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Practical Television

1'3

OCTOBER 1956

AND TELEVISION TIMES

EDITOR: F.J. CAMM

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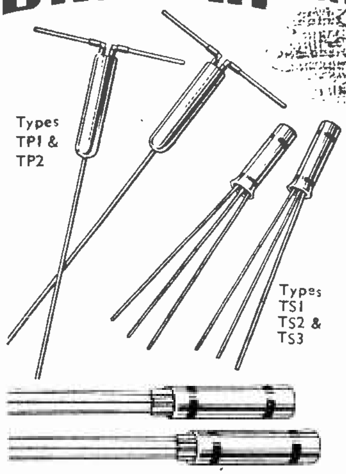

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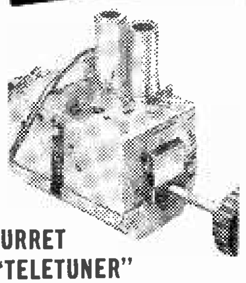

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Practical Television

& TELEVISION TIMES

Editor : F. J. CAMM

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Televiews

TV AT THE SHOW

THE Radio Show this year provided no surprises and from many points of view was extremely disappointing. Whereas a few years ago manufacturers vied with one another to produce novel designs and to prove that their sets were better than their competitors, this year there was a bleak standardisation which almost invited members of the public, when they required to buy a television set, to go into the nearest dealers and ask for a TV set without specifying the make. For they mostly looked alike, and apart from the fact that most makers have standardised on 17in. tubes, there was little distinction between this year's models and the previous one.

It was surprising that so few manufacturers made use of transistors, but we understand that this is entirely due to production difficulties, one well-known firm who manufacture transistors turning out only 250 a week. Perhaps next year transistors and printed circuits will be more in evidence.

The very excellent side shows provided by the BBC and others were the main attractions which drew the crowds. The stall-holders have mixed feelings about this. There are those who think that these shows lure away potential customers, whilst others think that but for the side shows the attendances would be much less. The credit squeeze and other factors, it must be admitted, have made this a difficult marketing year for manufacturers, and they have not encouraged manufacturers to embark upon new designs. Perhaps the time has come when these national shows should be held biennially.

As in previous years, air conditioning, catering, and seating accommodation (or lack of it!) left much to be desired.

TV AERIALS

THE Post Office states that out of 95,000 complaints concerning interference, investigations show that in one year over 15,000 were found to be due to inefficient aerials. In the early days of radio we became accustomed to the vast amount of weird aerial arrays all claimed to give better signal strength and in these comparatively early days of TV a similar state of affairs exists. There is, however, greater justification for this diversity of aerial practice, because reception conditions even in two adjacent houses can be vastly different, and often experiments are necessary in order to obtain the required signal strength. The situation is complicated because at present we need three aerials, one for BBC TV, one for ITV and another for V.H.F. (sound). We may shortly require a fourth, when the shorter wavelengths come into operation. There must be a solution to this problem, for if the attitude of certain landlords is persisted in many tenants will be deprived of the benefits of all but one form of TV entertainment. A number of people, however, are able satisfactorily to receive BBC and commercial television on indoor aerials. The cost of a television aerial is a not inconsiderable item and in these days of tight purses the need for a number of them is not in the best interests of trade.

THE PROGRAMMES

ANOTHER factor which is in need of considerable improvement is the quality of the programme material. Much of it is moronic, particularly those programmes which make use of interviews and bringing nonentities to the screen. During show week the programmes reached a new low, although the technical excellence was on a very high level.

The general standard and routing of the exhibition was a great improvement on last year, and the signpost indicating the avenues upon which particular stand numbers could be found was a marked improvement.

INDEX TO VOLUME 6

THE index to volume 6, comprising issues dated June, 1955, to July, 1956 (12 issues), are now available for 1s. 3d., by post from the publisher, George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2. Owing to the printing dispute we did not publish issues dated March, 1956, and April, 1956.—F. J. C.

The 'Scope as an Aid in Receiver Alignment

By G. J. King

MOST readers are by now aware that it is much more satisfactory to be able to observe the effect of a trimmer adjustment on a response curve displayed on the screen of a C.R.T. than having to rely on the limited information given by an indication on an output meter at various spot frequencies. In the latter respect, however, a curve based on the output meter indication at various frequencies may be produced if desired, but this is surely a tedious process and one that cannot be performed each time a trimmer is altered.

More TV set makers are now providing alignment instructions embracing the use of a wobbulator and oscilloscope. Some are even providing two sets of instructions, one relating to the 'scope method and the other to the spot frequency method where a signal generator and output meter are used.

The connection of the 'scope and wobbulator for TV alignment has been explained in these pages on many occasions. So far as the vision section of a TV receiver is concerned, however, the "Y" 'scope voltage is picked-up either from across the vision detector load resistor or from across the output of the video amplifier valve. In the latter instance it is often more convenient to take the connection direct from the appropriate pin (cathode or grid, depending on how the tube is modulated) on the picture tube.

A Frequency Marker

When making trimmer adjustments in a vision channel while observing the response curve on the C.R.T. it is essential to know the precise frequency corresponding along the width of the curve. To aid in this respect a signal from an accurately calibrated signal generator is applied to the receiver under test together with the normal wobbulated signal. This additional signal gives a little burst of R.F. at a point on the response curve corresponding to the frequency of the signal (see Fig. 1).

Clearly, then, the frequency at any significant point on the response curve can be determined simply by adjusting the tuning of the marker generator until the burst of R.F. (generally known as a marker pip) is at the required point on the curve, and then reading the frequency on the scale of the generator. As the frequency of the marker generator is swung from, say, the frequency corresponding to point A on Fig. 1 to the frequency corresponding to point B, the frequency marker will appear at point A, slide up the curve, along the top and then down the other side and disappear at point B. A means is thus available of accurately determining the width of the curve in terms of frequency.

Some wobbulators designed for TV use have a terminal available for injecting into them a marker frequency. If an instrument of this kind is not available, however, it is quite a simple matter to inject the two frequencies simultaneously into the receiver by using a network such as that shown at Fig. 2.

If it is found that the frequency marker extends considerably over a large area of the response curve and hides important contours of the curve, the marker can be sharpened up considerably by connecting a 0.001 μF capacitor across the "Y" and earth terminals of the 'scope.

The diagram at Fig. 3 shows how the 'scope, wobbulator and marker generator should be connected to a TV receiver.

A Calibrated Graticule

Particularly during the operation of TV alignment, it is often necessary to know the relative amplitude of the displayed response curve at various points along the trace. For example, when aligning normal receivers it is general practice to arrange the alignment of the I.F. stages so that the response at the nominal vision carrier frequency is 6 dbs down.

A calibrated graticule which can easily be fixed in front of the C.R.T. screen is a considerable aid in this respect. Such a device can be made quite easily by

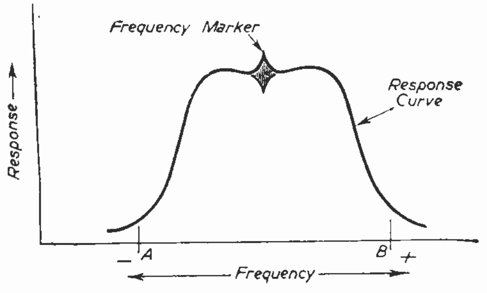


Fig. 1.—Showing the formation of a frequency marker on a response curve.

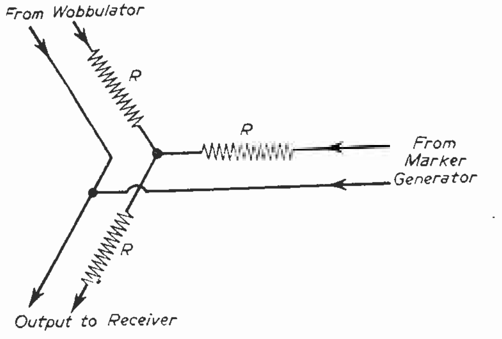


Fig. 2.—A network suitable for injecting two signals simultaneously into a receiver.

scribing a piece of Perspex as shown at Fig. 4. The size of the Perspex should be such that it fully covers the front of the tube; some commercially produced 'scopes have sliders at the front of the instrument for taking a graticule of this kind, but if such a feature is not available little difficulty should be presented in fixing the graticule by some other means.

If the deflection amplifier is fairly linear, the horizontal db lines may be marked off as percentages of response amplitude as follows: 3 db 70 per cent.; 6 db 50 per cent.; and 20 db 10 per cent.

Method of Alignment

Full alignment procedure cannot be given in this article, as the alignment procedure varies considerably between receivers. As has been intimated previously in various articles, optimum results are attainable only if the procedure given in the maker's instructions is closely followed. This applies to service engineers as well as experimenters, for although a picture will undoubtedly be obtained by employing the "guess and adjust" method, the operation can never be considered conclusive, and one is always tempted to readjust here and readjust there, always aiming for something a little better! Of course, if the instructions are really unobtainable then this course has to be adopted.

Even when employing the visual method of alignment it is always best to adjust the sound rejectors first by applying a spot frequency equal to the sound I.F. and setting the associated tuned circuits for minimum output from the vision channel. The 'scope may be used as an output indicator in this case by connecting the "Y" terminal across the diode load resistor as for wobbulator alignment, using a modulated input signal and adjusting for minimum amplitude trace, with the timebase running at about 50 c.p.s.

Although a frequency marker can readily be produced at the sound rejection frequency on a displayed vision response curve, as shown at Fig. 5(a), it is necessary to tune the rejectors with a signal considerably larger than that obtained from the wobbulator to provide a response display. If it is endeavoured to adjust the rejectors, therefore, while observing the vision response curve (i.e., adjusting for maximum dip at the sound rejection frequency), one often finds that the optimum point of rejection is not registered on the curve. What happens is that the curve dips correctly as the rejectors are tuned towards the sound frequency, but from a certain point and up to the point of optimum rejection no further dip is indicated.

After adjusting the rejectors it is general practice to align the sound section of the receiver. This can be done by employing the 'scope and wobbulator method, as detailed some time ago in these pages. The more popular method, however, simply involves connecting the "Y" terminal of the 'scope across the sound detector load resistor, applying a modulated signal at the sound I.F. to the control grid of the first valve, which is common to both sound and vision (as when adjusting the rejectors), and adjusting the appropriate trimmers in the sound channel for maximum amplitude trace, after setting the timebase frequency at about 50 c.p.s.

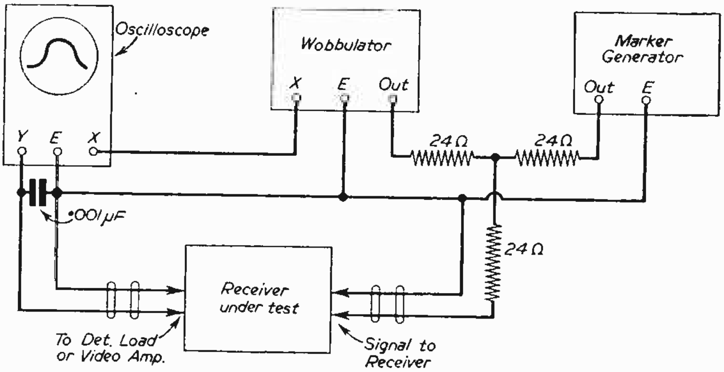


Fig. 3.—A block diagram showing how the 'scope, wobbulator and marker generator should be connected to a TV receiver.

Using the arrangement as illustrated at Fig. 3, it is general practice next to connect the wobbulator output to the signal grid of the final vision I.F. valve. The wobbulator is adjusted to provide a frequency sweep in the region of plus or minus 4 Mc/s relative to the nominal vision I.F., or as stipulated in the alignment instructions. With the timebase running between 12 c.p.s. and 50 c.p.s. the trimmers appropriate to the final vision I.F. valve should be adjusted, aiming for a curve something like that shown at Fig. 5(b)—it should be noted that this is for a single sideband vision characteristic.

The output of the wobbulator is then transferred to the signal grids of the preceding vision I.F. valves in turn, working back to the first valve in line, and adjusting the tuned circuits relating to the valve which is in receipt of the wobbulator signal, curves after the style of those at Fig. 5(c) and (d) should be resolved.

The I.F. transformer in the anode circuit of the frequency changer (or mixer) valve should be adjusted to produce a curve something like that at Fig. 5(e), when the wobbulator signal is applied to the signal grid of the valve concerned.

In cases corresponding to displays (b) to (e) it will be observed that the I.F. corresponding to the carrier is

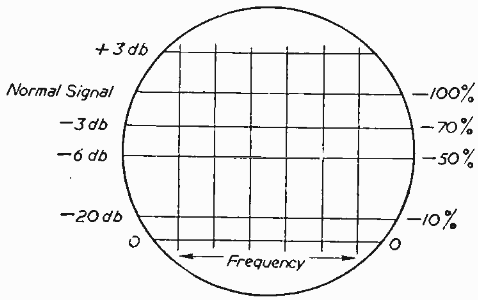


Fig. 4.—A suitable piece of Perspex scribed to form a graticule, as shown, considerably eases visual alignment of TV receivers.

approximately 6 db (50 per cent.) down the right-hand side of the curve, as indicated by the frequency marker. This, of course, indicates that the I.F. stages are tuned and adjusted to have a single sideband characteristic. Moreover, as the arrows indicate a rising frequency from the right to the left of the response curves, it will be seen that the nominal I.F. falls on the lower sideband of the curve.

Oscillator Frequency

It is worth while bearing in mind that this I.F. scale will be produced only on receivers whose local oscillator frequency is higher than the carrier frequency ; on sets of this kind the sound channel I.F. is always higher than the vision I.F. A mirror image of the overall vision characteristic is thus presented in the vision I.F. channel. When the wobbulator signal is applied to the aerial terminals, or injected before the frequency changer, the frequency scale of the displayed overall response curve will, of course, show a rising frequency from left to right.

Using a 'Scope

As many readers have shown interest in the use of the 'scope, but are uncertain of the best methods of using it, a short series of articles commences in this issue on page 116 dealing with this particular aspect.

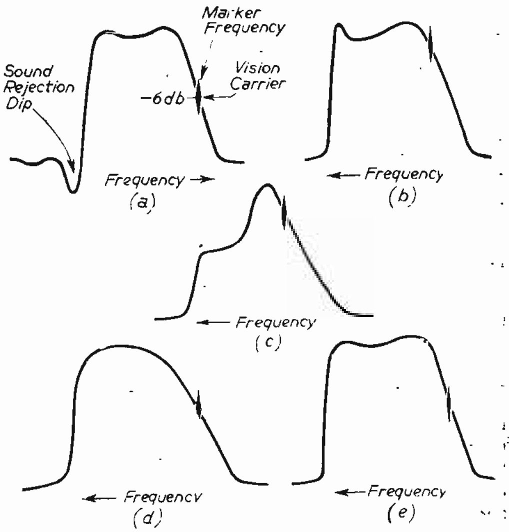


Fig. 5.—Response curves obtained during the process of TV alignment.

Pictures in Colour

THE following is an extract from a speech by Mr. B. J. Edwards, Technical Director of Pye, Ltd., to the Radar Association, dealing with methods of producing TV in colour.

"Twenty-one years after Baird's first demonstration, Pye, Ltd., gave the first demonstration in Great Britain at the Radio Show, Olympia, in 1949. For this occasion we used the sequential system operating on 405 lines under closed-circuit conditions, and this was followed by similar demonstrations in a number of Continental countries.

"In 1953, on the occasion of the Coronation, we gave a full-scale demonstration of the sequential type of colour television using a U.H.F. transmitter to transmit to a number of receiving points in the London area. This was the first full-scale colour transmission in Europe, and indicated the very great value of the addition of colour in a spectacle such as the Coronation.

"Whilst it was evident that extremely good colour pictures could be produced by means of the sequential system, it was equally obvious that the band-width requirement, which was approximately three times that of black and white picture transmission, would render the system impractical for broadcast purposes, since the space in the ether for transmission of this band-width is not available in that part of the frequency spectrum where it is economic to transmit and receive.

"America, with her vastly greater number of viewers and television stations, was the first country to realise this, and by force of circumstance had to set her scientists and technicians a problem of providing a colour transmission system capable of being transmitted over the existing television network, and capable of being received in black and white on existing television receivers. . . .

"It is interesting that the American public, despite the fact that colour transmissions and colour receivers have been available now for the past year, have not bought television receivers in anything like the quantity the manufacturers envisaged. I think there are two reasons for this : one, as I mentioned earlier, that from an entertainment point of view, colour adds little to a picture, and therefore the public made no special demand for colour, and the other reason which, taken in conjunction with what I have just said, probably provides the whole answer, and that is that the cost of the receiver is just too high.

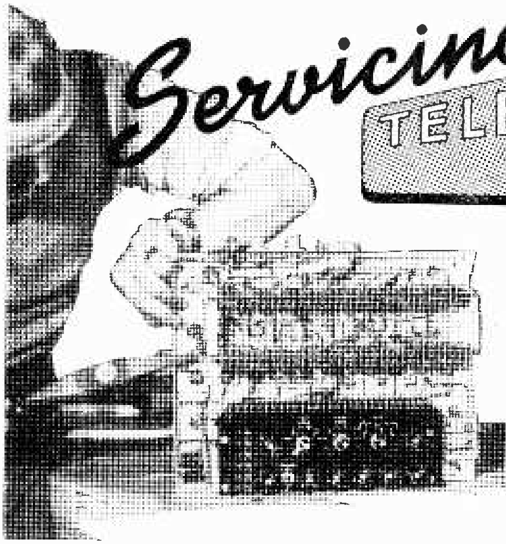
C.R. Tubes

"The most expensive component in a colour television receiver is the cathode ray tube, which at the moment costs approximately seven times that of a corresponding-sized black-and-white tube. In addition, this tube demands more complicated and costly circuits than a black-and-white receiver, and this accounts for the price difference.

"The only colour tube in reasonable production at the moment is the R.C.A. colour tube, and this, whilst a monument to man's ingenuity, is an intrinsically complicated and expensive tube. There is no doubt that R.C.A. are working on simplified versions of this tube, but I feel that fundamentally it is wrong and must be supplanted by a simpler, cheaper tube in the near future. Another tube that has been demonstrated in America, which is the Lawrence tube, is a less costly tube to manufacture, but does not produce as good a picture as the R.C.A. tube.

"A third tube that has been recently demonstrated is that made by Philco, which is known as a beam indexing tube, and this is in my opinion the tube of the future. It should be easy to make, install and operate, and when certain circuit problems have been worked out should enable a considerably cheaper television receiver to be made.

Servicing TELEVISION RECEIVERS



No. 23.—THE G.E.C. BT5147

By L. Lawry-Johns

THESE notes may be used with reference to the associated models BT4544, BT5543, BT6542, BT5246, BT4643, BT5642 and BT6641. Various differences occur, of course, such as the tube type fitted, and some differences in the circuit of the fringe models BT5246, BT4643 and BT5642 may be noticed from the description and the diagrams.

The BT5147 which is the subject of this article is a table model employing a Mullard MW36-24 tube. The BT4544 and BT4643 are the console and console with doors versions.

These are 16-valve superhet receivers, suitable for connection to A.C. or D.C. mains of 200-250 volts. Tunable to any of the five BBC channels in Band I, they are readily converted for dual band use by the G.E.C. BT204 for the BT5147 and the BT203 for the console versions.

The method of fitting the converters is quite simple provided the instructions are understood and followed, and it is not proposed to deal with this subject in the present article.

Reference to the diagram showing the top view of the R.F. chassis shows that all the valves are of the Z77 type with the exception of the sound detector and A.F. amplifier, which is a DH77. There is no valve diode in the vision strip—detection being by a crystal diode (GEX35). V1, V2 and V3 are common to both sound and vision and in the event of sound and vision failure, a blank raster still being controlled by the brilliance to indicate the functioning of the rest of the set, these valves and associated components should be suspected. V4 is the vision I.F. amplifier and V5 the video. The fault of "sound, no picture," but brilliance operating, should direct attention to V4 and the crystal diode circuits. A fault in the V5 stage usually affects the brilliance, since the cathode of the C.R.T. is fed from the video amplifier anode. To clarify this, the normal anode voltage of V5 is 160 volts with a current of 6.6 mA passing. Should the emission of the valve fall the current will reduce, thus causing the voltage drop across the load resistors (two 12 K ¼ watt in parallel) to reduce correspondingly. Therefore, the anode voltage rises nearer to that of the H.T. line, causing the C.R.T. cathode/grid difference of potential to become greater. This gives the same effect as reducing the brilliance control except that the contrast of the picture also falls with, perhaps, a loss of picture hold. This applies to the majority of receivers where the C.R.T. is cathode modulated from the video amplifier anode circuit. A poor picture when the sound is good, with weak sync, often indicates a faulty GEX35 crystal diode when both V4 and V5 are proved good. The crystal is mounted between the V4 and V5 valve bases—roughly midway.

