBC announces that medium-power standby transmitters having an output of 5 kW vision and 2 kW sound have now been installed at Sutton Coldfield. Switching is provided so that they can be used with either the main or reserve serial systems.

When the standby equipment now under installation at Alexandra Palace is completed, all stations will be able to maintain the service on reduced power in the event of a major breakdown of the main equipment. The transmitters were manufactured by Marconi's Wireless Telegraph Company, Limited.

Television Licences

THE following statement shows the approximate number of television licences issued during the year ended April, 1953. The grand total of sound and television licences was 12,912,786.

Region	*Number*
London Postal ...	728,980
Home Counties ...	250,816
Midland	473,203
North Eastern ...	246,966
North Western ...	285,057
South Western ...	69,133
Wales and Border ...	81,339
Total England and Wales	2,135,494
Scotland	67,083
Northern Ireland ...	766
Grand Total ...	2,203,343

No Booster

THE BBC has informed Folkestone Town Council that a "booster" station would not improve reception in the East Kent coastal area.

A deputation from Folkestone and other local authorities had been received by the BBC for better viewing, but, as Director-General Sir Ian Jacob pointed out, such a station is only beneficial to an area already within the service area of a transmitter.

Japanese TV Contract

PYE LIMITED, of Cambridge, who were recently awarded a £70,000 TV contract with Belgium, announce that in competition with several other manufacturers, including a number of American firms, they have secured a substantial TV contract for Radio Tokyo.

During the summer three camera chains and the associated control equipment, all of which will operate on the American system, will be shipped to Japan.

Watch First, Wash After

ACCORDING to a recent statement in the House of Commons, there are more television sets in Chicago than ordinary bathtubs.

Advice for Australians

IT is understood that the Australian Government deputation due here to discuss TV programme production costs will have the BBC technical staffs at their disposal for any information they may require.

Set for Children's Home

THE townspeople of Stourbridge, Worcestershire, bought a television receiver for the local children's home, but the county council children's committee refused permission for its installation on the grounds that it might harm the youngsters' eyes.

After a full Worcestershire County Council meeting, however, the committee ruled that the set could be installed provided the warden of the home saw to it that the privilege was not abused.

Japan's television service is rapidly developing and new equipment being bought. Above is a typical scene in a Japanese television studio.

Fee Too Small

THE BBC's request for more full-length, newer films has met a setback. Sir Henry French, director-general of the British Film Producers' Association, has said that the fees offered by the BBC are "economically impossible."

A figure of £1,000 had been put forward for exceptionally good films, but this would inevitably result in a loss for the film makers.

Less Fires Than Five Years Ago

TV receivers have been known to cause fires in the home. In 1947, one set in every thousand caught fire and caused a certain amount of damage. Last year, the rate had dropped to one set in every ten thousand.

Society's Own Transmitter

WITH reference to the details under the above heading in our last issue, we are asked to state that the Television Society's 625-line transmitter is being built primarily for the benefit of amateurs requiring a radio test signal conforming to the Continental standard and will transmit a standard test pattern. The "broadcasting of sales propaganda programmes to the Continent" mentioned has never been contemplated.

The Society has no intention of competing with present or future entertainment programmes and its only interest is in the improvement of television technique.

Interference Tracked Down

FOR some time in the small Sussex village of Storrington, the viewers had been troubled by interference dots and flashes on their screens which usually began at 8.50 p.m.

Investigations failed to uncover the source of the villagers' irritation until it was eventually discovered that local council employees had been working late adding up on electric counting machines.

Ulster TV

IT is learned that the permanent transmitter to be erected on Divis Mountain in Ulster will be five times as powerful as the temporary station at Glencairn.

The primary function of the Glencairn station was to provide a service for the people of Belfast in time for the Coronation. The permanent transmitter will cover almost the whole of Northern Ireland as far as the Sperrin Mountains.

"Bounced" Signal

THE viewers in Arley Road, Saltley, Birmingham, are now able to receive an excellent picture from Sutton Coldfield after many months of bad reception.

The rising and falling of adjacent gasometers which stood directly in the path of the signal had been the cause of poor reception. The set owners then found that by turning their aerials to face a church tower, they received a "bounced" signal and their difficulties were solved.

Work in Cotton Towns

CONSTRUCTION of a new factory in the "slump" area of North-East Lancashire begins soon. Although backed by the Government, it is being set up by Mullard, Ltd., for the manufacture of cathode-ray tubes.

A site at Simonstone has been selected, within easy reach of four of the worst hit "dole" towns, and, once full production is under way, employment for 1,200 will have been found.

Suppression Campaign

BELLING AND LEE, LTD., have recently introduced the "Sparkmaster" to the motoring public, a suppressor finished in bright red plastic costing 2s. for the cut-cable model, 2s. 6d. for screwing into normal distributors.

Buyers of the suppressor are supplied free of charge with a windowscreen transfer badge bearing the words "Friends of Television."