No Sound

No sound, but with a hum from the speaker upon rotation of the volume control, indicates a fault on the R.F. chassis, and if the vision appears in order the V9, V10 stages are normally in need of inspection.

The DH77 does seem prone to sudden failure which, of course, results in complete loss of sound signals. On the other hand, distorted and probably low sound should immediately point attention to the 10 MΩ resistor associated with the crystal diode sound noise limiter. The crystal is adjacent to the underside of the octal socket to the left of V10. The resistor is close by, coloured brown, black, blue. Normally, this resistor increases in value to an extent where it is practically open circuit, thus restricting the operation of the diode. If, however, the resistor is not responsible, check the crystal itself (GBX34) and then the 220 KΩ DH77 anode load resistor which is very close to the crystal. This resistor is coloured red, red, yellow.

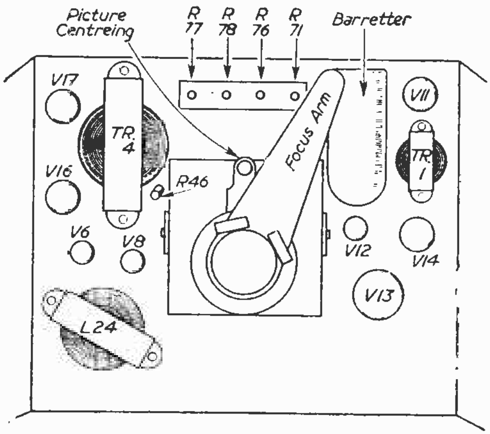


Fig. 1.—Rear view of main chassis ; R.F. unit and tube removed for clarity.

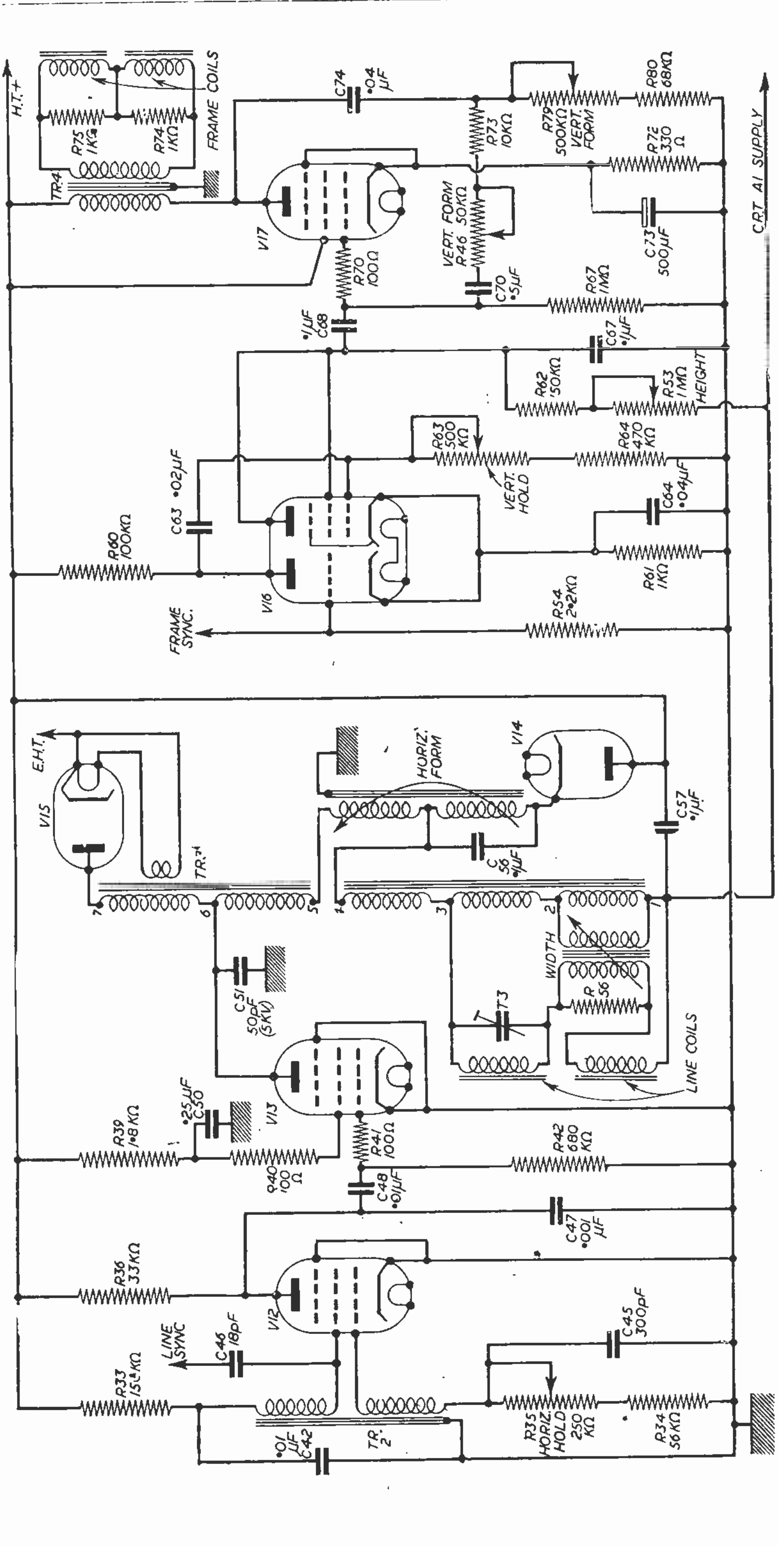


Fig. 3.—Line and frame timebases.

The sound output valve is V11 PL82; in the event of doubt, this may be interchanged with V17, whereupon the frame scan will exhibit abnormal operation if V11 is defective as well as the sound fault clearing.

Noise Limiter, Vision

A D77 on the main chassis (V6) carries out the function of noise limiter diode (V6a) and interlace diode (V6b). For the moment only V6a need be considered. It was mentioned earlier that the C.R.T. is fed from the V5 anode. The actual connection is to the left side of the R.F. chassis and this is marked X on the layout diagram.

As well as being the C.R.T. cathode feed, this also feeds the noise limiter cathode (pin one on V6 valvebase). The anode of this section of the valve is pin seven which connects to the slider of the noise limiter control. In the event of a heater-to-cathode leak in the diode a heavy A.C. ripple will be superimposed upon the C.R.T. cathode. This results in wide black and white bars across the raster. In some cases the top half of the raster only appears as white and the lower half is completely blacked out or vice versa.

C.R.T. Circuit and Faults

The tube is fairly trouble free in service, but is prone to cathode-grid shorts, which were fully dealt with in an earlier article in this series (Further Notes On Cathode Ray Tubes) and heater partial shorts, which were also mentioned in the article. The MW36-24 is a tetrode tube and is used in this receiver with an EHT voltage of 13 kV. An ion trap magnet is fitted on the tube neck and the only position for this is that which gives maximum brilliance. Some small movement can be made to remove corner shadow, but only if the brilliance is not affected. The first anode voltage (tag 10 of the tube base) is slightly in excess of 400 volts when the receiver is working normally. The cathode voltage (tag 11) should be 160 approximately, whilst the grid voltage at tag two should vary from this figure down to zero as the brilliance is retarded. When the grid voltage approaches that of the cathode some distortion of the raster is to be expected since the heavy beam current taken by the tube tends to overload the U25 EHT rectifier and line output stage.

Some readers appear to be under the impression that the picture size should not vary under high brilliance conditions. It is *desirable* that the picture size and focus should remain constant over the entire brilliance range. Unfortunately, however, the source of EHT power is essentially a high impedance one. The regulation is, therefore, inherently poor, so that as the tube current increases, the supply voltage falls, and the efficiency of the line output stage diminishes. This explains why the presence of an internal short in the tube causes the symptom of no EHT, and why EHT brushing is likely to occur when the brilliance is at minimum, this being the condition when the EHT is at its highest (no load).

Thus some degree of distortion is to be expected at high brilliance level and is a normal condition. On the other hand, if the picture distorts and fails upon normal operation of the brilliance control, and bright scenes such as the weather chart tend to cause the picture to "blow out" and disappear, the U25 EHT rectifier should be immediately suspected. Therefore, some tolerance and plain common sense should always be used when testing and criticising the performance of a receiver employing EHT derived from the line output stage.

The Line Timebase

A Z77 (V12) is used as the line oscillator in a conventional blocking circuit, the output of which is coupled to the KT36 (V13) control grid. Now this valve (V13) depends upon the line drive from V12 for its bias. In the event of V12 failing, or some component associated with V12 causing it to cease

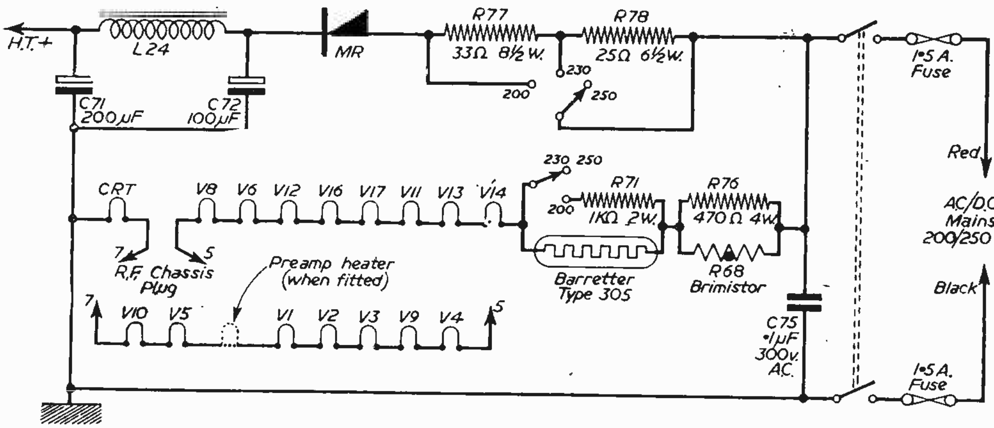


Fig. 4.—Mains supply circuit.

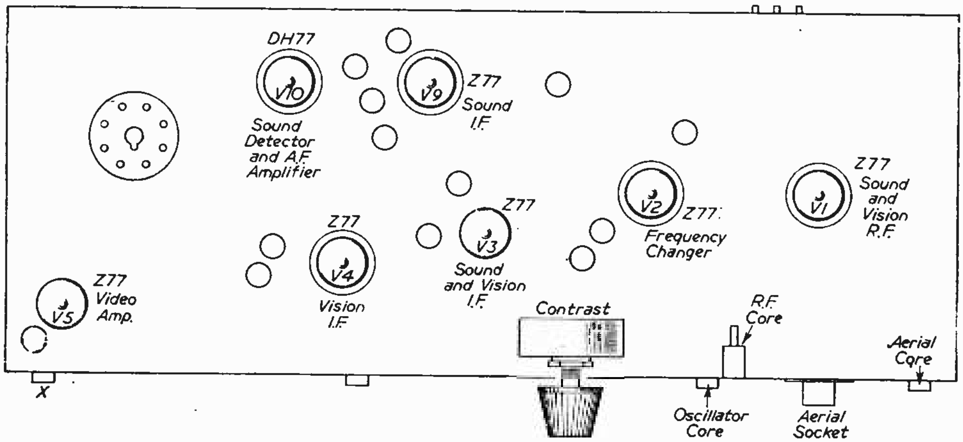


Fig. 2.—Top view of chassis.

operating, the KT36 will be left without bias and the current through it will rise to a high level, thereby endangering the valve and its associated components, especially the screen dropping resistor R39 (1.8 K), which may become overheated, causing a variation in value. Therefore, if upon the symptom of "no picture, no line timebase whistle," etc., the KT36 appears to be overheating check V12.

If this is in order, check the KT36 itself. If the timebase now resumes operation, but the picture width is insufficient, check R39, which may have gone high in value.

On the other hand, if the KT36 still draws excess current R39 may have *decreased* in value. Either is likely, and a new KT36 is not likely to last long if R39 has decreased much in value.

The line output transformer is fairly reliable in operation, but a misleading symptom is often caused by C51 (50 pF 5 kV) shorting to chassis. This immediately stops the line timebase and causes V14 to become red hot. This in turn causes, in a few cases, the U329 to develop a heater-to-cathode short. This defect often occurs without a component failure causing it; but in any case the symptoms are unmistakable. Upon removal of the rear cover it may be observed that the Barretter lamp is glowing brightly and that no valve heaters are visible. As the first valve in the heater chain is the U329 it is not difficult to see that a defect in this valve would divert the heater current from the remaining valves, thus causing the Barretter to overheat and probably fail if the receiver is not quickly switched off. In a typical case of this a receiver was examined and the Barretter was found to be defective, thus preventing any current reaching the valve heaters.

A new Barretter was fitted and the set switched on. The Barretter glowed normally and then settled down as the valve heaters became visible. After a few moments, however, the valve heaters dimmed and the Barretter started to glow abnormally. The set was hurriedly switched off to prevent further "losses" and the U329 was replaced after a meter check had revealed that no short circuits were present. Upon switching on normal working was maintained and the Barretter behaved normally.

EHT Circuit

The overwind on the line output transformer is applied to the anode of V15 (U25) EHT rectifier. This valve is mounted behind the KT36 valve base and the cabinet must be removed from the base plate to gain access to it. This is a simple operation and will be described later. The U25 heater is fed from another winding upon the line output transformer which supplies the nominal two volts required under normal working conditions.

The EHT voltage for the tube anode is derived from this point. There is no separate EHT capacitor as the conductive coating of the tube forms, with the internal anode coating, sufficient smoothing capacity at line frequency. As stated, the EHT voltage under normal working conditions is some 13 kV.

Frame Timebase

An LN309 (V16) is connected as a cathode coupled multivibrator, the pentode section of the valve being connected as a triode. In the event of unreliable frame timebase operation or a total collapse, as evidenced by a thin horizontal white line, the LN309 should always be suspected first. Poor height should direct attention to V17 (PL82), the LN309 and its anode load resistors, R60 and R62. Cramping at the bottom of the picture or raster should direct attention to, first, the PL82, then, if the cramping is severe with loss of picture height, C73. Then inspect the components in the vertical form circuits, C70, C74, etc., and also C68 coupling capacitor. A frequent fault is that of the LN309 developing a heater-to-cathode short. The symptoms are no picture, no sound and a slight wisp of smoke rising from the V16 valve base. This is from the 1 K cathode resistor. This quickly decreases in value, causing the majority of the valve heaters to become extinguished and the Barretter to glow brighter.

Valves 11, 13, 14 and 17 will remain heated, glowing more brightly than is normal.

It is not sufficient to replace only the LN309; the 1 K resistor (R61) must also be inspected and replaced in most cases.

Hints on Handling

As the main chassis is vertical the bottom of the cabinet is not removable. A large amount of servicing can be carried out by simply removing the rear cover. To do this, remove the five fixing screws, pull the back rearwards until the flanges clear the sides of the cabinet; spring the side pieces outwards to clear the side controls, then tilt the back to clear the top of the cabinet and withdraw to the rear and upwards.

To gain access to the rear of the valve bases, the U25, metal rectifier, etc., remove the back cover as above, pull off the two side knobs, and unscrew the two large screws from underneath the baseboard, one each side, towards the rear. Slide the cabinet forwards about half an inch to a stop.

Lift off the cabinet; the speaker leads are long enough to permit free access if the cabinet is turned back to front and placed at the side of the receiver.

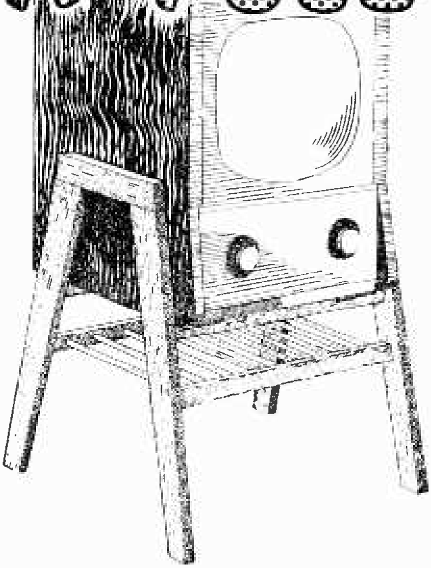
The following information may be of assistance in various ways:

The Brimistor is a CZ1A. The Barretter a type 305. The volume control on-off switch is a 500 KΩ—double pole. The brightness is a 100 KΩ, vertical hold 500 KΩ, horizontal hold 250 KΩ, contrast 5 K w.w., I.F. vision 35.6 Mc/s, sound 37.6 Mc/s., Fuses: two 1.5 A. G.E.C. cartridge type RK201658. Resistance of line output transformer windings: 1-2: 0.18 Ω, 2-3: 4.3 Ω, 3-4; 5.8 Ω, 5-6; 3.6 Ω 6-7; 24,000 Ω, see Fig. 3.

The normal H.T. voltage is 200 at 230 mA. The boosted H.T. voltage at C57 is approximately 420. Where insufficient width is experienced on low voltage D.C. mains, the metal rectifier may be shorted out to avoid the volts drop across it, but when this is done great care must be taken to see that the mains leads are correctly wired, i.e., red positive, black negative.

To clarify this, if the metal rectifier is to be shorted by placing a lead between its two ends, the polarity of the mains supply must be first ascertained and the mains lead connected accordingly to the supply socket.

A TELEVISION TABLE



MAKING A CONTEMPORARY DESIGN FOR A TABLE MODEL RECEIVER

By D. K. Wright

MANY viewers prefer the table type of receiver to the console, and in the majority of cases this is placed on some kind of small table in a corner. In these days of contemporary furnishings this does not give an altogether modern appearance, and something more in keeping is called for. Certain manufacturers have realised this and are now supplying ready-made stands for their table models either as an integral part of the design or to be purchased separately. I had a rather old table model which I did not wish to part with as it had given such yeoman service, and this was generally kept on a table. Unfortunately the particular model was rather larger than its modern counterpart and the table raised the picture to a level above that which experience had shown to be necessary. I, therefore, set out thinking how to house the set to preserve a modern appearance, and at the same time lower the screen to a more convenient angle. The solution is depicted in the artist's impression at the head of this page.

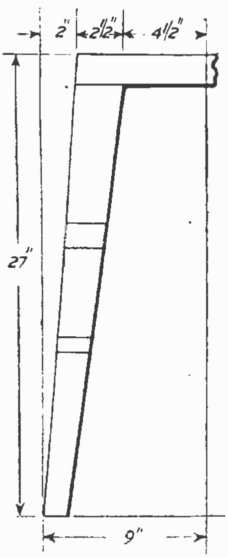


Fig. 1—Detail of the legs.

Design

First of all a rough description of the design and the features underlying it. The set was to be supported at a desired level, firmly but without excessive timber in the construction. The appearance was to be one of lightness and in modern treatment and, if possible, some facility for the housing of books such as the "Radio Times" was to be provided—again to avoid heaviness and dust-retaining shelves. The solution was finally found surprisingly easy and without any need for elaborate carpentry. Only ordinary domestic tools are required, namely a saw, plane, brace and bit, and screwdriver. Ready-planed timber is available in most districts and the only part of the suggested design which may prove difficult is the shaped legs. As depicted these are tapered which will call for cutting and subsequent planing, but this may be avoided by using material which is parallel throughout its length. This will to some extent detract from the more modern appearance given by the tapered legs. They are not difficult to make and it is only necessary to run a line from the top to the bottom, retaining the measurements shown, and then cut along the line, and if you possess one of the modern power bench saws the cut may be made

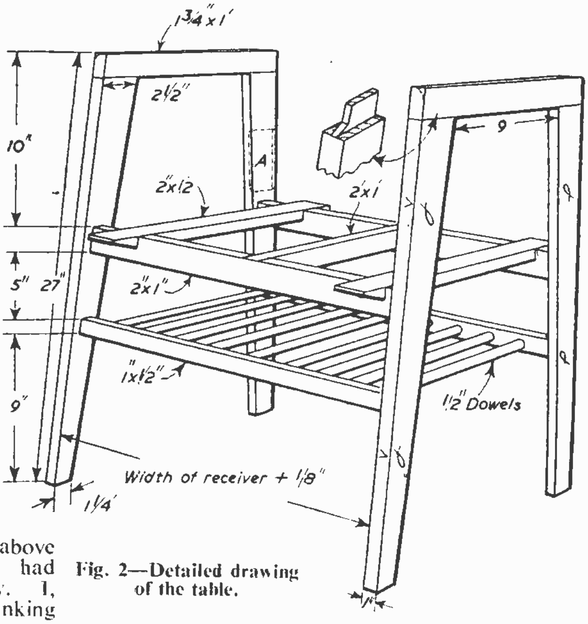


Fig. 2—Detailed drawing of the table.

in a matter of minutes to all four legs. Plane and sandpaper the cut as the two rear legs expose the cut edge to the front. It is possible to cut two legs from one piece of timber if you choose a piece 3in. in width. The sloping line will then cut for two legs, although the overall length would have to be greater than 2ft. 6ins. so that the narrow end could be preserved. Points such as these depend upon your carpentry experience and ability, and the single shaped leg is the simplest. In addition to the 2½in. strips needed for the legs you will also need some 2in. by 1in., some 1in. by ½in., some 1¾in. by 1in., some 2in. by ½in. and a quantity of ½in. dowelling.