A New Invention

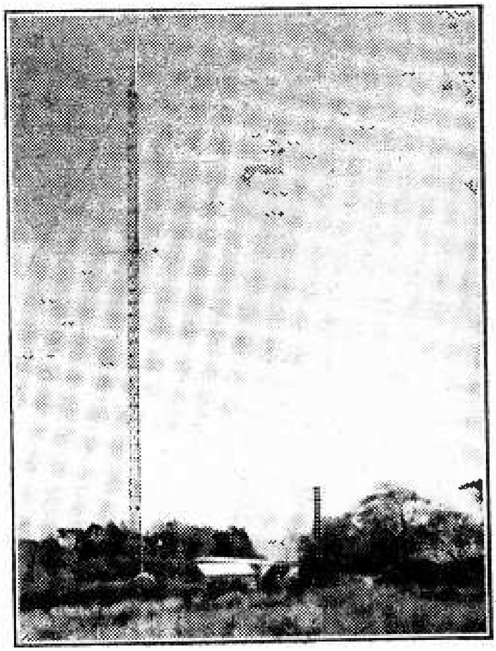
IN order to use the very latest TV invention of the BBC's own research engineers, scores of producers will have to go to a TV school again! Beginning in the summer, British viewers will see startling effects on their screens when a hush-hush TV gadget costing nearly £10,000 is used.

The new gear enables a producer to "punch" holes in a television picture and to place a second picture neatly in the holes thus made. This will mean a real saving in scenery—and dramatic shocks for viewers. Until now "ghost" effects and other camera tricks have been done by the superimposition of one camera on another.

The new process, called "Inlay," will enable actors to appear to speak from aeroplanes, buses, etc., simply by standing alone in a TV studio. Postcard-size photographs of backgrounds or "props" will be fed into the new machine. So will "live" TV pictures of the artists. A touch of a switch and viewers will gasp at the weird effects produced on their screens.

Colour in 1955?

MR. FRANK FRIEMANN, a leading American radio and television manufacturer, has stated that colour television sets for the home would not be available for at least two years and even then they would not cost less than £350.



The 235ft. mast with 23½ft. single-stack super turnstile aerial, horizontal polarisation, which Marconi's Wireless Telegraph Co. Ltd. erected at Glencairn Road, Belfast, in time for the Coronation.

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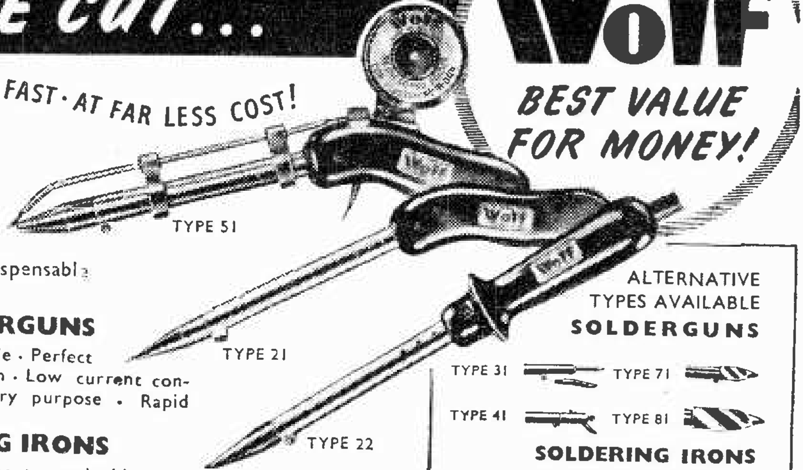

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CORRESPONDENCE

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).

SIGHT-STRAIN

SIR,—I feel that I cannot allow the article, "Television Sight-strain," in the April issue, to pass without comment. This article is sub-titled, "A Controversial Point of View," but this would have been a little more correct had your contributor provided some solid material for controversy. As it is, he has contented himself with asserting several times that there is strain in viewing, but has not given any reason why this should be so.

I do not think that the majority of regular viewers would agree with this assertion, unless possibly they habitually view in total darkness, as your contributor appears to assume. Even when viewing is done under these conditions I doubt that the amount of eye strain is as wide-spread as your contributor asserts.

It would have been more helpful had your contributor drawn comparisons between the different types of fluorescent screens met with on direct viewing tubes, e.g., white, blue, sepia, etc.; the effect of the various dark filters which are available; and between direct viewing receivers and projection receivers. To lump all these together under the assertion that all give rise to eye strain is, I feel, entirely misleading, and I am sure many of your readers will agree.

If, in spite of the oft-repeated advice to view in a soft ambient light, viewing is done in total darkness, eye strain can at least be expected. Furthermore, if in addition to this the brilliance of a directly-viewed tube is turned excessively high the possibility of eye strain becomes a probability, but how many sensible viewers do, in fact, view under these extreme conditions?

Some viewers prefer projection receivers because they believe that the "softer" picture produced is more restful to the eye, and this may be so, although I believe the restfulness is more likely due to the lower intrinsic brilliance of the picture produced by such receivers. These receivers are also usually (or should be) viewed from a greater distance than the 9in. or 12in. direct viewing receivers and this probably also reduces eye strain (see below).

The size of the picture plays some part in the amount of eye strain experienced, but the question of screen size is also bound up with the distance from which the picture is viewed. Personally, I have viewed a 9in. screen for a considerable period and have not found that this is any more liable to cause eye strain than viewing a larger screen, but there is a tendency with the smaller screen to sit too close, which might be liable to cause eye strain. The distance recommended for comfortable viewing has been stated to be eight times the height of the screen, and with a 9in. tube this works out in the region of 5ft., and with the 12in. tube in the region of 7ft., and these are probably the minimum distances at which viewing should be done. There does not seem to be any need to sit closer and, in fact, the illusion of reality is probably reduced by sitting nearer. Due to the peculiarities of the Schmidt optical system used in projection receivers, the picture brilliance appears to decrease when viewed too close, and this is one reason why eye strain is absent with these receivers, as the tendency to sit too close is discouraged.

I should like to have your other readers' views on the points raised above. —F. W. T. ATKIN (A.M.Brit. I.R.E.) (Hull).

SIR,—After reading the fantastic article, "Television Sight-strain," by H. Stoneley, contained in the April edition, I am extremely surprised that the learned gentleman was unable to see the obvious solution to his problem, that is to buy a pair of green-tinted glasses to suit his requirements. I feel certain that instead of consulting opticians or biologists, he would be better informed if he consulted an artist or effect lighting engineer as to why his suggestion is totally unpractical.—P. D. BAIN (Godalming).

BEGINNER'S TIMEBASE

SIR,—I was very interested to read in the March issue of the "Beginner's TV Receiver," and have decided, no doubt in common with many other readers, to build the receiver.

Although ostensibly written for the beginner, the article airily states that the "unit . . . can be used in conjunction with any timebase and C.R.T. *which the reader may have.*" Beginners, may I point out, rarely have any timebases or C.R.T.s lying about.

Seeking some assurance that if I build the receiver, I shall not be left high and dry, I am offered a luke-warm promise in para 2 that "it is *hoped, at a later date* to produce data for T.B. and C.R.T. network for a VCR97" and later for a tube of standard type.

Will you please arrange to give us a timetable of the issues in which it is proposed to publish these details? This will help "beginners" like myself who, at the moment, while very keen to start on the receiver, would like to know—(1) whether the T.B. and C.R.T. network details will follow immediately the receiver unit is covered, and (2) whether to build the VCR97 vision portion, or to wait for the electromagnetic tube details.

Mr. Editor, put us out of our present uncertainty and let us know in the next issue what we may expect to be able to do with our receivers.—D. G. HACK (Bath).

[*The timebase will be given in our next issue.*—ED.]

THE "MIRACLE"

SIR,—I have read with interest Charles Hassell's letter in the March, 1953, issue. He mentioned that the chassis of his set slides down a slope. This gave me an idea that I might be the owner of the same model. Like his, mine has been serviced often in the just over two years I have had it, in which time two or three valves have been replaced as well as one or two components. Once again it has not long come back from the service engineer, this time to replace a 9in. tube and L.O. trans, also one larger wirewound 10 watt 2,500 ohm resistor has replaced two 2,500 ohm 5 watt resistors in parallel. At this time it was supposed to have received an overhaul. To top this it took *nine* weeks to do at a cost of just over £23, and tomorrow I shall have to inform the service engineer that I now have a picture which is gradually decreasing in size, also that a white line is persistent at the top of the picture. I could do with one of C.H.'s miracles. I would have liked the manufacturers to see this set, because I have been accused of tampering with it, thus causing these faults. Do you think that moving the mains tapping back from 220 v. to 230 v. (as my house mains is 230 v.) is in any way damaging to a TV, as that is what I did after an ion burn appeared on the C.R.T? And can you understand why an overhaul on a TV should cost anything from £1 to £5? Mine was supposed to have cost £5 5s. I am now considering building my own TV, but I would like to know from readers what they think is the average life of a 17in. C.R.T.; one likes to weigh up the cost of tube with repairs before beginning such a venture.—CHARLES A. BURTON (Churt).

AERIALS

SIR,—Regarding comments and observations on the question of TV aerials in various technical journals, I think the following may be of interest.

Some three years ago I purchased a Cossor 10in. TV (Model 917) which has given good entertainment on an indoor loft aerial on the Alexandra Palace frequency a few miles east of Bedford and for the last six months Holme Moss.