Construction

Full details are given in Fig. 2, and the only tricky part shown is the tenon which I used for the leg tops. I deemed this necessary in the interests of rigidity, and it would well repay any constructor to follow this feature. To assist in accuracy the individual parts may be drawn out full size on some shelf-covering white paper or wallpaper, and the cut pieces then tested for accuracy on the drawings. Note that the height of the supporting shelf will be governed by the particular receiver which is to be used, and also that the width of the stand is the other main controlling dimension. Should one of the receivers with side knobs be used it may be necessary to slot or otherwise modify the upper cross piece on the legs, but this will be left to the individual—bearing in mind that the receiver will have to be capable of being removed.

It should be unnecessary to give any other instructions and the finish and similar details are left to personal preferences. There is no reason, for instance, why the bookshelf should not be omitted or even made in slightly different form. The main thing is the general overall design of the legs and method of supporting the table model.

New Pye Underwater Camera

PYE LIMITED announce that they have produced a new hand-held underwater television camera which will enable divers to be effectively supervised from above water. It will be the smallest and cheapest underwater TV camera yet to be produced.

With the new camera, instead of having to rely on a diver's report, a number of expert observers may view the underwater scene displayed on large-screen picture monitors. A record of the picture reproduced on the monitor screen is easily made by photographic means, which obviates the difficulty of taking photographs under water. The equipment will find many applications in salvage operations, submarine engineering, marine biology and oceanography.

The camera is intended for operation down to a depth of 250 feet, but to provide an adequate safety margin the container has been designed to withstand a water pressure of 220 lbs. per square inch, corresponding to a depth of 500ft. The unit is buoyant in water and weighs 38 lbs. in air.

Normally, the spherical camera is fitted with two handles held in position by means of two clamping rings. When not required the handles can be removed and replaced by weights or lamps so that the unit can be used without the assistance of a diver. An output socket is provided for the connection of lamps or an underwater loudspeaker.

The equipment consists of a spherical-shaped camera unit, 12in. in diameter, and a picture monitor and camera control unit which may be on board ship or at any other convenient location above water. All camera adjustments are carried out from the control position, the only concern of the diver being to position the camera correctly.

The container for the camera unit consists of two Duralinox hemispheres held together entirely by external air or water pressure to form a sphere 12in. in diameter. The action of forcing the two halves together by means of a simple hand tool pushes air through a release valve and creates low internal pressure.

The electronic details of the equipment are similar to those of Pye industrial television. The camera, control unit and monitor comprise a complete closed circuit television system capable of providing a high definition picture.

Lime Grove—Studio "D"

THE first of the new Emitron cameras at Lime Grove was brought into service in August when the programme "Nom-de-Plume" was transmitted from Studio "D."

The pick-up tubes in these cameras are similar in principle to the former C.P.S. type, but an additional mesh on the scanning side of the mosaic greatly reduces the tendency to instability caused by excessive high-light brilliance. The tubes can accept an illumination of ten times the normal peak-white value without instability, and even when instability does set in, it is confined to the area immediately surrounding the point of excess brilliance. The former tendency for the instability to spread over the entire mosaic (causing the effect sometimes known as "peeling off") has been eliminated.

The fundamental sensitivity of the new tubes is approximately the same as the C.P.S. type, but their greater resistance to instability enables them to be worked with twice the previous signal current, giving higher signal-to-noise ratio and an increase in the acceptable contrast ratio.

The normal control of lighting within the camera is by a continuously variable neutral density filter which is remotely controlled. This makes it possible to work with a fixed lens aperture and therefore to maintain a constant depth of field under varying lighting conditions. The use of this filter, together with the increased working signal current, will require some increase in studio lighting for a given aperture. On the other hand the increased flexibility of choice of scenery and wardrobe (resulting from the increased contrast range) will be an advantage.

The absence of any shading controls, together with the provision of remote control for the neutral density filter, means that the normal operational control of each camera channel requires only three knobs—"Light," "Lift" and "Gamma."

While the studio has been out of service a new "inlay" equipment (which enables special scenic effects to be produced electronically) has been installed in the Vision Control Room. The flying-spot raster in this equipment is in the centre of a large desk, with almost completely unobstructed access in all directions. This should make the operator's task of placing the necessary masking devices in position a great deal easier.

A Beginner's Guide to Television

A NEW SERIES

7.—THE TUNING SIGNAL, TEST CARD C, AND TRACING FAULTS

By F. J. Camm

AT the commencement of each TV programme a standard tuning signal is radiated, and it is illustrated in Fig. 29. It is intended as a guide to receiver adjustment, so that this can be carried out before the actual programme commences. The controls should be adjusted so that the central ring is circular and the segments around the circle should appear as depicted. This will ensure correct values of black and white, and correct linearity, and the Brilliance and Contrast controls should be set so that the various tones are as illustrated. In general, the Contrast control will govern the lighter shades, and the Brilliance control the lower shades. This tuning signal is used to check the performance of the receiver, but it must also be remembered that it will also indicate defects in the transmission itself, such as ghost images.

The controls on televison receivers vary according to make, and so it is impossible to give specific instructions. In general, the controls which set the Brightness and Contrast are the most important and they are inter-related. If tnis adjustment is not correct, the brightness of the picture will change in accordance with the intensity and position of the high lights in the studio.

The BBC recommends that the receiver should be switched on 15 minutes before the start of the programmes so that the circuits may have enough time to reach their normal working temperature. Next, turn the Contrast and Brightness controls fully down, then turn the Brightness control slowly up until a very faint glow is just visible on the screen. Next, turn it down slightly until the glow just vanishes. Now turn the Contrast control up until the topmost shapes on each side of the circle on the tuning card are white, and the shapes below them are light grey. Then, readjust the Brightness control so that the bottom shapes are black and those above them dark grey. Make a slight adjustment to the Contrast control to get the best contrast between the white and pale grey shapes.

Finally, adjust the Focus control to give the clearest definition to the vertical lines in the centre of the circle. On modern sets there are only two controls, and the major adjustments have been carried out by the makers.

Test Card C

A special test pattern is included in the morning television transmissions on weekdays, and at certain other convenient times, and it is shown in Fig. 30. It is designed to give an immediate indication of the performance of the whole transmitting and

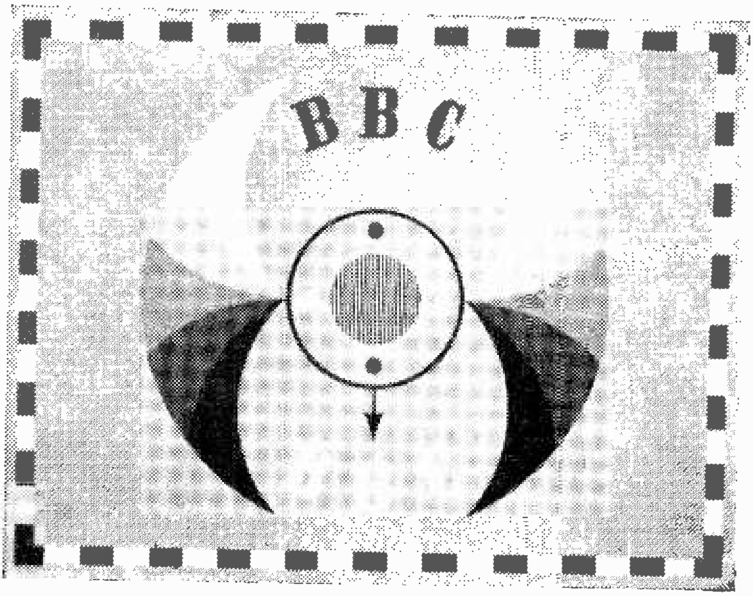


Fig. 29.—The new BBC tuning signal.

receiving chain. As the performance of the transmitting equipment is maintained in accordance with agreed standards, during the normal periods of radiation for test purposes, Test Card C serves as a check on propagation and the performance of the receiving apparatus.

The card, which bears the identification letter C, incorporates a number of patterns each designed to assess one particular characteristic, and they are listed as follows :

Aspect Ratio

Concentric black and white circles surrounding the 5-frequency gratings will appear truly circular when the width and height of the picture are adjusted to the standard aspect ratio of 4 : 3.

Resolution and Bandwidth

Within the circles there are two groups of frequency gratings, each consisting of five gratings having black and white stripes corresponding to fundamental frequencies of 1.0, 1.5, 2.0, 2.5, and 3.0 Mc/s. In the left-hand group the 1.0 Mc/s grating is at the top, the frequency increasing towards the bottom, and in the right-hand group the order is reversed. The response of the whole system is required to be uniform to 2.7 Mc/s, so that the 2.5 Mc/s gratings should be clearly reproduced, but the 3 Mc/s gratings may be blurred. The picture must just fill the viewing aperture during the test, with the black and white border visible.

Contrast

A 5-step contrast wedge appears in the centre of the test card. The top square is white, corresponding to 100 per cent. modulation, and the lowest square is black, corresponding to 30 per cent. modulation. The three intermediate squares should be reproduced as pale, middle and dark grey.

Scanning Linearity

The background of the test card is a middle grey, bearing a graticule of white lines. The areas enclosed between the lines should be reproduced in all parts of the picture as equal squares.

Synchronisation Separation

The border consists of alternate black and white rectangles, which facilitate recognising interference between the picture signals and synchronisation.

Low - frequency Response

A black rectangle within a white rectangle is provided at the top and in a perfect system it would be reproduced as a rectangle of uniform blackness on a clean white background. At present, imperfections in the transmitting system result in a slight streaking at the right-hand side of the black area, even with a perfect receiver, but by experience it is possible to judge whether the reproduction is abnormal.

Reflections

Reflections, which may occur in propagation or in the receiving installation, are indicated by two single vertical bars, which should be reproduced without positive or negative images at their right-hand sides. The width of these bars represents a pulse of 0.25 μs.

Uniformity of Focus

These are four diagonally-disposed areas of black and white stripes corresponding to a fundamental frequency of about 1 Mc/s, and all four should be resolved uniformly throughout.

The size of the tuning signal and of test Card C will, of course, vary according to the size of tube. Each must completely fill the screen.

Of course, troubles develop in course of time, and readjustments are usually carried out by the dealer who is agent for that particular make of receiver. When a new receiver is installed all that it should be necessary to do is turn on the picture. Just as one would turn up the sound volume on a normal broadcasting receiver. In course of time, however, valve deterioration takes place, or components may vary in value. These will call for additional adjustments and these adjustments are made by resetting the pre-set controls at the back of the receiver.

Some of the elementary defects can be corrected

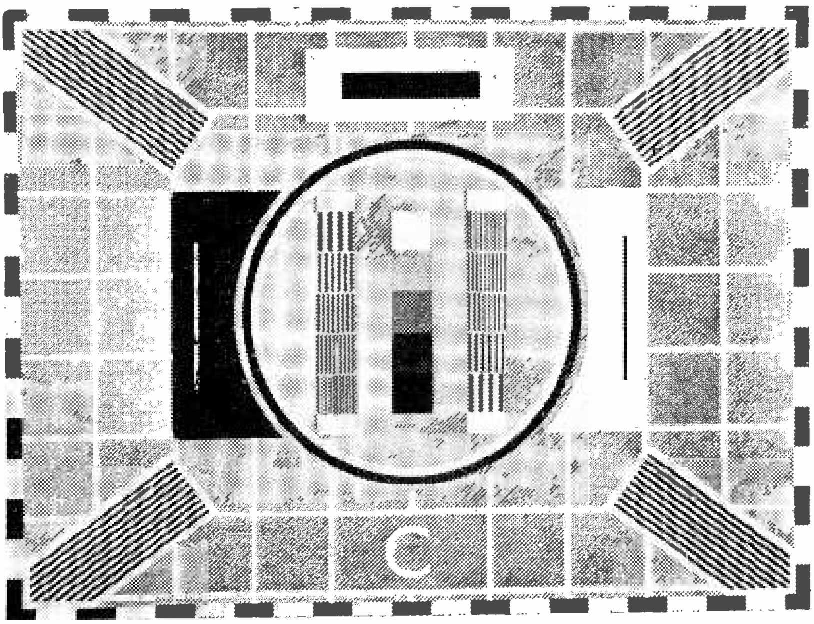


Fig. 30.—Test Card C, which is transmitted by both the BBC and I.T.A.

by use of a simple system, but for regular servicing a very expensive and comprehensive range of instruments is required, and these include an oscilloscope, an all-purpose test meter for measuring the A.C. and D.C. voltages, and a special meter for measuring EHT, with readings up to 25 kW. This is the voltage used in most projection receivers. A valve tester, and a capacity bridge are other instruments which are necessary.

As I have already said, however, a simple universal or general-purpose meter will suffice for simple adjustments. It must cover D.C. voltages up to 500, A.C. voltages up to 250, and a low reading scale for testing heater circuits. The EHT voltages can be calculated without direct measurement.

Common Faults

We have seen that the cathode-ray tube is fed from the timebases in such manner that even without a signal a rectangular area of light known as the picture area and of the correct aspect ratio of 4 : 3 appears on the end of the tube. We have seen that this area of light is modulated by the output from a visual receiver, and so produces a picture. The loudspeaker is fed from the sound receiver to produce the speech of music. From this it can be deduced that if there is a raster (picture area) and a signal is obtainable from a loudspeaker, the fault lies in the vision or video part of the receiver. On the other hand, a picture, unaccompanied by sound indicates that the sound receiver is faulty, and absence of picture or raster with a sound signal indicates trouble either in the tube or in the timebases.

The horizontal and vertical timebases are independent, and it is extremely unlikely that both will fail together, and thus absence of raster will indicate a fault in the tube or in the power supply to both timebases. A horizontal line only on the tube indicates failure of the frame timebase, and a vertical line indicates failure of the line timebase.

Once the functions of the receiver are understood, irrespective of make or design, a little reasoning will quickly indicate the path of the circuit in which to look for faults. *(To be continued.)*

I.T.A. Results in the Midlands

DATA produced by the Nielsen Television Index shows that the potential audience able to receive I.T.A. transmissions in the Manchester area is 428,000 households (as at August 2nd, 1956). This is an increase of 75 per cent. over the available audience when the I.T.A. transmitter opened in May. This audience is continuing to grow.

A study of the viewing habits in the Manchester area during this first quarter shows that the average I.T.A./BBC household has been viewing 3.9 hours per day Monday to Friday, 4.4 hours per day Saturday/Sunday, and 4.0 hours per day Monday to Sunday on average.

	Manchester I.T.A. per cent.	BBC per cent.	Total* per cent.	
7- 8 p.m.	33	20	58	Mon.-Fri.
8- 9 p.m.	41	27	73	
9-10 p.m.	43	25	74	
10-11 p.m.	31	18	53	
7- 8 p.m.	32	14	48	Sat. and Sun.
8- 9 p.m.	45	24	74	
9-10 p.m.	42	29	75	
10-11 p.m.	38	18	59	
7- 8 p.m.	33	18	55	Mon.-Sun.
8- 9 p.m.	42	26	74	
9-10 p.m.	43	26	74	
10-11 p.m	33	18	55	

* NOTE.—Homes tuned to the Birmingham I.T.A. station are included in this total.

Monday to Friday Granada transmissions have had an average share of 54 per cent. of this viewing. The BBC has had 38 per cent. share. It will be noted that viewing to the BBC and the Manchester I.T.A. station does not account for all the viewing in the Manchester area. This is because of the overlap between the Birmingham and Manchester I.T.A. areas which enables certain homes in the Manchester area to receive transmissions from the Birmingham I.T.A. station. Viewing to the Birmingham I.T.A. station accounts for 8 per cent. of the Monday to Friday viewing.

Saturday/Sunday ABCTV transmissions averaged 57 per cent. share of viewing. The BBC had 36 per cent. share. Viewing to the Birmingham I.T.A. station accounts for 7 per cent. of the Saturday/Sunday viewing.

Monday to Sunday Manchester I.T.A. station transmissions averaged 55 per cent. share of viewing. The BBC averaged 37 per cent. share. Viewing to the Birmingham I.T.A. station averaged 8 per cent. share of the Monday/Sunday viewing.

The tables on the left show the average percentage of households viewing during evening transmissions.

An analysis of the top ten programmes in each week since the opening of the I.T.A. transmitter shows that the following programmes have appeared most frequently in the top ten.

1st	Sunday Night at The Palladium/Blackpool	ABC	11 times
2nd	ABC Playhouse	ABC	6 times
	Jack Jackson Show	ABC	
	TV Theatre	Granada	
	Gun Law	Granada	
6th	Dragnet	Granada	5 times
	My Wildest Dream	Granada	
8th	64,000 Question	ABC	4 times
	Douglas Fairbanks Presents	Granada	
	Val Parnell's Startime	Granada	
	Make Up Your Mind	Granada	

Of all programmes appearing in the top ten ratings 77 per cent. were transmitted by the I.T.A. of which 65 per cent. were Granada programmes and 35 per cent. ABCTV.

Of the total number of appearances in the top ten ratings Granada obtained 56 per cent., ABC 32 per cent. and BBC 12 per cent.

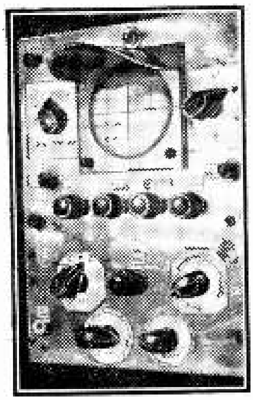
During the first three months nearly 6,000 commercials have been delivered through the Manchester I.T.A. station, 72 per cent. of these being put out by Granada and 28 per cent. by ABCTV. Of the Granada commercials 18 per cent. were of seven seconds duration, 43 per cent. 15 seconds, 21 per cent. 30 seconds and 13 per cent. 60 seconds.

Of the ABCTV commercials 18 per cent. were of seven seconds duration, 36 per cent. 15 seconds, 26 per cent. 30 seconds and 18 per cent. 60 seconds.

HOW TO USE AN OSCILLOSCOPE

HOW TO UNDERSTAND AND EMPLOY THIS VALUABLE SERVICING ACCESSORY

By J. Hillman



On the right is the 'scope which was described in our May and June issues.

Introduction

ON looking through numerous books on oscilloscopes I could find very little on how to operate them, especially in regard to TV and radio servicing. Most of the books assume one knows how to operate the oscilloscope, and the purpose of this short series of articles is to give the necessary information so that anyone who has never used an oscilloscope before can operate it. The oscilloscope I use was described by me in the May and June issues of this magazine, but the tests described can be carried out with any oscilloscope though the traces may be slightly different due to the different sensitivity of the oscilloscope used.

Operation

Before making any test with an oscilloscope make sure that the leads you are using do not alter the trace, and there should be a straight line on the screen with no leads connected to it. This should still be a straight line with one end of the leads connected to the oscilloscope and the other end not connected to anything. First switch on and set the following controls, with no leads connected to oscilloscope, beam sw. on ; beam blanking sw. to hard ; coarse frequency sw. to 1 (i.e., slowest speed) ; sync sw. to int. ; X amp. sw. to int. ; Y amp. sw. to high ; sync control min. ; fine frequency control halfway ; Y amp. control near min. ; X amp. control halfway ; now advance brilliance control until a trace appears on the screen. This should be a straight line.

Centre this line by moving Y and X shift controls. The length of the line can now be altered by moving X amp. control. The line will probably be blurred and thick, but by operating the focus control it can be made thin and clear. One point to notice is that the line cannot be focused all along its length due to the curvature of the tube. If the centre part is in focus, then the sides are out of focus and vice versa. Having obtained a straight line, the Y amp. control can now be advanced to maximum, and the line should still be straight. Any waviness in this line will be due to the Y amplifier picking up hum. At the very slowest speeds of the timebase it is very difficult to eliminate hum entirely, but so long as the line is reasonably straight this will not interfere with the working of the oscilloscope. However, the straighter this line the more efficient is the oscilloscope.