I remember my father bringing home a kit of parts in 1927 which we screwed together on a Sunday, to my mother's horror. The 100ft. of steel aerial wire was laboriously erected on two scaffold poles with about three egg insulators and a 25ft. lead-in. The set worked very well, the horned diaphragm speaker standing on top of the set. Time went by and the elements played havoc, the halyard broke, the aerial trailed over the top of an apple tree with no ill-effect to the set; the poles fell down, the aerial got shorter and shorter until the down lead was all that remained. One would not think much about the aerial for a radio set to-day.

With this in mind, I "made" my own aerial—an inverted V—out of rusty fence wire and installed it in the loft. The set duly arrived and worked. Later, I used ⅜in. duralumin tube and have tried all manner of loft aerials, but have found none to warrant the extra effort in manufacture.

The same aerial shortened overall by 8in. coupled to the set by two lengths of coaxial, the joints of which are unscreened. I would like to add here that I am somewhat removed from a main road! The end to set is still not soldered to the plug!

The results? Well, many have seen for themselves. I've compared it with other installations: I even tried the set on a neighbour's 40ft. "H" with no obvious improvement.

On checking with others I find that if a set is bought the price is so high that another £15 for the aerial is neither here or there. Perhaps the experimenter of the old days has gone—I often think we are a ready-made nation—but it would be interesting to hear other views and results then perhaps we could banish for ever the galaxy of tubes that sprout and wilt from our homes.—R. SIMMS (Sleaford).

SIR,—I, like Mr. Hobley (G2VU), have also been very interested in the letters published in PRACTICAL TELEVISION since the letter from "Dealer, Bristol."

I have been receiving television in Oxford since 1938—Alexandra Palace first and now Sutton Coldfield. I have tried many types of aerials—multi rods and ordinary "H," but for the past 18 months I have been using an indoor slot aerial made from netting wire and have so far had nothing better, and we are approximately 80 miles from Sutton Coldfield.

I was certainly shaken two weeks after I first installed it because of very bad fading, until a friend living four doors away with a multi rod aerial came and asked me why his picture had faded completely that same evening, but I had held a picture all through on the indoor slot aerial.—M. TRINDER Cowley, Oxford).

DOUBLE-TRIODE MIXERS

SIR,—With reference to the pages from a Television Engineers Notebook in the March issue, I was very interested in the details given therein, and should like to give some details of some experiments which I carried out in this connection. I had tried triode-pentodes, and double-triodes, but one day a friend gave me a circuit for a triode used as a double changer. I do not know where he got it from, but it did not work. I saw your article and connected a similar triode to agree with the arrangement in Fig. 1 and it worked perfectly. Unfortunately, however, one of the triodes (the one I had used previously) burnt out. I got another similar one, and when I plugged it in the circuit would not work. I found no fault in the wiring and obtained on loan another valve of the same type, but this also failed to work. After some experimenting I changed the two valves round and the circuit worked perfectly. I should like to know whether any other experimenters have found cases like this, where two similar triodes in a balanced or similar circuit will only work one way round. I might mention that the circuit itself has been checked and found perfectly in order.—J. K. BRADLEY (Romford).

Pages from a Television Engineers Notebook

(*Continued from page* 70)

Trap Circuits as Coupling Elements

It has been seen that an inductance L_m or capacitance C_m can be used as the mutual element in a coupled circuit system. Such a coupling element can be made to serve as a sound trap in addition to its normal function, and such a circuit is shown in Fig. 3. Here the primary L_1 and secondary L_2 are both tuned in the normal way, and the coupling takes place through the tuned circuit L_3C_2. This latter circuit is adjusted to resonate at the sound I.F. frequency so that it acts as a rejector at this frequency. Above resonance, this circuit is capacitive and provides a normal coupling impedance that is common to L_1 and L_2. Two or more of the I.F. stages can be constructed in this way, and adequate sound rejection obtained. Condenser C_1 is, of course, simply a D.C. blocker and is not critical in value; 500 pF is normally suitable.

The actual design of such coupling units is critical and is not simply a matter of the insertion of a circuit that will tune to the sound frequency. Fig. 4 shows a suitable experimental basic design which has been used by the writer in some vision strips, two of these couplings being followed by an overcoupled bifilar transformer at the detector. All relevant details are given in the figure, the vision I.F. being 13 Mc/s. and sound 9.5 Mc/s. Capacitive tuning is used (Phillips 3-30 pF concentric trimmers), and damping resistances of about 10 kΩ are shunted across both primary and secondary windings.

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TUBE COATING

I have a Pye D18T with tube MW22-14C. I have been offered MW22.14 which is the same but less the external coating. Is this a suitable tube and what modification needs to be carried out if any? No circuit is available so, perhaps, you could keep instructions down to practical terms and not theoretical.—John H. Bixley (Dartford).

The external aquadag coating on the MW22-14C tube, together with a similar coating within the tube, forms a capacitance which is used for E.H.T. smoothing. Therefore, to employ a similar tube without the coating would demand the employment of an additional 0.001 microfarad 10 kilovolt capacitor. This component is readily available and should be connected between the E.H.T. connector on the picture-tube and chassis.

THE "TELE-SQUARE"

Would you help me with a small point in connection with the construction of the Tele-square described recently? I have constructed this piece of test gear and find I cannot get enough line pulse width, in other words the blocks of line pulses are not of long enough duration. I am using a 12AU7 in place of valve specified, and have tried varying cathode bias resistors without any improvement. Do you suggest using separate bias resistors as you know this valve has two cathodes?—L. Parker (S.E.19).

Your query is not too clear. It is of no importance how long the "line pulses" are in duration so long as they exist and give a pattern.

To obtain wider pulses the value of C2 or C3 must be increased to reduce the frequency tuned by L3, L4, and vice versa.

If by some chance you mean that the pattern does not extend right across the televisor screen this, of course, would be a function of the television receiver.

The cathodes of the 12AU7 must be joined—separate cathode resistors would mean the circuit would not operate at all.

VERTICAL WHITE LINE

I have been getting very good reception here on my 12in. Viewmaster, using a two valve pre-amp, and a Mullard MW31-17 tube.

Recently I decided to add the E.H.T. boost as recommended in the Sixth Edition Viewmaster Handbook. This addition has improved the picture, but the white line a few inches from the left-hand side of the screen still persists, although I have removed the additional resistor as instructed.

The removal of the resistor has reduced the width of the vertical white line from 5/16in. wide to 1/8in. wide, but has not removed it; this line cuts the picture up, and if wording appears on the screen, roughly two letters are cut out. Can you tell me how to correct this annoyance?—E. R. Ridgway (Torquay).

To remove the vertical line we suggest connecting a .1MΩ variable resistor in series with R46, adjusting this to give best amplitude and linearity.

PERSONAL RECEIVER

I seek information re "Television Receiver" Nov. 1952 issue, (Personal Receiver). I wish to extend the range of this model; will it, therefore, be in order to add two additional R.F. stages following the first two stages, and follow on with the detector and video stage? Also, I propose to add a buffer stage preceding the detector on the sound channel. I will be glad to receive your comments.—J. R. Allen (Aylesbury).

The Personal Televisor can, of course, have its range extended in the manner suggested, but it is no longer so "personal"—the extensions to the chassis will cause a fairly large increase in size, viewed proportionately.

The chief point which arises, however, is in the prevention of feedback. The original was designed as a two-stage (R.F.) receiver and was very easily stabilised—the addition of a further two stages will undoubtedly cause instability if these two stages are mounted on the same chassis without inter-stage screening. Screening will be essential.

It might be worthwhile to try the effect of a two-stage pre-amplifier separate from the chassis covering the vision and sound channels, although for Aylesbury we would suggest a more sensitive circuit altogether.

LOW EMISSION TUBE

Please could you help me with a fault that has developed in my home-constructed receiver. It has been working for about 18 months. Now when I switch on the picture is very dark. If I turn the brilliance up the picture becomes very thin and out of focus. In fact, it almost disappears. By leaving it as a dark picture for a quarter of an hour it creeps up to a normal brilliance and good focus. It remains so for the rest of the evening. Is it possible that the tube is losing emission or the E.H.T. is slow to reach a good working voltage?

I am using an R.F. E.H.T. unit. I have replaced the oscillator valve 6BWG without making any effect. The rectifier valve U25 was replaced by the makers about nine months ago.

The tube, a 12in. aluminised, is cathode modulated and has its heater supplied by a separate winding on the mains transformer.—F. Ward (Iver Heath).

It is extremely probable that the picture-tube is indeed responsible for the defect you describe—low emission being the most likely cause. A new lease of tube life may be gained by over-running the heater by about 25 per cent., and a transformer for this function is now available from Norman Rose, Ltd., Hampstead Road, London, N.W.1.

ARGUS RECEIVER

I am having trouble in tracing a fault in my "Argus" television receiver. Having no instruments to speak of I have tried to remedy it by substitution.

About two months after receiving a decent picture, the raster and picture disappeared off the tube. On

examination I found two resistors had burnt out, R66 and a 47 KΩ 1 watt between the junction of R66/65 and VR9, inserted to enable me to black out the raster.

After renewing these two resistors, also condensers C62 and C64, I switched on my set and noticed the D.C. restoring diode, V19, was flashing internally. Disconnecting co-ax. link from timebase I found this stopped the diode flashing, but resistor R66 started to get warm.

Changed condenser C61 and connected link with timebase, but diode continued to flash. I suspected internal short in cathode tube so I had it picture tested only to find it had gone flat. A dark picture could be received, but only with brilliance control at maximum.

Replaced with new tube but faults still persisted. As last resort I ran the set without the timebase but left the H.T. run to shift controls. The diode stopped flashing but R66 still got warm in a matter of 10 seconds.

Hoping you can sort out a remedy from the above symptoms.—R. J. Hamill (Cardiff).

If R66 gets warm then you have a leakage at some point. The most probable source is the spindle of VR9, but the whole of the bleeder chain should be inspected including C64 and C62.