Tests

Having seen how the various controls affect the trace it is now time to carry out a few tests. For all these tests the controls are set as follows : Sync sw. to int. ; X amp. sw. to int. ; beam blanking sw. to hard ; beam sw. to on when trace is required. Keep brilliance control just high enough to see trace clearly and use focus control to give sharp outline. Coarse frequency sw. to 1 ; Y amp. high ; Y amp. control to 3 (all variable controls having 10 divisions) ; X amp. to 4 ; connect a lead from Y to 50 cycle test ; sync control min. ; adjust fine frequency control until a trace, as shown in Fig. 2, appears, and advance sync control until trace is stationary. Timebase is now running at 50 cycles per second, and this setting can be noted for future reference. Without altering control settings adjust fine frequency to show trace (Fig. 2). This is 25 cycles per second, then trace (Fig. 3) 16.6 c.p.s. and trace (Fig. 4) 12.5 c.p.s. Note that as frequency gets lower the trace will be rather jumpy in the vertical plane, even though it remains locked and stationary. At intermediate frequencies the trace will appear as a number of loops and traces, and by counting the number of loops and dividing

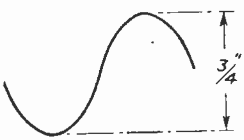


Fig. 1

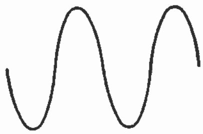


Fig. 2

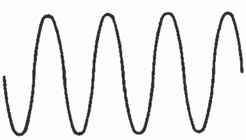


Fig. 3

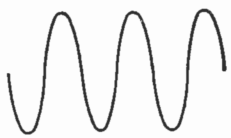


Fig. 4

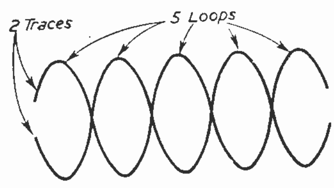


Fig. 5

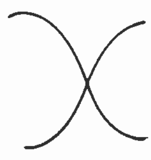


Fig. 6

Figs. 1 to 6.—Various waveforms as they are depicted on the tube with variation of the sync and other controls.

by the number of traces the ratio between the frequency of the Y and X inputs is obtained. Thus in Fig. 5 there are five loops and two traces, and ratio is $\frac{Fy}{Fx}=\frac{5}{2}$. Therefore $Fx=\frac{2\times Fy}{5}$, i.e., $Fx=\frac{2\times 50}{5}=20$ c.p.s. Where Fy is frequency of Y input, in this case mains frequency 50 c.p.s. and Fx is frequency of timebase. Formula for finding timebase frequency is therefore $Fx=\frac{Fy\times \text{number of traces}}{\text{number of loops}}$. Now adjust controls until trace Fig. 6 appears, and it will be seen that there are two traces and two half loops, and the ratio is therefore 2 : 1, and frequency $Fx=\frac{50\times 2}{1}=100$ c.p.s.

Now adjust fine frequency control to get trace as

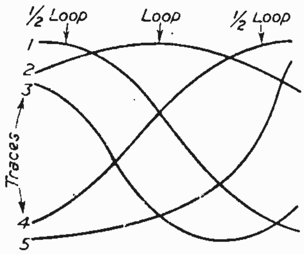


Fig. 7

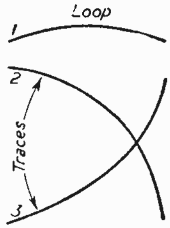


Fig. 8

Figs. 7 and 8.—Curves for calculating frequency as explained here.

Fig. 7. In this there are one loop and two halves, making two loops and five traces. Then $Fx=\frac{50\times 5}{2}$ $=125$ c.p.s. Similarly, Fig. 8 gives 150 c.p.s., and Fig. 9 gives 175 c.p.s. As these intermediate frequencies are not easy to recognise, it is best always to return to a trace that you know for certain, such as 25 c.p.s., 50 c.p.s., 100 c.p.s., to check whether the trace is above or below this frequency. All the above tests were carried out using the mains frequency as a standard, but any standard frequency can be used and the curves shown will still be obtained. Suppose we used a standard frequency of 1,000 c.p.s., obtained from an audio oscillator, and inject it into Y output socket, joining their common earth leads together. Then, if Fig. 1 trace is obtained at a certain setting of the fine frequency control, the timebase frequency is the same as the standard one, i.e., 1,000 c.p.s. For, say, Fig. 7, where we have two loops and five traces, then using the formula $Fx=\frac{Fy\times \text{number of traces}}{\text{number of loops}}$, then $Fx=\frac{1,000\times 5}{2}=2,500$ c.p.s. Where Fx = Speed of timebase and Fy = Speed of standard frequency.

Another method that is used is a circular trace. First, make up the circuit as Fig. 10. Connect Y out to point A ; X ext. to point B ; 50 ∿ test to C and earth socket to D. Beam blanking hard ; X amp. max. ; Y amp. high ; Y amp. near max. ; range sw. I ; X switch ext. ; sync off ; adjust fine frequency until trace Fig. 11 appears. This is a circle or ellipse with a gap in it and the speed of the timebase is 50 c.p.s. Similarly, trace Fig. 12 has two gaps and the frequency is 100 c.p.s. Now switch to beam blanking

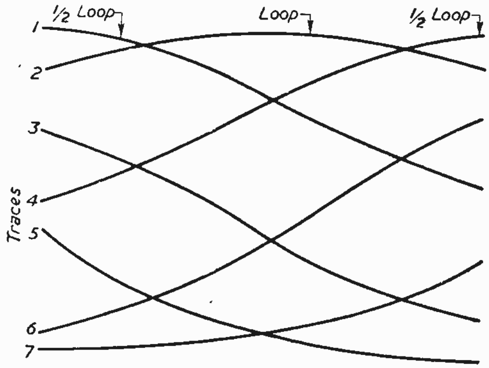


Fig. 9.—The traces from a 175 c.p.s. frequency.

soft and where gaps are in the trace it will brighten up and this makes them easier to see when checking higher frequencies. Simply count the number of bright spots and multiply them by 50 c.p.s. In this case, or, if you use a higher standard frequency, then multiply by that frequency. Incidentally, if you use a higher or lower frequency as a standard, then the values shown in Fig. 10 will need to be altered. The resistor should always equal the reactance of the condenser at the frequency used. The reactance of a condenser varies according to the frequency, and this value can be found from a book of tables or from the formula, one divided by [6.283 × frequency in cycles per second × capacity of condenser in farads], remembering that a microfarad is one millionth of a farad.

Comparisons

To compare two frequencies, say, 50∿ mains and signal generator L.F. signal output, set up as follows : X ext. to B ; earth to D ; Y out to A ; beam blanking switch to grid mod. × sw. to ext. ; sync sw. to ext. ; Y amp. sw. high ; Y amp. control max. ; X amp.

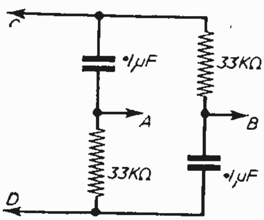


Fig. 10


Fig. 11

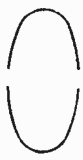


Fig. 12

Figs. 10, 11 and 12.—A circuit for obtaining circular traces and two examples.

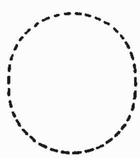


Fig. 13

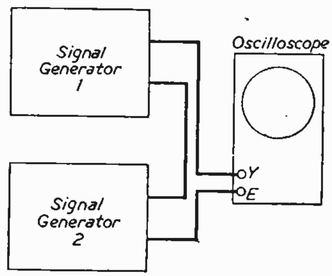


Fig. 14

Figs. 13 and 14.—A further trace and diagram of hook-up for obtaining a check on the instrument.

control max.; 50$\sim$ test socket connected to point C (Fig. 10); grid mod. socket to signal generator L.F. socket E of signal generator to E of oscilloscope. Trace will now appear, as in Fig. 13, and number of spaces in this case was 11, giving a frequency of 550 c.p.s. Note that as the gain control of the signal generator is altered so does the frequency, so that if at any time you are using the L.F. output of the signal generator as a standard frequency always check the frequency against the mains frequency, using this method, and do not alter the setting of the gain control on signal generator. To summarise, if you connect the known frequency across C and D (Fig. 10), and the unknown frequency across grid mod. and earth, then count the number of spaces in the circular trace and multiply this number by the known frequency; the answer gives the unknown frequency.

To Check Accuracy of Signal Generator Using Another Signal Generator

Connect up, as in Fig. 14. Set X sw. to int.; Coarse freq. range 1; beam blanking hard; sync sw. int.; Y amp. sw. high, X amp. 4; fine frequency 6. Set signal generators 1 and 2 at 100 kc/s and adjust signal generator 2 until envelope trace is as in Fig. 15. when the two generators are now working at the same frequency. It will depend on the setting of fine frequency control as to the number of envelopes seen, but so long as the envelopes are clear and stationary the two generators are at same frequency. Both instruments were at 1 volt output each, and some idea of the traces given is shown in Fig. 16. Trace A was obtained at 600 kc/s: B at 1,500 kc/s, C at 10 Mc/s, and at either side of this frequency the trace would thicken. The limit at which the trace could be checked was 15 Mc/s. The maximum range of the timebase of this oscilloscope was 650 kc/s, which was on range 5 with fine frequency at maximum. This gave a trace of one cycle of the 650 kc/s frequency with an input of 1 volt from the avo signal generator and trace was 3/16in. high with Y amp. at max.

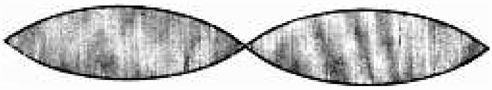


Fig. 15.—Traces from the time generators shown in Fig. 14.

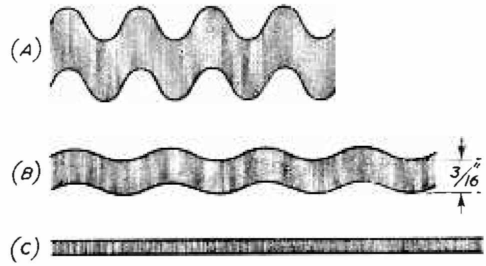


Fig. 16.—Traces obtained from the set-up in Fig. 14.

In the next article we will show how to measure the sensitivity of the oscilloscope, how to see sound waves, phase displacement, traces obtained in TV and radio servicing. *(To be continued)*

Television Licences Analysis

AT the end of June, 1956, there were 5,922,020 television licences in force throughout the country, an increase of 182,427 over the figures at the end of March. The increases were as follows:—

England (excluding Monmouthshire), from 5,087,506 to 5,241,433.

Wales and Monmouthshire, from 261,729 to 269,424.

Scotland, from 348,152 to 365,646.

Northern Ireland, from 42,206 to 45,517.

London Postal Districts

The number of licences increased from 658,212 to 674,361. The south-eastern district had the highest number of licences with 141,629 followed by the eastern district with 138,912 and the northern district with 119,641.

Wales

Of the Welsh counties, Glamorganshire had the largest number of licences with 150,012 and of the towns, Cardiff headed the list with 54,565, followed by Newport with 44,148.

Scotland

Glasgow led in Scotland with 114,263, followed by Edinburgh with 48,950.

Northern Ireland

Belfast had 37,919 licences.

There are 60 towns and districts throughout the country where the number of television licences exceed those of sound—31 in and around London, 7 in the north-west, 4 in the north-east and 18 in the Midlands.

BBC Television Centre

THE BBC announces that a contract has been awarded to Higgs and Hill Ltd. for the erection of the superstructure of the main block at the Television Centre, Wood Lane, W.12, upon foundations constructed by George Wimpey and Co., Ltd., who were awarded the contract for that work last November. The retaining walls now constructed by them to receive the superstructure contain an area of approximately 3½ acres—nearly twice the area covered by St. Paul's Cathedral.

This next stage in the development of the BBC's Television Centre covers the erection of a circular building around a central courtyard. The building will have a high multi-storey inner ring—basement to seventh floor—which will contain dressing rooms and technical areas in the lower storeys and office accommodation on the upper floors. Radiating from this ring will be the studios, of which four of the seven provided for will be completed initially. Two of these will be 100ft. by 80ft. by 35ft. high, and two will be 70ft. by 50 ft. by 25ft. high, each with its ancillary accommodation. Around the outer periphery of the studios there will be an enclosed runway for transporting scenery. Between two of the studios there will be a multi-storey "wedge" in which there will be accommodation for the central control and apparatus rooms, and the telecine and presentation suites. Under the central courtyard there will be telerecording rooms.

The contract requires the construction of the first operational unit by the end of 1959—with a view to it being in service in 1960.

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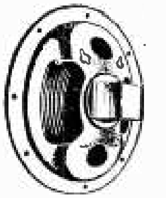

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Selenium Rectifiers in Power Supply Circuits

SOME USEFUL NOTES ABOUT A POPULAR COMPONENT

By W. J. Burbidge, A.M.I.P.R.E.

THERE are many uses for which the selenium rectifier is suitable, in fact, wherever a valve rectifier is normally fitted, a selenium rectifier can be used and often with no small advantage. They provide a simple, compact and, not least, an economical form of alternating current rectification.

Several types are available giving outputs varying from 30 mA up to approximately 300 mA for use in television receivers, power amplifiers, etc. The low current types are very useful in providing the H.T. for television converters, pre-amplifiers and so forth, in fact, for any equipment where a compact and convenient form of H.T. supply is required.

The use of this type of rectifier presents little problem, but there is one precaution which must be observed if long life is to be expected, and that is to ensure adequate cooling. This is particularly important in the case of the low current rectifiers. The rectifiers are adequately provided with cooling fins to dissipate the heat generated by them, but the air reaching the fins should be cool, not air which has been heated by the valves and other components in the equipment. This point must be watched in the case of pre-amplifiers of the completely enclosed type. The maximum temperature to which the rectifier is allowed to rise must never exceed 75 deg. C. The rectifiers must always be mounted with the fins vertical.

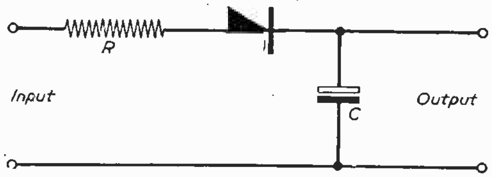

Fig. 1.—The half-wave circuit.

There are many advantages to be gained by using selenium rectifiers, first and foremost being that no heater supply, with its wastage of power and heat, is required. Another feature of them is their mechanical strength. There are no delicate parts at all and so they are ideal for applications in mobile equipment where severe vibration may occur. Also there is no limit to the size of reservoir capacitor which may be fitted, thus by using a very large value capacitor of, say, 50 or 100 μF, H.T. voltage regulation and smoothing is greatly improved. The voltage drop across the rectifier is less than with a valve rectifier and so the D.C. voltage is higher.

The half-wave rectification circuit, Fig. 1, is often preferred when using selenium rectifiers and the last-mentioned advantage enables us to use a large value reservoir capacitor, C, to offset the effect of the larger ripple voltage present in half-wave rectification circuits as compared to the full-wave or bi-phase half-wave circuit. The 30, 60, 100 and 120 mA selenium rectifiers are suitable for a maximum applied R.M.S. voltage of 125, but in applications where a higher voltage is required, two or more rectifiers may be fitted in series. Care must be taken that the applied R.M.S. voltage does not exceed 125 multiplied by the number of units fitted.

The purpose of R in Fig. 1 is to limit the peak current, particularly when switching on. With the large values of capacitance used for the reservoir capacitor, the initial charging of this component causes a high peak current to flow. This peak current can cause "ageing" of the rectifier to take place, but R, although small, effectively reduces this current thus minimising any ageing which might otherwise occur. A typical value for R is 22 ohms in a single rectifier circuit, this value being doubled when two rectifiers in series are used.

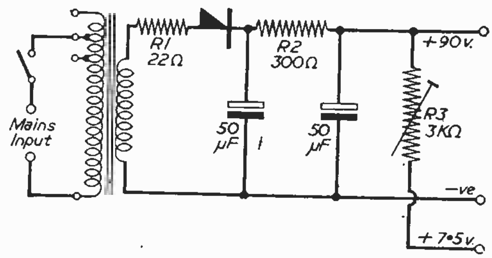

Fig. 2.—Circuit of a complete power supply, using the half-wave rectifier.

The 120 mA selenium rectifier may be used to form part of a very compact power unit for converting battery portable apparatus of the series filament type, using low consumption valves of the DK, DF, DAF and DL96 range, normally using a 90-volt H.T. battery and a 7.5-volt L.T. battery, to mains use. A practical circuit is shown in Fig. 2.

The mains transformer, T1, secondary gives an output of 125 volts R.M.S. which is applied through the limiter resistor, R1, to the selenium rectifier. On load, the D.C. output is approximately 130 volts,

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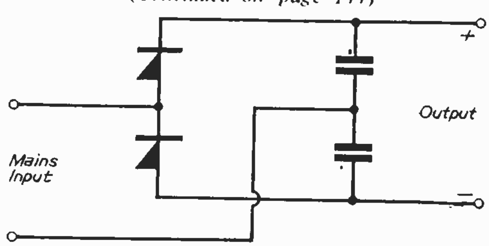

Fig. 3.—The basic circuit for a voltage doubler.

TV Distribution at the Radio Show

SOME INTERESTING DETAILS OF THE NETWORK WHICH WAS USED AT EARLS COURT

QUITE a number of visitors to our Stand at the Radio Show enquired about the pictures which were demonstrated on the various stands and apparently it was not realised that the distribution of the TV signals to the exhibitors' stands at both Band I and Band III frequencies is a very difficult proposition. The work was carried out by the E.M.I. organisation, and in view of the interest expressed we give the following details of the set-up which is used for such purposes.

The number of television points comprised in the distribution system varies from year to year, but is usually estimated at approximately 400, and when one realises that each exhibitor expects—as he is entitled to expect—constant, high-quality reception throughout the entire period of display, without dislocation or interference, for every one of his operating models, it will be appreciated that its successful achievement is no mean task.

More Than Eight Miles of Cable

The network starts from the transmitters in the R.I.C. Control Room, which is itself unique in that it is the only TV Control Room in existence that handles two separate TV programmes from a variety of sources simultaneously, and is in continuous operation for 12 hours a day. From there 16 main trunk cables, some 30 ft. above the ground floor, traverse the entire length of the great hall, and from these main trunks are tapped the feeder lines supplying the stands and demonstration rooms. The system involves over *eight miles* of co-axial cable.

Each of these main trunk cables and their associated feeders carry both BBC and I.T.A. programmes at Channel 4 and Channel 11 carrier frequencies respectively to groups of television receivers, all capable of multi-channel selection. Because of the cable losses at the different carrier frequencies, the line and differential voltages must be carefully calculated and corrected where necessary.

The entrance of the feeders into the ultra-modern structures of the stands must be made as unobtrusive as possible, and exhibitors are committed to confining the number of receivers in operation to the number of points initially requested and provided for in the network. Observation is maintained during the course of the exhibition to ensure that no "piracy" occurs and that all receivers are operating correctly.

The transmitters, which are specially designed and built by E.M.I. for the Exhibition, consist of two separate racks of equipment—one for Band I and one for Band III. Each rack incorporates four transmitters—two for vision and two for sound (one of each pair being a stand-by), and measured approximately 8ft. 9in. wide, 6ft. 2in. high and 2ft. 2in. deep and weighs over a ton.

Wide Variety of Programmes

Incoming programmes may be received from aerials at Channel 1 and Channel 9 frequencies, or they may be received at video and audio frequencies by cable from remote studios, or from cameras and microphones at various places within the exhibition, or from combinations of these sources. Signals received at television frequencies are de-modulated to give video and audio signals to modulate the transmitters.

Because of the possibility of interference from unwanted pickup of Channel 1 and Channel 9 signals on the distribution cables, the signals are distributed throughout the exhibition on Channels 4 and 11 respectively.

The separate outputs of the four transmitters are combined into a single complex signal for distribution over the network. This is achieved by means of special mixing equipment contained in the rear portions of the end bays of the two racks.

The control panels on each rack provide great diversity and flexibility of switching so that, in addition to the switching functions already described, the monitor speakers, the picture monitors and the waveform monitors can be applied to any appropriate incoming source of signal so that these can be checked before being passed into the main equipment. All this is done without interfering in any way with the outgoing programmes.

Altogether some 460 valves are in operation in the two racks, and the total power consumption is of the order of 6 kilowatts.

Technical Details of the Equipment

The general construction uses the enclosed type of cabinet, with the actual apparatus built on to panels and mounted on runners. Any panel can be withdrawn from the front and remains supported on the runners for easy inspection and service. An adequate system of ventilation and air extraction is incorporated to remove the quite considerable heat generated in the cabinets.

The detailed layout of the equipment is as follow:—

Each rack consists of five bays, both similar in layout and equipment.