The grid and cathode circuits of the C.R.T. network should be carefully examined. It is quite common to have a fault due to C61 which causes the diode to flash but does not damage the tube. Remember that the E.H.T. can comfortably jump a gap of ¼in.

TV INTERFERENCE WITH RADIO

I built a "Viewmaster" and have had it running for 10 days with a very satisfactory picture. However, I have just learned that it is causing a great deal of interference to a neighbour's radio, so much, in fact, as to make it impossible for him to get any pleasure from his listening. My set is not yet in a cabinet, but I cannot see this making much difference. Can you suggest anything to help me ?—D. E. Yates (Leicester).

Interference with radio receivers can be caused by radiation from the line timebase and this may be reduced by mounting the receiver in a cabinet in which the inside is covered with either metal foil or a conducting paint which should be connected to chassis. At the same time a .1μF A.C. working condenser should be connected from each of the A.C. power sockets to earth whilst further improvement will be brought about by arranging that the radio receiving aerial is as far away as possible from the TV receiver.

LINE OF DOTS

My "Murphy V114" is now six years old and I have recently fitted a new tube. I get a satisfactory picture, but always have a line of dots across the picture—sometimes across the centre and sometimes higher up. This is too consistent to be ordinary interference. I also have a hum on the sound when the volume is turned high.

Can you advise on dots and hum ?—Frederick Barrell (W. Harrow).

The band of white spots you refer to are probably originating from a very slight flashover within the mains transformer, this effect often occurs in the type of receiver you mention (or any mains derived E.H.T. circuits) after it has been in use for a number of years—the E.H.T. winding usually being the offending section. On the other hand, however, an electrolytic capacitor flashing over internally may be the prompting factor, as indeed may any other slightly defective current-carrying component—although it should be remembered that the effect of spots in the form of horizontal bands is a sure indication that the defect is somewhere in the A.C. mains circuits.

Mains hum on maximum setting of volume control is probably due to low cathode-to-heater insulation in the HL41DD—sound detector and first A.F. amplifier valve.

LINE DRIVE

Some few months ago I was just commencing the building of a "Viewmaster," and before deciding which tube to incorporate when you printed an article in the October issue of "P.T.," detailing the mods. necessary for using wide-angle tubes. I thereupon decided to use the Brimar C17BM. After a few minor troubles, picture reversed, upside down, etc., which I was, of course, able to rectify, I have managed to get a fairly good picture although the focusing does not appear to be evenly distributed over the tube face. I might add that I have used all new components exactly as specified. P.M. focus ring is used Elac type W25, H.T. line 270, boost volts measure 440.

My query is this. When switching on I turn up brightness control and increase drive 100 KΩ resistor in anode of line osc. I thought when once this drive control was set the set could be switched off by turning down combined brightness and on/off control. This I find I am unable to do as the intensity of light is so great that I am liable to get an ion burn unless the drive is reduced, brightness turned down and set left several minutes before finally switching off. This, you will see, is a very great inconvenience as only myself can operate the set in this way. I have had one small burn appear when I inadvertently switched off too quickly on one occasion. I am worried if, for instance, on some future occasion the H.T. should fail, plug get pulled out of mains socket, or something similar happen, when I shall undoubtedly get more ion burns. Can you suggest a remedy or is this state of affairs due to something I have overlooked?—A. Fomer (W. Croydon).

It should most certainly not be necessary to have to reduce the drive to the line output valve each time the receiver is switched off, and we suggest that the reservoir condenser for smoothing the E.H.T. be disconnected, and only the conducting coating of the C.R.T. be used. In this way the stored energy will be reduced and the spot will disappear sooner, but in any case it is doubtful whether any harm will come to the tube.

ARGUS—SHIFT CONTROL

My set has developed a fault which did not exist when I first completed it. Shift control VR7 has no effect on the raster, and my picture is too low down and will not lock in the frame correctly, so I have flyback lines on my picture. I have tried changing V17 and 18, C47 and C44. Could you please assist. —R. Brear (Catterick Camp).

The shift control has nothing whatever to do with frame lock. If it does not function you should check the control and its associated wiring—R59 is suspect or R58. A deflected picture usually indicates trouble in the biasing network of the deflector plates.

A value of 0.005μF can be used for C43 and 0.002 μF for C44.

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"DIRECT T/V REPLACEMENTS" enables you to purchase all your components, valves and T/V books from one supplier. Largest stock of manufacturers' and home constructors' components. Spares Manual and Supplement, **9d.** 134-136, Lewisham Way, New Cross, S.E.14. (TIDeway 2330 and 3696.)

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3D6	2/6	6L6	10/6	50L6	9/6		
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News from the Trade

New Mazda Tube

THE Edison Swan Electric Co., Ltd., have introduced a new 15in. cathode-ray tube. This tube, which is to be known as the CRM153, is a 15in. round tube with an aluminised screen and a grey glass filter face, fitted with a new type of inclined ion trap tetrode gun assembly. The price is £15 8s. 0d., plus Purchase Tax, £6 2s. 11d.—Edison Swan Electric Co., Ltd., 155, Charing Cross Road, W.C.2.

Etronic TV Spares

ARRANGEMENTS have been made by Direct T/V Replacements for a continuous supply of the main replacement parts used in Etronic TV sets. Immediate delivery is offered of all frame and line transformers.

The main difficulty has been in respect to transformers for the EVC1536. This transformer is subject to corona arcing and early breakdown.

As a temporary measure the original transformers are being supplied treated with silicone compound M.S.4. This compound should be applied around the points where the wires leave the winding.

Replacement transformers are in stock, but an improved winding is being developed by Direct T/V Replacements and will be available later in the year.

Readers sending a stamped, addressed envelope will receive an Etronic list, or send 9d. stamps for list and spares manual. M.S.4 can be supplied by Direct T/V Replacements at 10s. 6d. a tube.—Direct T/V Replacements, 134-136, Lewisham Way, New Cross, S.E.14.

Marconiphone Announce a New TV Console

THE newest addition to the Marconiphone range of television receivers is Model VC61DA.

This is a five-channel console model with simple tuning to any BBC Television Station, and incorporates a 15in. aluminised Emiscope tube giving brilliant, high-definition pictures approximately 120 square inches in area.

There are efficient interference limiters on both the sound and vision channels and special device to deal with aeroplane flutter. High-quality sound reproduction is provided by the 10½in. elliptical loud-speaker.

The cabinet is distinctively styled in walnut, with doors to conceal the screen when not in use and castors for easy manoeuvring. The price of Model VC61DA is 89 guineas, tax paid.—The Marconiphone Co., Ltd., Hayes, Middlesex, England.

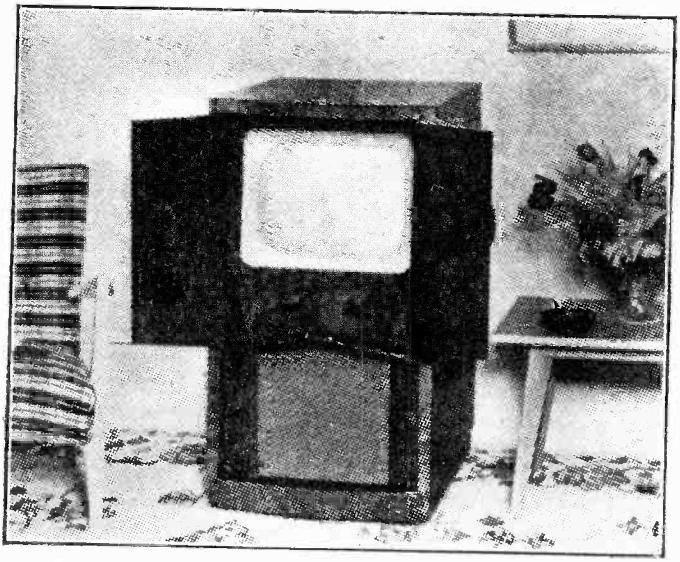
New Egen Television Aerial Plug

EGEN ELECTRIC, LTD., have produced a high-grade television aerial plug and socket. Strongly constructed from plated brass, the socket incorporates a standard valve pin as a socket contact. The plug is retained within the socket by a constant tension spring which ensures a correct mating fit.

Cable entry is through the top of the plug, the outer sheath passing round the spreader, which holds it in contact with the body. The same spreader also grips the conductor insulator securely when the two halves of the plug are screwed together. The plug pin is held in a high-grade phenolic moulding which is resistant to distortion from heat while soldering is taking place. The Egen plug and socket is completely interchangeable with other types of similar design.—Egen Electric, Ltd., Canvey Island, Essex.

Clydesdale Supply Catalogues

NEW lists of ex-service items and supplementary lists of radio and television components are now ready. The former contains 164 pages and costs 1s. 6d. Ask for List No. 8d. We are informed that once the pressure of delivery of these two books is over they will be combined and produced as one. Clydesdale Supply Co., Ltd., 2, Bridge Street, Glasgow, C.5.



Marconiphone Model VC60DA described in last month's issue.

QUERIES COUPON

This Coupon is available until July 21st, 1953, and must accompany all Queries.

FRACTICAL TELEVISION, July, 1953.

Published on the 22nd of each month by GEORGE NEWNES, LIMITED, Tower House, Southampton Street, Strand, London, W.C.2, and printed in England by W. SPEAIGHT & SONS, LTD., Exmoor Street, London, W.10. Sole Agents for Australia and New Zealand: GORDON & GOTCH (A/sia), LTD. South Africa: CENTRAL NEWS AGENCY, LTD. Subscription rate including postage, for one year: Inland and Abroad 13s. 6d. (Canada 13s.). Registered at the General Post Office for the Canadian Magazine Post.