In the first bay are three TV receivers covering all Bands I and III Channels. They are specially designed and built for this work and have separate outputs for video and audio frequencies.

They are used to receive BBC and I.T.A. transmissions respectively, and to monitor the R.F. output of the E.M.I. transmitters.

The lower three panels are: (a) a patching panel to connect any of the three receivers to suitable aerials and to route the outputs of the receivers to the control panel described later; (b) A Pattern Generator and Wedge Generator for test purposes, available for use on either rack (that is, on the Band I or Band III equipment) by switching; (c) power supplies for the above two generators.

The second bay carries (a) the Vision Monitor for checking the picture received from any video input or the video output of any of the three receivers; (b) an oscilloscope for checking the level and the waveform of the audio signals and the audio frequency response of the equipment; (c) power supplies for the vision and sound transmitters housed in the fifth bay.

The centre bay carries the control equipment. At the top are various indicators, including two

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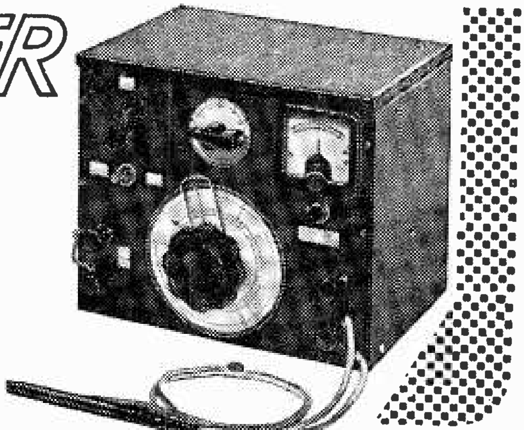
An INFINITE Resistance VOLT METER

By A. M. St. CLAIR



EVERY radio man knows those irritating-to-measure voltages which are reduced, sometimes almost to vanishing point, by the application of even a "high resistance" meter. There are, of course, formulae for the correction of such reduced readings; but as long as there are non-linear elements in the circuit—valves, for example—they cannot be relied upon to give correct answers. The solution is, of course, to use an infinite resistance voltmeter. The electrostatic voltmeter has virtually infinite resistance, but even if we do not mind its bad scale-shape, its sluggishness and its lack of robustness, we are likely to find the price strongly against it. The instrument to be described has, properly used, true infinite resistance, an open scale, and is far from costly.

One of the standard laboratory methods of measuring voltage, the "potentiometer method," consists of a device for opposing the voltage to be measured with an equal and opposite voltage, and obtaining a reading of the voltage required to do this. Since, in this method, no current is drawn from the source under measurement, it "sees" the measuring instrument as an infinite impedance. The apparatus normally comprises a uniform wire, evenly stretched

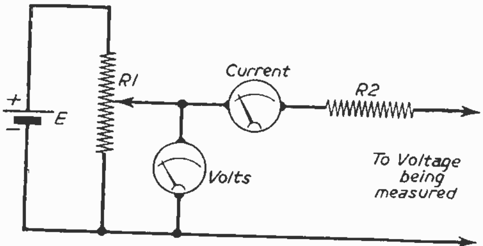


Fig. 1.—The potentiometer principle.

over a long graduated scale, and a slider actuated by means of a vernier screw mechanism. Not very convenient for the amateur lab., and not particularly cheap, either. But here are two methods of achieving the desired result rather more simply and with sufficient accuracy for our purposes.

In Fig. 1 we have a battery of voltage E, which must be higher than the voltage to be measured, connected across a potentiometer R1. The only restrictions on the value of R1 are that it should be of high enough wattage to stand the applied voltage E, and as low in resistance as is compatible with a reasonable drain on the battery. For example, if we are using a 100 volt battery, to make R1 100 kΩ would draw 1 mA., and it would then dissipate 0.1 watts $(I=E/R, W=I^2R)$. R2 is a "stopper" and should be embodied in the end of a prod, as will be described later. If we apply the prods to the voltage being measured, and adjust the slider of R1 until no current is registered on the milliammeter, then we know that the voltage on the slider is exactly equal to the voltage on the upper prod. This is read off on the voltmeter and, since no current is being drawn from the apparatus under test, we have a correct infinite resistance reading.

If you wish to achieve this result with a single meter, you may proceed as follows: First, ascertain the resistance of the meter on the volts range on which you are going to use it. (For example, a 200 ohms-per-volt meter on the 100 volt range is $200 \times 100 = 20{,}000$ ohms.) Obtain a resistance of this value and connect it in place of the voltmeter in Fig. 1. Adjust for zero current as before. Now remove the meter from its current-reading position, switch to volts, and connect it in place of the resistance which has been "dummying" for it. These steps are shown in Fig. 2(a and b). Since you are now measuring a voltage to which you are no longer connected, nobody can complain that you are upsetting circuit conditions!

Practical Arrangement

For those who wish to build these principles into

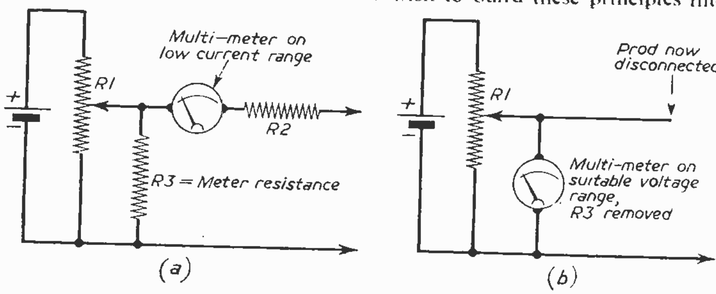


Fig. 2.—Potentiometer, using a multi-range meter.

a permanent instrument, instead of setting up a "hook-up" each time the need arises, details are given in Figs. 3 and 4. The circuit of Fig. 3 is fundamentally the same as that of Fig. 1, but certain refinements have been incorporated for convenience in use. The simple potentiometer has been augmented by a bank of switched resistances, to effect multi-range working. The ranges suggested are 0-50 volts, 50-100 volts, 100-150 volts, 150-200 volts and 200-250 volts. Note that the ranges do not start from zero each time; this means that a difference of one volt is as big on the top range, and therefore as easy to read, as it is on the lowest. This is due to the method of range-switching adopted, which also ensures that the current drain on the internal source is constant and that the same calibrating point can be used for all ranges.

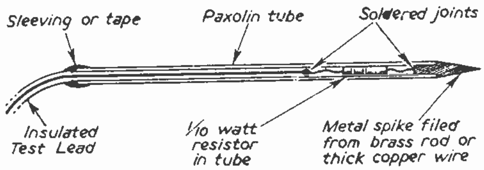
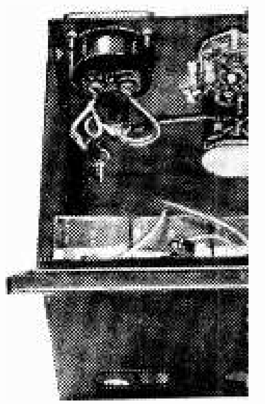


Fig. 5.—How to make the test prods

The functions of the components are as follows: R4 is the calibration control. It is used to adjust the current through the main potentiometer so that the voltage across the latter shall at all times be equal to the range coverage, namely, 50 volts. R2 is the main potentiometer, corresponding to R1 in Fig. 1. R1 in Fig. 3 is the meter shunt, which can be disconnected by means of S3, a normally closed push-button. R3 is an isolator or "stopper," of which more later. S1 is the "Calibrate—Read" switch. In the "Read" position the instrument is available for use as a voltmeter; in the "Calibrate" position the meter M is placed in series with the battery feed, enabling R4 to be adjusted to the correct value. S2 is the range and on-off switch.

R4 is an ordinary 50 k. carbon pot. R2 is a linear 50 k. pot, preferably wire-wound, but necessarily of good quality and construction. S2 is an ordinary two-pole six-position wafer switch, and the resistances "r" are tenth-watt 47 k., soldered direct to the switch tags. By making them slightly smaller in value than R2 we ensure that each range overlaps slightly those above and below it, at the expense of a slightly reduced overall coverage. If the resistances were all prefectly accurate the ranges would become 0-50, 47-97, 94-144, 141-191, 188-238. S1 is a normal double-pole double throw toggle switch. M is the best meter you can afford to use; centre-zero is desirable, but not essential. Mine is a 100-0-100 microamp 2in. square, but anything up to a 1 milliamp movement should serve. The better the meter the more sensitive the indication of zero current, and therefore of the true infinite resistance condition.



View of th

If you use a 1 milliamp meter you can omit R1 and S3. Otherwise R1 is a shunt to make the meter read 1 milliamp so long as the button of S3 is not pressed. Make this as accurately as possible, for although the accuracy of the instrument does not depend upon it, the accuracy of the 50 volt range coverage does. (If this appears contradictory, you will see what I mean when we come to the setting up procedure.)

The panel layout suggested in Fig. 4 is not in any way essential; it is that which I have adopted, and I have found it convenient. R2 is fitted with a large knob to the underside of which is screwed a strip of Perspex 3in. × ¾in. × ⅛in.; a hairline is scribed down the centre of this cursor, top and bottom, to avoid parallax in the readings. One then takes the reading obtained when both lines are seen to coincide. The dial is made of good cartridge paper marked in indian ink during setting up and protected after marking by clear copal varnish. The internal wiring is straightforward, and may be point-to-point or in beautiful right-angles at the whim of the constructor. R3 is not in the instrument case but in the prod. A suitable value for general use is 47 k., wattage unimportant. It is desirable to make up three prods, however, one having the 47 k. just men-

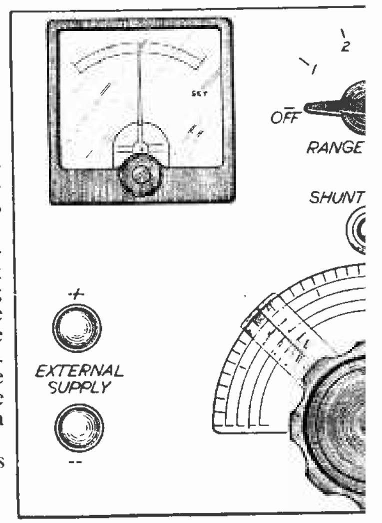


Fig. 4.—Panel layout. The dial will, of co

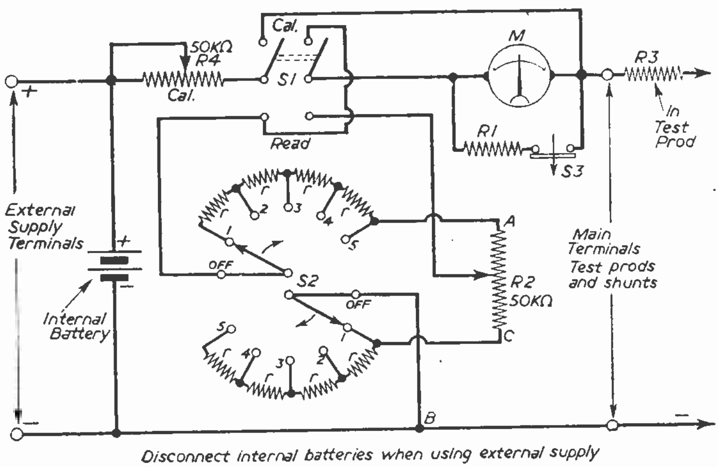
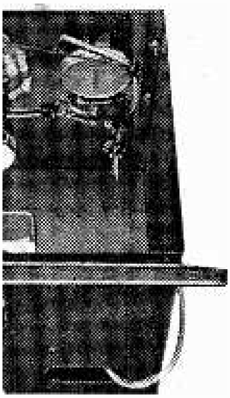


Fig. 3.—Theoretical circuit of the meter.

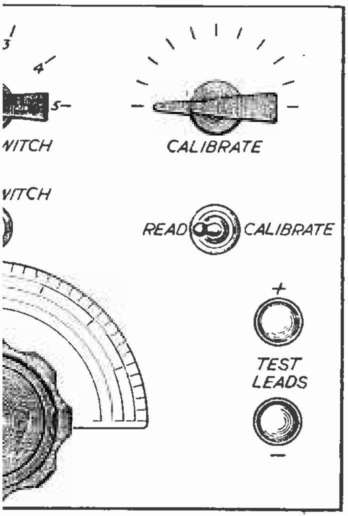


interior

tioned, one with 1,000 ohms and one with 10 megohms. The special uses of the last will soon become apparent. A suitable form for the test prods is shown in Fig. 5. As for the battery of Fig. 3, any source of 250-280 volts D.C. may be used. I use an ordinary unstabilised power pack on the bench and three midget 90 volt batteries when portability is desired. The current consumption is precisely 1 milliamp. It is often possible to make use of the H.T. from the apparatus under test ; under these circumstances voltages can be measured only with reference to chassis.

Operation

Here is the procedure for using the instrument. Set the " range " switch to the required range. Put the " Read — Calibrate " switch in the " Calibrate " position. Adjust the " Calibrate " control until the meter indicates 1 mA. (This point should be clearly marked on the meter scale, preferably in red.) Switch the " Read — Calibrate " switch to " Read." Apply the prods across the points where the measurement is to be made, as for an ordinary voltmeter. Turn the main dial until the meter indicates zero current, pressing the shunt button to obtain final adjustment. The pointer of the main dial now indicates the true voltage.



...e, be drawn to suit R2, i.e, 180° or 270°.

It remains only to show how the main dial itself is calibrated ; the initial setting up. There are two methods. We may do it by theory or by checking against known voltages. The theoretical method is perfectly satisfactory so long as R2 is a really good, accurate component and the 1 mA marking on the meter is true. Five semicircles are drawn with suitable radii on the dial, one for each range, together with radial lines corresponding with the ends of the pointer travel. The range switch is set to position 1, and the resistance between points A and C (Fig. 3) is measured. This figure, which is the resistance of R2 (probably not exactly 50 k) gives the voltage span of every range, at the rate of 1,000 ohms per volt, i.e., if it is 49.3 k, each range will cover exactly 49.3 volts. Mark this figure at the top end of range 1. Turn to range 2 and measure the resistance between B and C. This figure corresponds to the bottom of range 2. If it is 46.8 k then we mark 46.8 v at the beginning of range 2 and 46.8 + 49.3, i.e., 96.1 v at the top. Still reading between B and C, repeat for the other ranges. Mark the intermediate voltages by dividing the

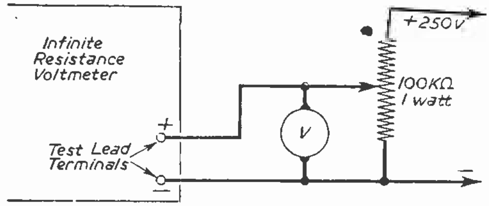


Fig. 6.—One calibration method.

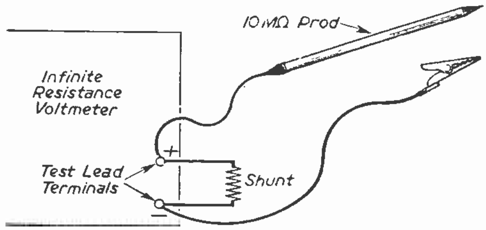


Fig. 7.—A range multiplier.

scales evenly. If you are content to neglect the odd fractions of a volt, and in practice they are claiming a higher accuracy than we are likely to be entitled to, then it is sufficient to divide the outer scale only and to obtain the divisions on the others by drawing radii, since each scale covers the same range in volts. You can simplify things still further by purchasing R2 and the four resistances on the lower half of S2 (Fig. 3) as 1 per cent. tolerance components. You

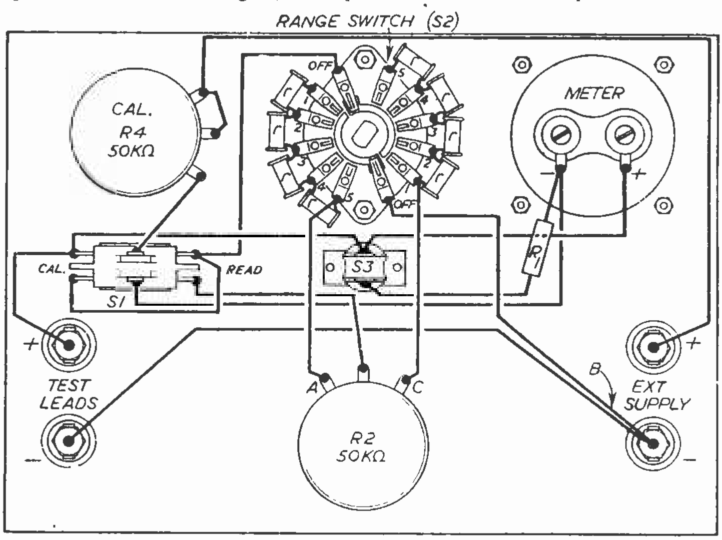


Fig. 8. — Practical wiring diagram of the instrument.

then know in advance that the five resistance readings will be 50 k, 47 k, 94 k, 141 k and 188 k and can prepare your dial accordingly.

Calibration

The second method is quicker and easier, but requires an accurate voltmeter against which to calibrate the infinite resistance instrument. It consists, in effect, of setting up a second, temporary infinite-resistance meter. The circuit is shown in Fig. 6. The potentiometer in this diagram is varied to give suitable voltages as read on the ordinary voltmeter, and the infinite resistance instrument is adjusted at each voltage for zero current indication. The voltage then shown on the ordinary meter is entered on the scale of the infinite resistance meter directly under the hair-lines of the cursor on the appropriate range. Before marking any point on the scale it is advisable to switch to "Calibrate" for a moment, to make sure that the current through the main potentiometer is still standing at 1 mA. If this second method of calibration is adopted, the instrument will be accurate independently of the accuracy of the 1 mA mark on the face of the built-in zero-current meter, but the range covered in any one setting of the "Range" switch, since it is equal to the voltage developed across the main potentiometer, is directly proportional to the accuracy of this mark. This fact can, indeed, be used to correct for small inaccuracies of resistance in the main potentiometer.

Test Prods

Finally, a word about the prods. Since the instrument possesses infinite resistance when properly adjusted, no amount of series resistance in the leads will affect the readings. This is in contrast to the behaviour of a conventional voltmeter, in which series resistance is used to extend the range. The effect of the two lower resistance prods is to isolate the voltage under measurement from the capacity of the instrument, and of its user, without affecting the accuracy of the readings. Too much resistance, however, causes the indication of zero current to become vague. Hence, use the 47 k prod wherever possible, otherwise try the 1,000 ohm one.

The 10 megohm prod is used as a range multiplier, by the device of connecting shunts across the main terminals of the instrument. See Fig. 7. In conjunction with a 10 megohm shunt all ranges are doubled; a 2.5 megohm shunt will multiply them by 5, and so on. Used in this way the instrument is no longer infinite resistance, of course, but its resistance is always over 10 megohms, which is good enough for many purposes.

The instrument described is, of course, suitable for D.C. voltages only. Its use, however, need not be confined to the "vanishing voltages" for whose measurement it was specifically designed; it is suitable for the measurement of any D.C. voltage within its range.

I.T.A. Statement on the £750,000

THE Independent Television Authority has learnt with dismay of the Government's decision that none of the £750,000 provided in the Television Act for the support of balancing programmes can be made available to it.

The setting aside of a maximum sum of £750,000 each year from the rapidly increasing yield of the licence fees for the support of such programmes was an integral part of the arrangements approved by Parliament and embodied in the Television Act in 1954, and has always been regarded by the Authority as crucial to the proper discharge of its duties in this field.

So completely did it seem to be accepted that the money would be available, if the Authority judged it necessary, that the Treasury began deducting this additional £750,000 from the licence fees in the financial year 1955-56, and the deduction is continuing this year. The Treasury has now received, during the last sixteen months, a million pounds under this arrangement. Requests for this grant were made in November 1955, and repeated during the following eight months. It was only on July 31st that the Authority was informed that no money at all would be passed on to it.

Meanwhile the gross yield of the licence fees has risen in 1955-56 to £11,500,000, an increase of over £3,000,000. These licence fees were swollen by payments from over a million and a half families in Band III homes (over a quarter of all viewers) who spend more than three-fifths of their viewing time watching I.T.A. programmes.

The Authority is conscious, and its view is shared by the programme companies, that the present programmes, although extremely popular, do not contain a sufficient number of programmes of information and discussion, or of plays and performances of lasting value. For this the explanation is the very simple one that such programmes, whether transmitted by the Authority or the BBC, do not attract relatively large audiences, despite their national value. The possibility that this situation would arise was clearly foreseen during the debates on the Television Bill, and it was precisely in order to make such programmes possible that the £750,000 provision was included in Section 11 of the Act.

The BBC does not find itself in this difficulty, as its rising income is guaranteed whatever the size of its audience. The Authority and the programme companies are, however, very much in this difficulty, and are apparently to be left unable to respond, as they would wish, to the preferences of large and important minorities.

This is not a situation which the Authority can accept without feeling that it is failing in one of its main duties, whatever degree of success it may have achieved in the discharge of others. It is, of course, aware that the provision of the £750,000 is not automatic under the terms of the Act but depends upon the agreement of the Treasury and the Postmaster General. It did not at any time enter into its calculations that this agreement would be withheld.

The Authority appreciated that the Government might reasonably take the view that the payment of the full sum should be deferred while the country's present financial difficulties continue, and so made it clear that it would for the present rest content with the payment of only a small part of the sum so that at least a start could be made in the provision of balancing programmes, and in token of the acceptance of principle that independent television, if it is to grow to its proper stature, should not be dependent on advertising revenue alone. Even this modest proposal has been rejected.

Battery Operated TV

HINTS FOR THE COUNTRY DWELLER AND OTHERS WHO HAVE NO MAINS FACILITIES

By F. G. Rayer

THE operation of a TV receiver from an accumulator supply is a relatively straightforward matter, but experience shows that some initial difficulty in obtaining satisfactory results is by no means unusual. Such battery operation is, of course, quite pointless when mains are available, but nevertheless has a certain field of utility. "Portable" equipment can be powered from a car battery, while in rural houses with low-voltage lighting plants, there is no alternative to the use of some type of battery circuit.

A number of methods exist, each with particular advantages. The rotary transformer is simplest, but draws rather a heavy current in some circuits. A vibrator is much more economical, but produces R.F. hash difficult to suppress. Whether or not the receiver is to be used on mains will also govern the method adopted.

The direct operation of an A.C./D.C. type receiver from a rotary transformer of sufficiently large rating has much to recommend it when circumstances permit. No changes whatever are required to the receiver, which may be plugged into convertor unit or mains, as required. Connections for this method of operation are shown in Fig. 1.

It is essential that a rotary transformer of correct rating be used, and a large model will be required, since the output also has to provide heater current. For example, assume that the receiver consumes 60 watts, then a 200 v. to 250 v. rotary with this output rating is required. The mains-voltage selector of the receiver is adjusted to suit the transformer output voltage, if this differs from the local mains voltage.

The input voltage of the rotary is also chosen to suit the supply available, usually being 12 v. for "portable" use, or 24 v. to 30 v. for domestic low-voltage plants. It is necessary to bear in mind that the current consumption will be quite high. When running, it is likely to be around 8 to 15 amps., according to battery voltage and receiver, with an initial starting current of up to 20 amps. or more. For successful operation, the input voltage to the rotary must be maintained. A large accumulator, well charged and in good condition, is thus essential. With domestic plants, the load can be relieved by running the engine generator when the rotary is in action.

To avoid unnecessary interference, the rotary unit is best kept clear of the receiver. Connecting plugs should be marked, or non-reversible, so that the receiver cannot be connected in the wrong polarity when operated from the D.C. output of the convertor unit. If interference is observed, suppressor chokes may be inserted in the output leads from the rotary, which may need screening. It should in any case be enclosed, to reduce noise. Further by-pass condensers from input leads to earth may also prove necessary to keep down interference.

It is possible to operate an A.C. type receiver from a convertor giving an A.C. output, but this is not easy to arrange, as both output voltage and frequency are liable to fluctuation, with resultant deterioration in reception.

H.T. Only

In home-constructed receivers of suitable type, where the heater circuit can be separated and operated directly from a source of low voltage, the load upon the rotary transformer will be very greatly reduced. If heaters and rotary may both be run from the same accumulator, as in Fig. 2, the arrangement is particularly simple. The large type of transformer required in Fig. 1 is no longer necessary, as the output only needs to provide a suitable H.T. current.

The 6.3 v. type of valve is very suitable for operation from a 6 v. accumulator ; or may be wired in pairs (dissimilarity of current rating, if any, being met by parallel resistors) for 12 v. operation. The current required from the battery can be found by adding consumption of the rotary and all heaters operated from this circuit.

Reasonable care to avoid interference is necessary, with by-pass condensers from heater and H.T. circuits

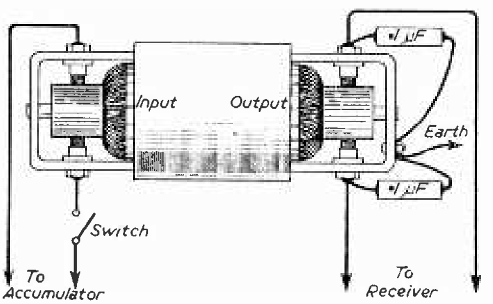


Fig. 1.—Operating an unmodified A.C./D.C. receiver.

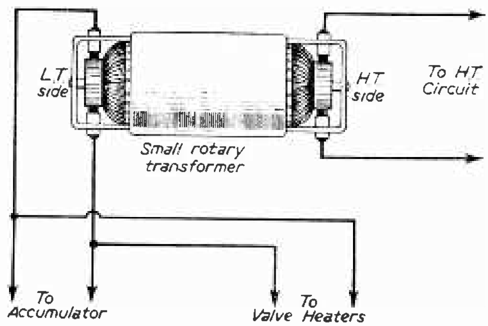


Fig. 2.—Circuit for H.T. only.

to earth. If the rotary sparks excessively this may be caused by worn or dirty brushes or commutator. If so, attention to this may well remove the interference, and such a fault should certainly be corrected if present.

Vibrator H.T.

A vibrator can provide a fairly economical and reasonably quiet means of obtaining H.T., but is very prone to cause interference. In operation, it throws upon the accumulator a load which alternates in degree continuously, and which may produce a low-pitched hum or buzz. Even when this is avoided, the continuous sparking produces forms of R.F. interference often difficult to suppress. For this reason, the self-rectifying (synchronous) type is best avoided, as sparking at the rectifying contacts may be a source of trouble, and will be avoided with a valve or metal rectifier.

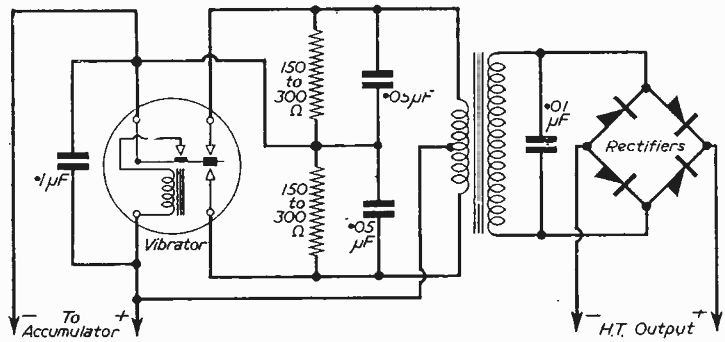


Fig. 3.—A vibrator H.T. supply.

Fig. 3 shows a typical vibrator circuit, a metal rectifier being employed to avoid further load on the battery. The small condensers shown are primarily R.F. by-pass components. To reduce low-frequency buzz, a capacity of 100μF or more may be found beneficial, in parallel with the accumulator circuit. The whole equipment needs to be screened and earthed, with suppressor condensers inside, and possibly suppressor chokes in the leads where they emerge to accumulator and H.T. circuit. Indeed, without full care it will probably be found that interference is very troublesome and difficult to eliminate.

If necessary, suppressor chokes may be added between vibrator contacts and transformer primary, with further condensers of .05μF or .1μF to earth line. It must not be overlooked that R.F. interference can readily travel along the accumulator leads, thereby entering the receiver, and that the H.T. output may not, therefore, be responsible for trouble of this kind.

When circumstances permit, the rotary transformer will be found less troublesome in terms of interference, since it forms a steady load, which a vibrator does not.

TV DISTRIBUTION AT THE RADIO SHOW

(Concluded from page 122)

oscilloscopes for continuous observation of the vision and audio waveforms going out to the network, and meters showing the outputs of the vision and sound transmitters.

The main control panel carries 84 push-buttons and 16 other controls. All the video and audio switching is done on this panel, which includes the master level controls of the vision and sound transmitters.

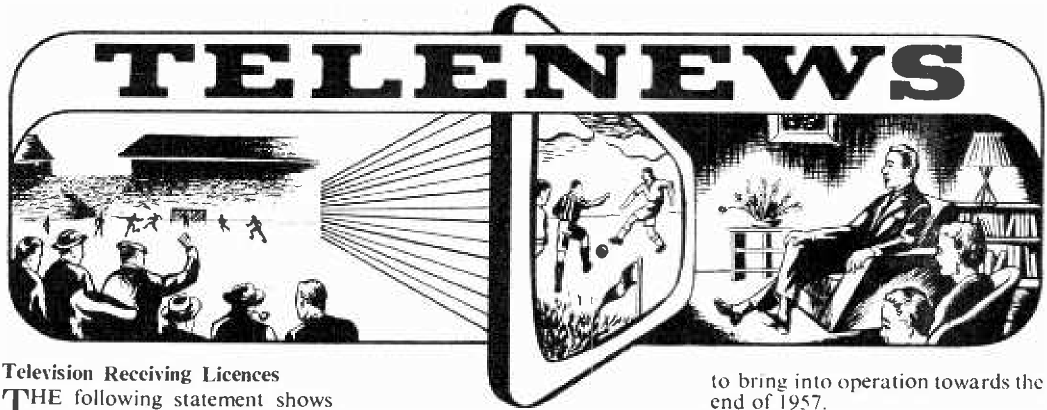
Below is the mains intake, with Variacs for precise voltage control, fuses and power distribution equipment.

The fourth bay carries the Monitor speaker, the Vision Monitor and a Waveform Monitor, for monitoring and checking any of the inputs and outputs as required, while the Waveform Monitor is also used to check the waveform and levels of the Vision Modulator sections of the vision transmitters. At the bottom of this bay are the power supplies for the vision and sound transmitters in the next bay.

The fifth bay in each rack carries two vision and two sound transmitters and modulators—one of each being a stand-by.

The vision and sound transmission frequencies are respectively 61.75 and 58.25 Mc/s for BBC programmes, and 204.75 and 201.25 Mc/s for I.T.A. programmes. All frequencies are crystal controlled to ±0.005 per cent.

At the rear of this bay is the equipment for combining the vision and sound transmissions, and splitting the outputs to feed the main trunk lines of the distribution network.



Television Receiving Licences

THE following statement shows the approximate number of Television Receiving Licences in force at the end of July, 1956, in respect of receiving stations situated within the various Postal Regions of England, Wales, Scotland and Northern Ireland.

Region	*Total*
London Postal	1,334,471
Home Counties	688,164
Midland	1,030,027
North Eastern	911,785
North Western	859,072
South Western	405,608
Wales and Border Counties ...	333,694
Total England and Wales ...	5,562,821
Scotland	370,457
Northern Ireland	46,232
Grand Total	5,979,510

Airborne TV for Reconnaissance

THE Philco Corporation, of Philadelphia, announced recently that it has developed an airborne TV system which may be used by the U.S. Air Force for its reconnaissance jet planes. The system will provide ground control points with a picture of troop movements or terrain and makes it possible to transmit a TV picture, not only from near ground level but also from the stratosphere, beyond reach of anti-aircraft gunfire.

Unlike those systems which have been used commercially to relay TV signals from one ground point to another, *via* a slow-circling plane, the new airborne reconnaissance system is a complete, self-contained broadcasting station. It is so compact that it may be carried in a single-seat aircraft.

To cover a wide area, two unmanned TV cameras are used in the plane. Signals from the plane are transmitted to a ground control point where they are picked up by a receiver. At ground control, the picture may be instantaneously photographed on 35mm. film, processed in less than a minute, and then immediately projected on theatre-size screens or relayed to other locations. Live pickups from slower-moving aircraft may also be observed on standard fine-line monitors.

The company has overcome the inherent difficulties of obtaining a clear, sharp picture from aircraft travelling at supersonic speeds by developing a unique transmitter circuitry and method of transmitting a high-quality picture. The picture obtained is as good as ordinary TV. It is now possible to slow, or stop, TV pictures taken at high speeds without blurring ground movement. Data, such as time and position, may also be automatically printed on the film.

I.T.A. Station in South Wales

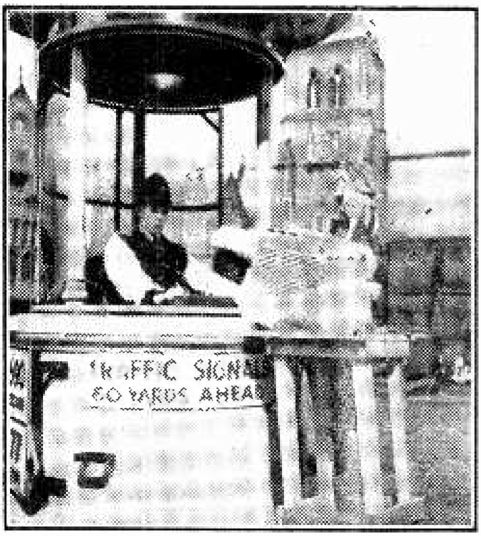
THE Independent Television Authority has been giving careful consideration to the selection of a site for its new station to serve South Wales and the areas to the east and south of the Bristol Channel. It has now decided to locate the station in the Wenvoe area. Sites on the south side of the Bristol Channel have been considered, but have been rejected on technical grounds.

About 3,000,000 people should be served by the new transmitter, which the Authority hope to bring into operation towards the end of 1957.

The Authority will be advertising shortly for applications for the contract to supply the programmes which will be broadcast by this transmitter.

Durham TV Traffic Control

DURING August Durham became the first city in Great Britain to use television for traffic control. Due to the narrowness of certain streets it is very difficult to ensure a steady flow of traffic through the market-place, and jams became frequent. By installing two television cameras of the commercial type, one attached to a lamp-post in one street and another cited in a first-floor window of another street, a closed circuit relay to the pointsman in the market-place enables a steady



The television control point in Durham. See story above.

view of both streets to be seen. In this way the traffic lights may be suitably controlled and the congestion considerably reduced.

Radio Show for Glasgow

THE Radio Industry Council, organisation of all sections of the radio manufacturing industry announces that it will hold a Scottish Radio and Television Exhibition at the Kelvin Hall, Glasgow, in Mid-May, 1957.

It is expected that all the leading manufacturers of radio and television receivers will exhibit and there will also be exhibits of the latest high-fidelity sound equipment and of valves and components.

The BBC has promised its full co-operation.

The only previous exhibitions held in Scotland by the radio manufacturers were at Kelvin Hall in 1933, 1934 and 1935.

London Base for Television Index

HEADQUARTERS for British Nielsen Television Index have been established in London at Stockleigh House, 99, Park Lane, W.1 Telephone: MAYfair 4528/4529/4530; Telegrams: Nielindex Audley; Cables: Nielindex.

From this office Graham R. Dowson, the Nielsen company's director in charge of NTI, will direct the operation and development of Nielsen audience research activities. Day-to-day sales and client servicing—under William S. MacDonald—will also be based on the Park Lane office. TV Field administration and Production operations remain at the company's main offices in Oxford.

The establishment of the London office is part of the Nielsen Company's plan to provide maximum assistance to its Television Index clients in the interpretation and effective use of audience-research findings.

The London office will soon be available on Tellex, installation of which is currently in hand.

Drama Script Editor

GEORGE F. KERR, a Lancashire man, born in St. Helens and brought up in Southport, has been appointed script editor for A.B.C. TV'S new Drama Department, now being set up by drama supervisor Dennis Vance. Mr. Kerr's appointment will, however, leave him time to continue the writing which has brought him many successes in recent years.

At the beginning of 1955 Mr. Kerr joined Towers of London Productions as script editor, and was responsible for many of the scripts in the "TV Playhouse" and "Theatre Royal" series.

I.T.A. Midlands Transmitter at Lichfield

ADDITIONAL sound and vision transmitting equipment is now installed at the Authority's Lichfield transmitter. This is available as a stand-by in the event of breakdown. Moreover, when certain ancillary equipment has been installed early in the autumn, the authority will then be able to give effect to its intention of raising the regular power of this transmitter from 50 to 200 kW effective radiated power.

Mr. Menzies, the Australian Prime Minister, had a television receiver fitted to his car whilst he was here for the Suez talks. This was so that he could follow the Test Match during his journeys.

New BBC Station for Londonderry

THE BBC announces the purchase of a site some 570ft. above sea level on Sherriffs Mountain, near Londonderry, Northern Ireland, for the Londonderry television transmitting station.

The new station is expected to be ready for service by the end of 1957. It will serve an area including Londonderry, Strabane, Limavady, Dungiven and Newton Stewart, bringing the BBC Television Service within reach of more than 130,000 additional people in Northern Ireland.

The site will also be suitable for V.H.F. (F.M.) transmissions of the Home, Light and Third programmes.

Miniature TV

A MINIATURE TV camera and transmitter which, combined, weigh only 19 lb., and with a range of over a mile, were recently announced by the Radio Corporation of America. Batteries can operate the camera and transmitter for about 5 hours.

BBC's Crystal Palace Aerial

WORK on the erection of the first part of the permanent aerial at the Crystal Palace transmitting station is making good progress. The new aerial is mounted at a height of 400ft. at the top of the support tower which forms the lower part of the permanent mast. It will therefore be twice as high as the present temporary aerial and, in addition, it will have greater horizontal directivity. The overall result will be an increase in the effective radiated power from 60 kW to 120 kW. The resulting increase in the strength of signal will be most noticeable on the fringes of the service area.

Preparatory work is also in hand for the completion of this aerial by the addition of a further section above the support tower; this work is expected to be completed in the late summer of 1957.

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

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

R.S.C. TRANSFORMERS

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

TOP SHROUDED DROP THROUGH

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

FULLY SHROUDED UPRIGHT

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

FILAMENT TRANSFORMERS
All with 200-250 v 50 c/s Primaries: 6.3 v 1.5 a, **5/9**; 6.3 v 2 a, **7/6**; 0-4-6.3 v 2 a, **7/9**; 12 v 1 a, **7/11**; 6.3 v 3 a, **8/11**; 6.3 v 6 a, **17/9.**

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

OUTPUT TRANSFORMERS

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

E.H.T. TRANSFORMERS 200-230-250 v, 2,500 v 5 ma, 2-0-2 v 1.1 a, 2-0-2 v 1.1 a for VCR97, VCR517 ... ... **36/6**

SMOOTHING CHOKES

250 ma 5 h 50 ohms	11/9
100 ma 10 h 250 ohms	8/9
80 ma 10 h 350 ohms	5/6
60 ma 10 h 400 ohms	4/11

SELENIUM METAL RECTIFIERS
G.E.C. 300 v 250 ma, **12/9**; 120 v 40 ma, **3/9**; 6/12 v 1 a F.W., **5/9**; 240 v 50 ma, **5/9**; 6/12 v 2 a F.W., **8/9**; 6/12 v 4 a, **16/9**; 250 v 80 ma, **7/9**; 6/12 v 6 a F.W., **19/9**; 6/12 v 10 a, **29/9.**

BATTERY SET CONVERTER KIT
All parts for converting any normal type of Battery Receiver to A.C. mains 200-250 v 50 c/s. Supplies 120 v 90 v or 60 v at 40 ma. Fully smoothed and fully smoothed L.T. of 2 v at 0.4 a to 1 a. Price including circuit **49/9.** Or ready for use, **9/9** extra.

ALL DRY RECEIVER BATTERY ELIMINATOR KIT.—All parts for the construction of a unit (metal-case 5½-4½-2in.) to supply Battery Portable receivers requiring 90 v and 1/5 v. Fully smoothed. From 200-250 v 50 c/s mains. Price, inc. point-to-point wiring diagrams, **39/9.** Or assembled and tested at **46/9.**

R.S.C. TA1 HIGH QUALITY TAPE DECK AMPLIFIER. For ALL Tape Decks with High Impedance, Playback and Erase Heads, such as Lane, Truvox. Adjustment to type of deck made by alteration of a resistor. For A.C. Mains 230-250 v 50 c/cs. Positive compensated identification of recording level given by Magic Eye. Recording facilities for 15 7½ or 3¾in. per sec. Automatic equalisation at the turn of a knob. **Linear frequency response of ± 3db, 50-11-000 c.p.s.** Negative feed-back equalisation. Minimum microphony and hum. High output with completely effective erasure and distortionless reproduction. Sensitivity is 15 millivolts so that any kind of crystal microphone is suitable. Provision is made for feeding a P.A. amplifier. Unit can also be used as a gram-amplifier requiring input of 0.75 v R.M.S. Carriage 7/6. Illustrated leaflet 6d.