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This receiver has been developed after most careful research and affords a high standard of Television entertainment by producing a picture of *really outstanding* quality.

We confidently believe that not only have we achieved a T.V. Receiver that surpasses in efficiency any other designed for the home constructor, but that successful construction, even by the most inexperienced is assured by the step by step wiring detail and diagrams provided, and at about half the cost of the nearest comparable commercial receiver.

Here are some of the features which combine to make this such a fine receiver :

- The Superhet circuit *easily* tuned to any of the five channels, i.e. LONDON, SUTTON COLDFIELD, HOLME MOSS, WENVOE and KIRK-O-SHOTTS. (The extreme ease of tuning is accomplished by the provision of pre-aligned I.F.T's.)
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  The picture brilliance is also much above the average and enables comfortable viewing with normal room lighting or daylight.
- FIRM picture "HOLD" circuits (Frame-Line) ensure a steady picture, free from bounce or flicker even under the most adverse conditions met with in "fringe" areas and excellent "interlace" ensures the absence of "liney effect"
- Picture linearity better than 5% ! (Some commercial receivers are passed at 15%.)
- Negative feedback is used in the audio frequency circuits which provide 2/3 watts of High Quality Sound.
- Entire receiver built on two chassis units, each measuring 14½in. x 6½in. x 3½in.
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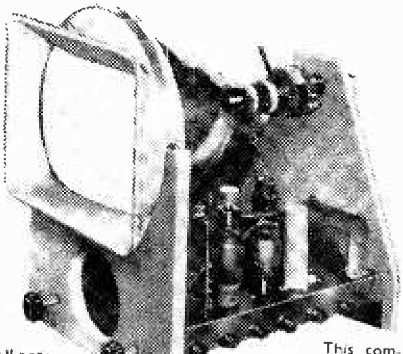

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- All pre-set controls are mounted on side of chassis enabling all adjustments to be carried out whilst facing the C.R. Tube.

As no hire purchase terms are available the receiver can be bought in five separate stages (practical diagrams and circuits are provided for each stage) thus enabling hire purchase interest rates to be avoided. Complete set of ASSEMBLY INSTRUCTIONS are now available, price 5/- (refunded against first order). The instructions include really detailed PRACTICAL LAYOUTS, WIRING DATA AND COMPONENT PRICE LIST.

ALL COMPONENTS ARE AVAILABLE FOR INDIVIDUAL PURCHASE. A CABINET WILL ALSO BE AVAILABLE.

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C. R. T. ISOLATING TRANSFORMERS of *PROVED* EFFICIENCY.

For over a year these small, low-capacity transformers have enabled tubes with Cathode to Heater shorts to be used again. Like our BOOSTER transformers they are available in all voltages from 2—13.3 v., with mains primary. Capacity from 20—35 pF.

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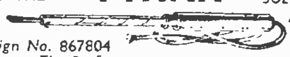

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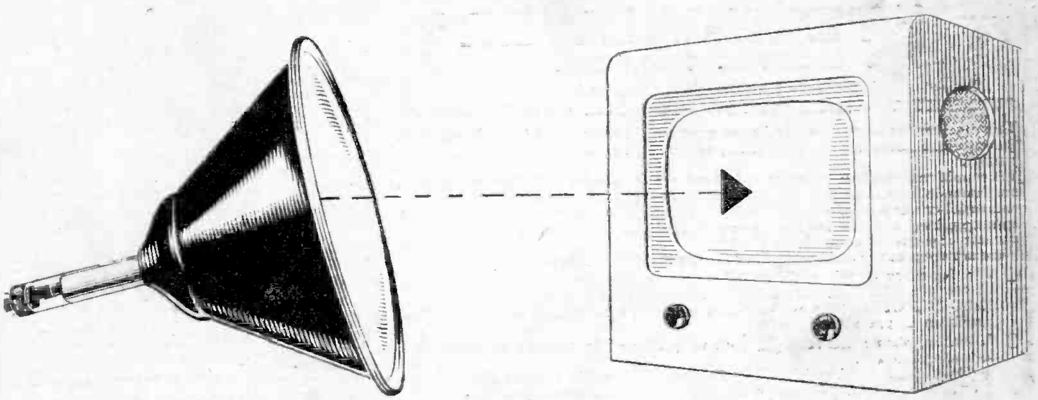

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To help you carry out the work our leaflet EV103A gives you the complete line and frame scanning information necessary, together with a suggested list of required components.

And why a T901—because it offers you brilliance, long life, high safety factor, ease of handling and withal it is British made.

It is the tube specified by the designers of the 'Tele-King' and 'Magnaview' circuits and 'Viewmaster' conversion circuit.

Brilliant black and white picture focusing over entire screen area with excellent contrast range; high optical quality glass face plate; wide angle scanning (70°); *fitted ion trap; overall length* 17 11/16" *diameter* 16".

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