Ready for Use ONLY 11 GNS

EX-GOVT. UNIT RDF1.—Brand new, cartoned. Complete with 14 valves, including 5Z4G. Also mains trans. L.F. choke rectifier, etc., etc. Only **28/9.** Carr. 7/9.

SMALL POTTED MAINS TRANSF. Removed from New Ex-Govt. units Primary 0-200-230-250 v Secs 250-0-250 v 60 mA, 6.3 v 2 a, 5 v 2 a. Size 3¼ x 4¼ x 3in. **11/9**

CO-AXIAL CABLE ¼in.

75 ohms 14/36	8d. yd.
Twin-screened Feeder	11d. yd.

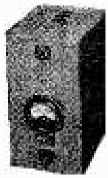
EX-GOVT. SMOOTHING CHOKES.—

100 ma 10 h 250 ohms Tropicalised ...	3/11
150 ma 6-10 h 150 ohms	6/9
150 ma 10 h 150 ohms	11/9
250 ma 5 h 50 ohms	11/9

E.H.T. SMOOTHERS
.5 mfd 2,500 v Blocks (ex-Govt.), **2/11.**

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

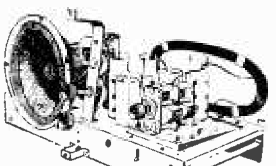
R.S.C. 6 v or 12 v BATTERY CHARGER
For normal A.C. mains input 200-230-250 v 50 c/s. Selector panel for 6 v or 12 v charging. Variable charge rate of up to **4 AMPS.** Fused, and with meter. Well ventilated case with attractive hammer finish. Guaranteed for 12 months. **69/6.** Carr. 3/6.



TV. CABINETS
Handsome well-constructed with walnut veneer finish. Size 18in. high, 20in. wide, 13in. deep. Size of aperture 17in. 13½in. Fitted Doors. For 15in. or 17in. Tube. Limited number at only **79/6** Plus 7/6 carr.
Table Model, 12in. Tube, **29/9.** 5/- carr.

BATTERY CHARGERS.—For mains 200-250 v 50 c/s. Output for charging 6 v or 12 v at 1 amp. In strong metal case. Only **25/9.** Above can also be used for electric train power supply.

RADIO & RADIOGRAM CHASSIS



3 w band & gram. Extra speaker sockets, 5 valves international octal. Built-in portable aerial. 4 knob control. A.C. or universal optional. Less valves (see our cheap list). 8" P.M. speaker 7/9 with order. Set of knobs 2/-. Chassis 15½" x 7" x 9" (when speaker is fitted). Carr. 4/6.

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RADIOGRAM CHASSIS 29/9

Including 8" speaker, dial and knobs, 5-valve s het 3 wave band, a.c. mains. Complete, tested, guaranteed. Less valves. P. & p. 4/6.

8" P.M. SPEAKERS. 8/9. Guaranteed std: 2-5 ohms, good makes. Post 1/9.

T.V. MASKS. 3/9. New rubber for 12in. tubes. Post 1/3.

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TIME BASES. 10/6. Containing scanning coil, focus unit, line trans., etc. Drawing free with unit. Carr. 2/6.

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POWER PACK & AMP. 22/6. Output stage. Pen 45, O.P. trans., Choke, Smoothed H.T. 325 v. at 250 m.a., 4 v. at 5 amp., 6.8 v. at 5 amp., 4 v. at 5 amp. centre tapped. Less valves. Ins. & carr. 5/6.

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SWITCH ASSEMBLY. Denco. Complete switch with fine tuner and coil platforms. **27/-.**

CONDENSER AND PRINTED CIRCUIT KIT. TCC. Contains all the condensers, printed circuit and valve holders. **43/-.**

RESISTOR KIT. We make up this kit with the specified LAB resistors. All labelled with value and position. **8/-.**

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VALVES. Mullard PCC84 **24/4.** Surplus **13/6.**
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KNOB. Pointed knob for switch. **1/-.**

SUNDRIES KIT. Contains all nuts and bolts, flex, wire co-axial cable, copper foil and spring wire. **8/-.**

COMPLETE KITS. All above items supplied at one time.

KIT A. With new Mullard valves. **£9.4.0.** Credit Terms: Deposit **£1.6.9** and seven monthly payments of **£1.6.9.**

KIT B. With surplus valves. **£8.2.0.** Credit Terms: Deposit **£1.4.0** and seven monthly payments of **£1.4.0.**

PLEASE NOTE. These kits do not include the items needed for conversion of the View Master Sound/Vision Chassis. We can supply the chassis conversion kit for **£2.0.0.** Full details in our list.

SET OF TWIST DRILLS. Complete set of the correct size twist drill for drilling the Printed Circuit Panel. **10/-.**

WATTS RADIO

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Telephone: KINgston 4099.

A Band I/Band III Switch

DETAILS OF A HOME-MADE COMPONENT AS USED IN THE EF50 CONVERTER

By R. Shalwell

ON the opening of the Winter Hill transmissions the writer hurriedly assembled a simple converter and the need for a station switch soon evidenced itself. Changing the set aerial lead, although simple, was considered rather crude and amateurish.

Very little information on commercially made switches for this purpose could be found, but the essentials are obviously low capacity, self-cleaning contacts, with facilities for earthing the unwanted signal. A search of the spares box brought to light a 10 pF variable condenser, and this produced a switch providing all these essentials and also screens between each section. Any similar type condenser can, with the use of gummed paper strip, some phosphor bronze for contacts, and a piece of thin paxolin, be similarly converted.

This switch, incidentally is the one depicted in the diagram (Fig. 2) of the EF50 Converter which was described in last month's issue.

The Essentials

The diagrams show the essentials. Fig. 1 is the condenser used, Fig. 2 the converted switch. Fig. 3 is simply to show the fitting together of the various parts. Obviously, only one contact strip is actually visible at each plate, but two are shown as this shows the earthing action more clearly. Fig. 2 omits parts 5 and 6 for clarity.

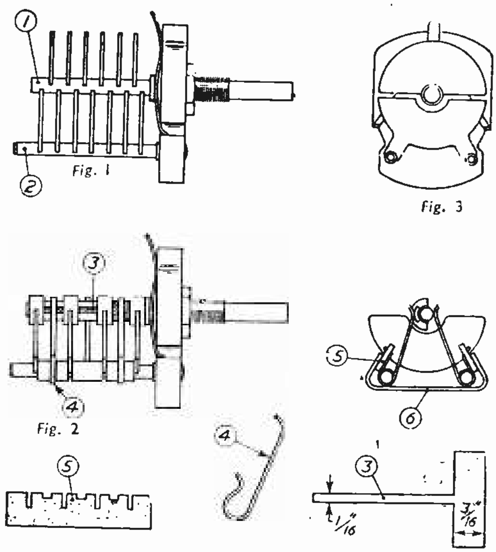
The sequence of operations in conversion is as follows: Dimensions will be to suit the condenser being used. The numbers quoted are to assist identification in the various drawings.

Construction

First remove the shaft with the moving plates attached, and remove all the moving plates from the shaft 1. With gummed paper strip build up this shaft to approx. ¼in. diameter. Next remove alternate fixed plates. Four fixed plates are needed with about ¼in. space between each. Build up the spaces on the rods 2 to 3/16in. diameter, with the paper strip cut to the correct width. Three spaces each side should be so treated. Now cut the T-piece 3 from thin tin plate, length to suit shaft and width of 3/16in. cross-piece sufficient to encircle the built-up shaft. Bend about the shaft with the 1/16in. tongue lying along the shaft. The circling of the shaft should be such that a butt joint is made. This is soldered and cleaned smooth with a fine file.

At points on the shaft coinciding with the position of the fixed plates build up with ⅛in. gummed paper strip to ⅜in. diameter. Before this make certain that the fitted piece 3 is completely isolated from the shaft. When the four points have been built up the shaft is completed and contains the circular ring as the output and the other two sections for Band I and Band III contact points. At a position 180 deg. from the tongue in these two sections file the build-up away to expose the shaft as an earth contact. From 1/16in. wide strips of thin phosphor bronze or springy brass cut three of the clips 4 and fit to the rods, one per section, between the fixed plates on alternate sides.

The two pieces 5 are then cut from 1/16in. paxolin. The sawcuts are ⅛in. deep and to slide tightly on to the fixed plates. The slots are 1/16in. wide and deep to hold the clip contacts firmly in place. Two 18 s.w.g. wire clips 6 hold the assembly securely, one at each end of the paxolin strips. The switch is now ready for use. No locators have been fitted, and



Details of the various parts of the switch

in use it can be rotated in either direction. The earthing of the unwanted signal is the deciding factor on correct setting and is evidenced by the disappearance of the patterning caused by the unwanted signal.

Connecting up

Wiring should be by coaxial, the outer sheaths being divided and taken to the fixed plates at each side of the contact used, thus shielding each contact strip from the remainder.

Tests in use have been unable to trace any breakthrough due to the switch, but obviously it will do nothing to mitigate breakthrough prior to the switch, which is a matter for rejectors and screening.

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).

I.T.A. SOUND QUALITY

SIR,—My attention has been drawn to a letter in your July issue under the above reference. Whilst I am in entire agreement with Mr. Dowling regarding the shouting and fair-ground announcements of some of the advertisers, I also feel that something should be done about the bad quality when films are transmitted. This trouble occurs also on the BBC channel, and in many cases there is a constant hum and noise in the background, and that it is the film or projector is obvious because when the picture stops for the commercial, so does the noise, only to return when the picture is resumed. Could it be due to the fact that they are old American films which have been badly worn or defaced, or is it just bad technique? Incidentally, to return to the main criticism of Mr. Dowling, I have fitted a remote volume control only to my set (which is home-made) and for the majority of the advertisements I turn the volume off. Some of these adverts. are clever and very musical, catching the eye as well as the ear, but others are simply ridiculous and bring the makers of the product into ridicule.—G. J. STEBBING (Barnet).

SPECIAL NOTE

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

AERIAL DESIGN

SIR,—I wonder if any of your experts could supply actual constructional data for combined aerials of *unorthodox* type. I remember some years ago the chicken-wire netting aerial of the slot type, which did not follow any known principles, but worked. Then before that we had the "X" aerial which was found highly efficient, and then rules and formulae governing its function were produced. Surely, the experts have not packed up at this? What about Band III novelties? I have seen in some American magazines the "bow tie" and wire netting reflector types on these very high frequencies, and being *really* an experimenter I would very much like to try out any new ideas such as these. I still use the netting slot aerial for Band I with a home-made Band III aerial, and it would be nice to dispense with both and put in something small but just as efficient.—H. G. BURTON (N.W.5).

A READER'S SUGGESTION

SIR,—In your July issue a reader suggests a twin filament tube to avoid costly repayment. I wonder this idea has not been adopted. Years before the war I designed a similar idea, in which a filament shaped like a letter M was used, the lower part of the central "V" section being anchored and made one connection, whilst the other connection was taken from the bottom of either of the uprights. Coupled with this suggestion was one that the anode should be formed as a succession of tapers—with a tapped filament, thereby providing a variable-mu valve. The suggestion was put up to one of the large companies, but was turned down, and shortly afterwards a valve did appear on the market with the switched filament idea to replace a burnt-out section.—L. WEALD (N.W.)

COLOUR AND DEFINITION

SIR,—There is a most interesting argument laid on in Mr. Presslow's letter in the September issue. Surely there is a very sound argument for both sides of this question. Colour, in my opinion, will provide what is missing in the way of definition with the present line structure, and I feel that a coloured picture will give much more satisfaction, even if the bandwidth as well as the "lineage" is less than at present. Of course, after some months of such a picture one would become critical as now with the present system and want improvements, but, so far as I see it, colour is much more important than bringing up the lines. After all, our engineers knew about the higher definition when they started and there must be a good reason why they stuck to 405 lines and not anything higher.—R. EDWARDS (N.9).

TV RECORDING

SIR,—Thinking recently about the recording of radio programmes directly on to tape without the use of a microphone, I was wondering if the same system could be used to record television picture signals (including sync. pulses, etc.). The programmes would be transmitted on closed circuit to a tape recorder which would record the signals and could later replay them when required. This would provide a simpler method of recording programme material as well as improving on the quality of present film repeats.

I should be glad to know if the method is in use.—G. SMITH (Thornton Heath).

STRANGE SIGNAL PICK-UP

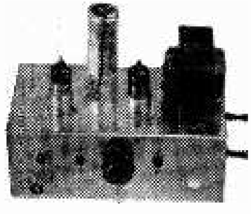
SIR,—Perhaps you could hazard a guess as to the reason of the following phenomenon.

A friend of mine who built himself a Band III television convertor was trimming same when, for some reason, he says he received quite plainly the "speaking clock." At first I did not believe him but eventually I was convinced he was speaking the truth and not "pulling my leg." He says it was quite distinct but superimposed on the sound.

I asked him had he a telephone and the answer was no. The nearest telephone was some distance away on the other side of the street.—ANTHONY MAGUIRE (Birkenhead).

RECEPTION ON WOBBULATOR

SIR,—I thought perhaps you would be interested in the following strange behaviour of the wobbulator which was described in your September issue. We had already made up the 'scope recently described and decided that the wobbulator would be a worthwhile addition. It was finished, checked over, and then connected to the 'scope. We switched on, and as soon as it had warmed up adjusted the calibrator and were surprised to see on the 'scope tube the Band III pictures. In fact it makes a splendid Band III converter.—G. BURNS (Surbiton).



BAND 3 T/V CONVERTER—185 Mc/s - 199 Mc/s

Suitable for London, Birmingham and Northern Transmissions

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Full range of Band 3 aerials in stock. Adaptors from 7 6 per set. Indoor dipoles, 6/6. Outdoor with cable 13 9. Band 1—Band 3 cross-over filter unit, 7/6. Variable attenuators 6 db—36 db, 7 6. BBC Break-through Filter, suitable for BBC pattern rejection, 8/6.

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

No. Sw.	S.P. Sw.	D.P. Sw.
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Linear Ratio, 10,000 ohms—2 Megohms. Less switch, 4/- each. **Coax plugs, 1 2. Coax sockets 1/-. Couplers 1/3. Outlet boxes, 4 6.**

80 ohm CABLE COAX

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

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

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TWIN FEEDER, 80 ohms, **6d.** yd.; 300 ohms, **8d.** yd.

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

50 OHM COAX CABLE 8d. per yd. ¼in. dia.

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

RESISTORS—Pref. values 10 ohms 10 megohms.

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20% Type. ¼ w., **3d.**; ½ w., **5d.**; 1 w., **6d.**; 2 w., **9d.**
10% Type. ½ w., **9d.**;
5% Type. ½ w., **1/-**;
1% Hi-Stab. ½ w., **2/-.**

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

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

STANDARD 3 WAVEBAND COIL PACK. Size 2¼in. x 2¼in. x 1¼in depth, 4 pos. Switching. Long, Med., Short, Gram. Dust-core coils prealigned for 465 Kc/s I.F. Complete with trimmer, ready to use. A very sensitive and efficient Coil Pack.
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ALUMINIUM CHASSIS.—18 s.w.g. Plain, undrilled, folded 4 sides and riveted corners lattice fixing holes. Strong and soundly constructed with 2½in. sides. 7in. x 4in., 4/6; 9in. x 6in., 5/9; 11in. x 7in. 6/9; 13in. x 9in., 8/6; 14in. x 11in., 10/6; and 18in. x 16in. x 3in., 16/6.

SPECIAL OFFER.—Goodmans 12in. P.M. Speaker Audiom 50. Brand new, boxed and guar. FEW ONLY. **£4/10/-.** Carr. 3/-.

BRIMISTORS.—CZ1 for .3a heater chains, **3/6.** CZ2 for .15 a., or .2 a., **2/6.** CZ3 (Pilot Lamp), **1/6.**

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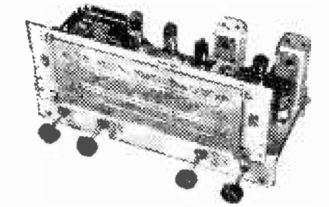
With variable Tone and Volume controls. 3 Midget BVA valves. 4 watts output. Neg. feedback. Chassis isolated from Mains. A.C. 200/250 v. A quality amplifier at an economical price. **PRICE £3.19.6.** Carr. 2/6. Wired and tested. **15/-** extra. Circuit and instr., **1/6,** free with kit.



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M.W. 200 m.—550 m.
L.W. 800 m.—2,000 m.
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7 Valve De Luxe, push-pull version 7 watt output, £12,10.0. Carr. & ins., 5/-.

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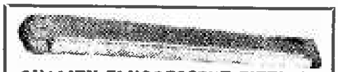
PLESSEY, **£8 10/-.** BSR MONARCH, **8½ gns.** GARRARD RC110, **£8/19/6.** COLLARO RC54, **£10/10/-.** All suitable for above Radiogram chassis.



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8 + 8/500 v. Dub.	4/6	16 + 16/450 v. T.C.C.	5 6
8 + 16/450 v. T.C.C.	5 -	16 + 32/350 v. B.E.C.	5 -
16/450 v. B.E.C.	3/6	32/350 v. Dub.	4
16/500 v. Dub	4 -	32 + 32/450 v. T.C.C.	6 6
16 + 16/450 v. T.C.C.	5/6	60/350 v. T.C.C.	6 6
32/350 v. Dub	4	60 + 100/350 v.	11 6
32/500 v. Dub	5 -	60 + 250/275 v.	12 6
50 + 50/350 v. B.E.C.	6/6	100 + 200/275. v.	12 6
		6,000 mfd. 6 v.	3 9

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ENGRAVED CONTROL KNOBS for ¼in. Spindle. 1½in. diam. Walnut or Ivory. Gold filled. 16 Standard engravings, **1/6** ea. Plain knobs to match above, 1½in. **10d.** ea., 1¼in. dia., **8d.** ea. Walnut or Ivory, 1½in., **1/-** ea.; 1in. **9d.** ea. Pointer Knobs Black with White Line, **9d.**

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Brand new ex-manufacturer's midget I.F.T. size 2½in. x ¾in. x ¾in. dust core tuning. Litz wound coils, High Q. Bargain offer, **7 6** pair.

MAINS TRANSFORMERS.—Made in our own Workshops to Top Grade spec. Fully interleaved and impregnated. **RADIO AND AMPLIFIER TYPE.**—250 v., 60 ma. F.W. sec. 5 v. or 6.3 v. 1 a. rect. 6.3 v. 2.5 a. set Htrs., **21/-.** etc. **C.R.T. HTR., ISOLATION TYPE.**—Low leakage with or without 25% sec. boost voltage. Ratio 1 : 1 or 1.25. 2 v., **10/6**; 4 v., **10/6**; 6.3 v., **10/6**; 13.3 v., **10 6.** Ditto with mains primaries 200/250 v., **12 6.** Specials to order.

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ERSIN MULTICORE SOLDER 60/40 grade. 18g., **3d.** per yd.; 16g., **4d.** per yd.; ¼lb., **2/6.**

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

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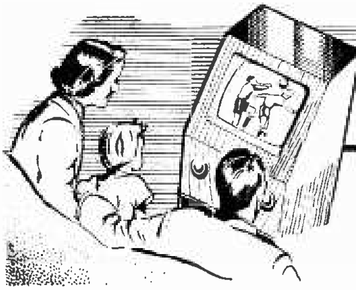


UNDERNEATH THE DIPOLE

TELEVISION PICK-UPS AND REFLECTIONS

By Iconos

A PEER SPEAKS

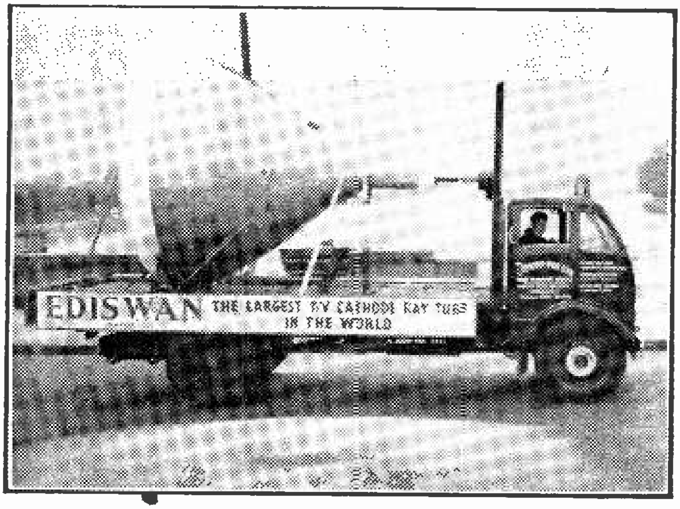
LORD LUCAS of Chilworth, champion of the authors' and composers' rights in the House of Lords debate on the Copyright Bill, attacked the I.T.A. in a speech at a luncheon of the Performing Right Society recently. "Good music is going off the commercial TV screen," he said, "and what have we in its place? Alleged humour which starts as mediocrity, gets to vulgarity and on all too many occasions has already reached obscenity." Strong words, these, but there's some truth in them. Commenting upon the popular methods used to put classical music over on television, he said: "Their ideas of production generally result in showing artists performing in every posture except standing on their heads." Truth in that, too, but how dull it would be to listen to a TV orchestral concert with a static long-shot of the orchestra on the screen. Finally, the angry peer attacked television itself: "Television is turning the nation into a glassy-eyed community of crystal gazers." His startled audience of members of the Performing Right Society were able to console themselves that the popularity of this particular kind of crystal gazing has yielded them a rich harvest of performing right royalties.

THE MUSICAL HORIZON

THE noble lord is entitled to his opinions, but I am of the opinion that popular taste for music on TV will steadily improve. At the moment, it is only natural that the best known classics and works which might be termed hackneyed occupy a large part of screen-time devoted to music. Musical orchestrations of a very high standard are often heard in the lighter programmes, particularly in those shows which feature ballet items. I would even suggest that many contemporary high-brow musical works, indigestible in themselves, prove acceptable when accompanied by an interesting visual image on the screen. Perhaps the musical horizon isn't quite so black as Lord Lucas painted it.

PICTURES ON TAPE

A STARTLING development has occurred in the technique of recording television pictures on magnetic tape. The Ampex Corporation of America have demonstrated their Videotape recorder, a machine in which good picture recordings have been achieved at the remarkably low tape speed of only 15in. per second. Hitherto, in order to obtain a 4 megacycle response needed for good quality tape recording of a picture, a speed of about 2,000in. a second has been required. This would mean that a 14in. diameter reel of magnetic tape would only record about half a minute of picture—which is hardly a practical proposition. With the new Ampex machine, a tape 2in. wide is used and the magnetic pattern is recorded transversely across the tape instead of longitudinally, as with conventional tape recordings. Four magnetic heads on a rotating drum scan the tape transversely at high speed in such a way that one head is always in contact with the tape. The sound accompanying the picture is recorded in the normal way, longitudinally, on one edge of the same magnetic tape. The machine was designed especially for television programme relay, so that New York live TV programmes could be sent by coaxial cable, recorded and stored, to be transmitted from Los Angeles and West Coast stations two or three hours later. It is said that both NBC and CBS networks have ordered a number of these new Ampex picture recorders, which, it is claimed, give much better quality pictures than the usual photographic telerecorder or "Kinescope," as they call it in America. I haven't yet heard of any similar type of picture



The "Largest Tube in the World" on its way to the Radio Show. It was, of course, a dummy, made from Flexiglass.

magnetic tape recorder being developed in England. The manufacturers seem to have concentrated on photographic recorders and reproducers, which, when correctly operated, have achieved a very high standard indeed.

GOOD MUSIC

IS good music a failure on TV? The public polls and private TV audience research organisations say it is. Hence, the steady reduction of programme time on I.T.A. transmissions devoted to music. Obviously, advertisers do not want to buy time for their commercials during periods when a large proportion of viewers have turned over to the BBC or gone out to the cinema. It is a great pity that this tendency is accepted by both commercial and BBC programme planners, though the BBC does occasionally produce some excellent musical programmes of a more serious type. After all, television is a composite of visual images allied to speech, sound effects and music, in varying proportions, and it would seem right that the high quality of sound reproduction on the TV channels should be used more for what is termed "good music."

PICTURE PARADE

ONE of the smoothest presentations of any of the current series put out by the BBC is Alan Sleath's *Picture Parade* in which Peter Haigh, Derek Bond and Maurice Elvey comment on pictures and picture personalities, past and present. I find Maurice Elvey's dips into the past quite fascinating and it is interesting to see how well some of the very old pictures stand up to the test of time, technically and otherwise. A good example recently transmitted was the excerpt from *Soldiers of the King* with Cicely Courtneidge playing mother and daughter in a theatrical scene. As regards the presentation of selections from modern films, I feel that it is a mistake to cut both sides of CinemaScope aspect ratio pictures in order to make the image fill the television screen. This sometimes results in principal characters near the sides of the picture being partially cut out. Much better to cut top and bottom of the picture and reproduce the elongated CinemaScope shape.

An O.B. camera with zoom lens in action during a recent relay of the British Oxygen Plant.

CO-AXIAL FEEDERS

THE web of co-axial cables laid by the Post Office for commercial television contractors increases almost week by week. There is hardly a part of London which is not fairly close to a terminal point. In the north-east, Highbury and Wood Green Empire are hooked up to A-TV headquarters, and I understand that a further extension is being made to the Hackney Empire. Television House is connected to Wembley Studios; Granville Theatre, Walham Green; and the Viking Studios, Kensington. The other extensions are on the way. The Viking Studios, formerly used as a film studios for second feature and documentary films, has been in use for over a year as a training school for television technicians by Marconi's Wireless Telegraph Company. Fully fitted with TV cameras and telerecording equipment, it is admirably arranged for this purpose, having a stage space of about 2,000 sq. ft. and excellent lighting equipment. Recently it has been used for a number of live transmissions by AR-TV during weekdays and at the week-ends by A-TV, and also, for specially filmed TV material for the Jack Hylton Organisation. I think we shall hear a lot more about this beautifully fitted up little television centre in the near future, when the training school is able to give more time over to the actual programmes. It seems a tiny little place compared with Lime Grove Studios, but the results obtained are first class.

WEMBLEY—THE H.Q.

THE announcement of the centralisation of facilities by AR-TV at Wembley and the consequent discontinuance of operations at their studios at Television House, Kingsway, and at the Granville Theatre, was not unexpected. This will mean that a large number of staff and quite a lot of equipment will become redundant. The concentration of activities at Wembley will result in great economies and reduce the enormous weekly loss that has been increased during the last few months. Losses were expected, of course, until commercial television was fully established. But what had not been realised was the amount of live TV it was possible to put through a comparatively small plant. Ideas and planning had been based upon experience of the vast resources of the BBC and of the huge American networks. A-TV, ABC-TV and Granada have demonstrated that it is possible to get by with a much more concentrated organisation and facilities. Nevertheless, it is unlikely the equipment and studio space will be scrapped. It will go into mothball treatment, ready for use at reasonably short notice.

1355 RECEIVER
Complete with 11 valves. 8 SP61, 5U4G, VU120, VR92. As specified for "Inexpensive Television." In absolute new condition. 27/6, carr. 5/-.

R.F. UNITS
RF24 complete with valves, 10/-.
RF25 complete with valves, 12/6.
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Brand new. Carr. 2/6.

MINIATURE I.F. STRIP TYPE "373" 9-72 MEG. Brand new miniature I.F. Strip size 10½in. x 2½in. x 3in. high. Valve line-up: 2-EF92, 3-EF91 and EB91. With circuit. Price (less valves) 7/6, P. & P. 1/6.
This I.F. Strip is part of above equipment.

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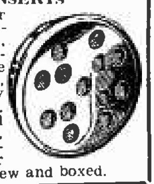

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Your PROBLEMS Solved

Whilst we are always pleased to assist readers with their technical difficulties, we regret that we are unable to supply diagrams or provide instructions for modifying surplus equipment. We cannot supply alternative details for constructional articles which appear in these pages. WE CANNOT UNDERTAKE TO ANSWER QUERIES OVER THE TELEPHONE. The coupon from p. 147 must be attached to all Queries, and if a postal reply is required a stamped and addressed envelope must be enclosed.

MARCONIPHONE VC59A

Thanks to your servicing series of July, 1955, I was able to locate the drop in H.T. through a faulty N152 (PL81) which restored the picture and other defects. One fault outstanding is lack of sound. There is a suspicion of sound barely distinct with the volume control fully advanced and very badly distorted. I have replaced the various Z152 valves, neglecting the D152 detector as the picture is satisfactory.

Could you please give me some guidance where to locate this fault ?—D. C. Downes (Stonehouse).

If the serial number of your receiver is over H17/6200 check sound detector crystal diode XL1 wired in the secondary circuit of the final sound I.F. transformer. Also check W1 noise limiter diode and associated 1 MΩ resistor. Also check all coils for continuity, i.e., both I.F. sound transformers. If the serial number is lower than that indicated, check ZD152 valve and anode circuit, including the 4 μF capacitor. Also noise limiter and 1MΩ resistor as before. Finally check .1 μF feeding volume control for leakage and capacity.

FERGUSON MODEL 10ST

Please advise on following faults on above model TV :

1. Picture unsteady horizontally on both Channels 1 and 9. The frame hold is steady.

2. After the set has been on some time picture moves to the right, leaving ½in. to 1in. gap between picture edge and escutcheon. Cramping is not present when this happens. The picture can be made to fill the frame by use of line hold, but this is not correct use of this control and line lock check by removing and replacing aerial gives locked picture immediately.

3. The set has hitherto worked perfectly on indoor aerials, simple dipole for Channel 1 and dipole with one reflector and two directors on Channel 9. Construction information gathered from your publications, of course !—T. W. Leary (Cambridge).

On the left side of the tube as viewed from the rear are two EF80 valves. The second one should be changed with a valve which is known to be absolutely steady on emission. This is the line control valve.

When the valve is replaced the picture should be locked by the controls on the weakest possible signal, or, better still, follow the information given on this subject in the "Servicing TV Receivers" article which dealt with the Ferguson 991T (Feb. '56).

G.E.C. 12in. MODEL

The tube of my set, which is a 12in. G.E.C. model, has worn out. All I can get is a faint raster. I have just started to get your monthly magazine, "Practical Television," which mentions reactivating tubes, details of which are printed in earlier issues. Unable to obtain these I was wondering if you could explain to me how to reactivate my tube—K. Dawson (Manchester).

The general method of increasing the tube emission, temporarily that is, is to employ a transformer which supplies a higher voltage to the tube heater. The exact transformer type and method of connection depend upon the type of tube and the model number of the receiver. We will give you full details of the necessary work if you will let us have the model number of the set. This is marked upon the rear cover and will be BT——.

BUSH TV24

I built your P.T. Converter some months ago, and it has proved very successful, but each time I change from BBC to I.T.A. I have to alter the tuning control at the back of the set. Is there any way in which I can eliminate this ? Can you help me at all ?—R. Thompson (S.E.3).

Set up the receiver for Band I operation and carefully adjust the tuning control and associated aerial and R.F. cores for optimum results. Connect the Band III converter and allow sufficient time to warm up properly. Adjust the oscillator of the converter for compromise between I.T.A. sound and vision and secure optimum balance with the aerial and R.F. tuning. You may also find it necessary to adjust the I.F. transformer tuning. This should be done without disturbing the receiver's tuning in any way.

EKCO T141

I have an Ekco T141 12in. TV and I am fitting a CRM123 tube. The EHT is approximately 7 kV. I would like to get the maximum results from this tube, which operates at 10 kV. Would, in your opinion, the enclosed circuit of a boost EHT taken from a back number of "Practical Television" be satisfactory, or could you suggest any other method ?—L. Engelen (Belfast).

The circuit shown will undoubtedly give an EHT boost, but since the line amplifier in your model is working at maximum under normal conditions the modification will severely impair the EHT regulation and make it difficult to obtain full width.

PYE VT4

My set has given good service for two years, but has now developed the following fault : two white lines (parallel) appear horizontally across the picture, which is badly distorted vertically. Do you think that the valve ECC82 is the cause of the trouble ?—F. W. Jaques (Birmingham).

The ECC82 frame timebase valve often causes this effect if it becomes faulty or alters in characteristics.

We feel that it would be well worth your while to check this valve before delving too deeply into the circuit.

McMICHAEL MODEL

I have the following fault on my McMichael No. 512.

There appears to be a " foldback " on the lower half of the picture which will not react to the picture height control. The fault appears to be on the video output valve, which is an EF91. (This is necessitated by the heater circuit being in series, and this appears to be the only B7G based valve at .3 amps. which is suitable).—A. W. Gaddes (Sutton).

We do not understand your remarks concerning the EF91 video output valve. This has no bearing upon the frame timebase and thus cannot be responsible for the compression of the lower part of the frame scan.

You should substitute the ECC82 valve (12AU7), frame timebase oscillator and output valve, and if this does not clear the condition replace the 50 μF cathode bias capacitor.

EKCO TC138

When first switched on the picture and sound keep going off and on for about eight or nine times before it finally settles down, and also when I turn the contrast up the sound is very distorted. This is very awkward and I have to have the picture pretty dim in order to follow the sound.—J. Jones (Ealing).

You will no doubt find that the intermittent vision and sound is due to a poor contact between the pins and socket of one of the first two valves (right side far end as viewed from rear). The valves should be rocked in their sockets to ascertain which is responsible and the valve pins should then be cleaned before replacement. The sound distortion is no doubt due to a high value resistor in the sound noise limiter circuit increasing in value. This would be concerned with the right side 6D2, which is behind the 6P25. The effect of this is to restrict the operation of the diode as the resistor is wired from the H.T. line to the anode of the limiter.

ULTRA V710

I have an Ultra V710 and I get just a blank screen and plenty of volume on sound. An electrical friend of mine spent several hours on it and has apparently got all the trimmers of the screened coils and I.F. transformers out of alignment.

As I am a complete novice I would like you to inform me of the correct way to use these trimmers.—F. E. Portland (S.E.15).

As viewed from the rear, on the left side of the chassis is a row of valves, the nearest one being a 6D2. Behind this is a 6F1. The components associated with this valve should be checked and you will probably find that the 1.8 KΩ anode/screen decoupling resistor is open circuit, thus preventing any H.T. voltage reaching these electrodes. This could be due to a defect in the associated .01 μF decoupling capacitor which is wired from the resistor to chassis. If the sound is in order only the coil cores associated in front and behind this valve may require adjustment. Once a picture is received the left side coil cores may be adjusted on test card C for best vision and sound response. We base this reply upon the assumption that a " blank screen " means that brilliance may be varied but with no picture.

TESTING DIODES

I would be pleased to know if a diode rectifier such as CG12E or CG6E, as fitted in vision strips of television receivers, can be tested with a 1,000 O.P.V meter, as I have been told they can be wrecked. I have a Ferranti small meter that is 1 mA FSD and would be pleased if you could say what I should do as one of these costs 7s. 6d. I feel that some advice on the matter would save any undue expense.—V. J. D. Smith (Surrey).

Germanium diodes suspected of a fault in a TV receiver are best checked by substitution. A rough check is available by the simple application of an ohmmeter, as you suggest, and no damage will result by using a 1,000-ohms/volt instrument for the purpose. The forward resistance will be found to vary between specimens and between different types of diode, but generally, if it is low compared with the reverse resistance, then the diode should at least give some indication of life in the circuit.

DEFIANT

I have a Defiant 9in. TV ; it is about five years old and has developed a loud hum and the talking is " quacky," and a dark bar covers the top half of the screen. Now and again it rights itself, on and off like morse ; the hum is louder with the aerial in. I substituted a 16×16 μF condenser in place of the original 8×16 μF power pack, but it made no difference. I have not got a circuit diagram, so I am at a loss to know what could cause it. I changed over the T41s, also Pen45s, but there was no change.—J. Davis (Bootle).

If you are sure that the electrolytic smoothing capacitors are all in good condition, then the trouble is probably caused by an intermittent heater-to-cathode short in one of the valves common to both sound and vision. Sometimes gently tapping the valves in turn reveals the one which is responsible by causing a show or correction of the effect. Check for poor soldered connection in the H.T. circuits.

SELENIUM RECTIFIERS IN POWER SUPPLY CIRCUITS (*Concluded from p. 121*)

this being dropped by the resistor, R2, to 90 volts. R2 and C2 form the smoothing components. The current required for the valve heaters is drawn from the H.T. supply via R3, this resistor being used to reduce the voltage to the required 7.5 volts. R3 is of the cement coated type of 5 watts rating and fitted with a metal strap, this being adjusted to give the correct voltage. The use of the double-wound mains transformer provides complete safety when the unit is fitted to receivers which have metal facias in contact with the chassis.

Other applications where the selenium rectifier may be with advantage are as follows : for rectification of low voltage A.C. for bias purposes, for voltage doublers, for energising loudspeaker field coils where the speaker is remote from the main amplifier and for numerous applications in test apparatus.

Fig. 3 shows the basic circuit for a voltage doubler. This gives full-wave rectification and is very useful where large voltage is required for operating a constant load. It is essential that the load is fairly constant as the regulation with this circuit is poor. The working voltage of C3 and C4 must be at least 1.414 times the A.C. voltage, R.M.S. applied. Typical values for C3 and C4 are 8 μF or 16 μF.

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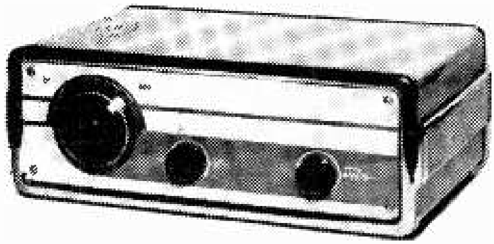
News From the Trade

SPENCER-WEST CONVERTER

THE ordinary type of converter often proves disappointing, due to the differences between the strength of the Band I and the Band III signals. In the Spencer-West converter illustrated below this difficulty has been overcome in a very ingenious manner. Instead of the normal cascode first-stage in the converter operating on Band III only, it is also applied to the Band I signals, and two normal R.F. gain controls are included in the stage. In this manner one is able to adjust the gain on both Band I and Band III signals before they are passed to the set in the normal manner, and equalisation of the signals can take place before amplification by the normal receiver—acting as usual as an I.F. strip.



The Spencer-West type 50 converter

As might be expected, this enables the grain of the picture to be kept at a minimum as a good strong signal may be passed to the normal receiver as a result of which the receiver gain or sensitivity control may be set well back. We have had an opportunity of testing one of these units out over a long period and the results certainly justify the claims made by the makers.

The unit has two sockets at the rear to accommodate both Band I and Band III aerials and it should be stressed here that for best results these should be separate without the use of any cross-over networks or similar devices, and as good as it is possible to fit. An output lead is provided for insertion into the aerial socket of the receiver. A further useful point is that the mains plug on the receiver is inserted into a socket on the rear of the converter, and then, switching on the converter (which has its own power supply) also switches on the receiver. The left-hand control on the converter panel selects the Band I signal, then either of the present Band III signals, with a spare position. Other versions are available in which the output from the first position may be at any Band I signal—to assist in using it with a multi-channel receiver where it would be possible to tune the receiver to a Channel other than the local, to assist in the removal of patterns. The centre control is the combined on/off switch and Band III trimmer, whilst the right-hand control is the Band III gain. The Band I gain control is at the rear. The controls are identified with small theoretical symbols instead of being named, and the general finish is in gilt and grey. The overall dimensions are 9½in. long by 7in. deep by 3½in. high and four small rubber feet are fitted so that it may be placed on a polished cabinet without soiling it. The price is £11 17s. 6d.—Spencer-West, Ltd., Quay Works, Gt. Yarmouth, Norfolk.

"BI-SQUARE" TELEVISION AERIAL

LABGEAR announce the introduction of the "Bi-Square"—an outstanding new long-range TV aerial, representing a big step forward in loft aerial design. Because it is out of sight, the "Bi-Square" leads the way in meeting objections to forests of outdoor aerials.

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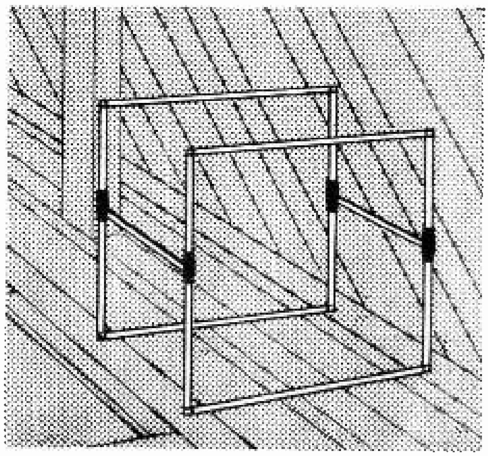

The Bi-Square loft aerial.

The Bi-Square gives first-class reception up to 40-50 miles, and is for Band I only. The price is £6 10s. 0d.—Labgear (Cambridge), Ltd., Willow Place, Cambridge.

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PRACTICAL TELEVISION, OCTOBER, 1956.

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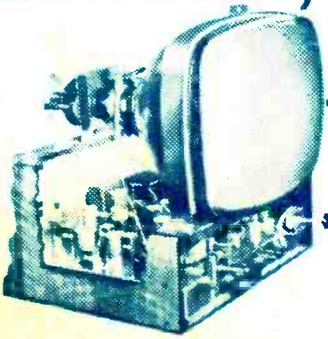

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