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PRACTICAL TELEVISION

AND TELEVISION TIMES

1/-

EDITOR
F. J. CAMM

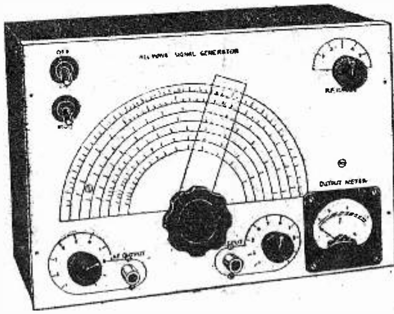
A NEWNES PUBLICATION

Vol. 6 No. 63 AUGUST, 1955

FEATURED IN THIS ISSUE

Receiving the ITA
Picture Tube Developments
Underneath the Dipole
Your Problems Solved

Amateur Chassis Construction
Servicing the Pye V4, V7, VT4 and VT7
A TV Engineer's Notebook



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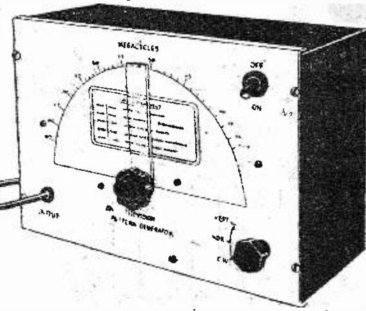

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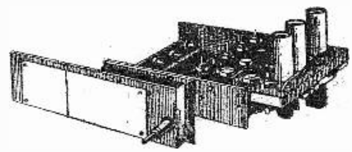

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Practical Television

& TELEVISION TIMES

Editor : F. J. CAMM

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Vol. 6 No. 63 EVERY MONTH AUGUST, 1955

Televiews

THE EVE OF I.T.A.

SOON viewers will have a choice between the BBC and the ITA programmes. The advent of the rival programme has had the beneficial effect of stimulating the BBC, who are busy not only in their efforts to improve their programmes so that they compare favourably with their rival, but also in signing up on contract the best personnel, both on the technical and the entertaining side. The new service has provided the best possible answer to those who feel that the BBC monopoly was a good thing. The moves they are at present making would not have taken place and the old attitude of take it or leave it as far as the programmes are concerned would have remained.

Commercial interests will be able undoubtedly to afford higher fees for artists and technicians and unquestionably will have to pay higher fees if they are to attract good personnel away from the BBC. It will remain to be seen whether an artist who serves one master will also be allowed to serve both. Will the BBC taboo those artists who work for commercial television ? There is not an excess of first-class entertaining material, indeed, insufficient to provide a good daily programme seven days a week. That is why so many of the programmes are padded out with silly parlour games and other matter of desultory and purely transitory interest. The BBC has excelled itself on the technical side, but we suggest that there is immediate need for a complete overhaul of its methods of programme production and selection of programme material and particularly of plays. In making this criticism we acknowledge that the BBC plans have been tied for lack of capital, but, at the same time, had they husbanded their resources and kept a wiser guard over expenditure, they would have had sufficient to produce first-class programmes all the time. There are far too many water-tight compartments, there is considerable over-staffing and overlapping. A select committee is needed headed by efficiency experts to examine the BBC methods both on radio and on television. There is far too much free-lance work about the BBC and those responsible for picking programmes are not subject to sufficient surveillance.

As far as commercial television is concerned, it now enters its first testing period. Those responsible for it know that unless the material is first class advertisers will not buy programme time at its present costly rate. It is beyond all doubt, however, that viewers will benefit by the new service, even if they do not wish to view the ITA programmes.

INTERFERENCE

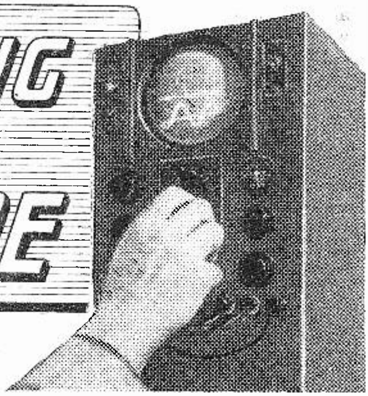
ALTHOUGH the new Act relating to the fitting of suppressors is a move in the right direction it does not go far enough. Interference caused by aircraft, power stations and electric vehicles is still a major cause of TV interference and it should be the concern of the Postmaster-General to seek early powers to put a stop to it. The present Act strains at a gnat and swallows a camel. Let the P.M.G. deal with major causes of interference and deal with the smaller fry later.

Of course, the problems of suppressing power stations, electric trains and aeroplanes is an involved and difficult problem, and it may be that it will only be solved by set manufacturers. It is, however, a problem which is the cause of widespread complaint and it should be tackled now.

BUILD-IT-YOURSELF

IN this do-it-yourself age more and more people are building TV receivers rather than purchasing the commercial product. In this respect they are finding our " Practical Television Circuits," which costs 15s., or 15s. 6d. by post, of great service. This valuable book describes construction of a number of cheap receivers, deals with aerials and test apparatus. The circuits range from a receiver costing under £10 to more elaborate receivers, designed for quality rather than low price. Those wishing to study the fundamentals will find " Television Principles and Practice " a practical help in their studies. It costs 25s., or 25s. 8d. by post.—F. J. C.

TIMEBASE TESTING with the OSCILLOSCOPE



OBTAINING MAXIMUM EFFICIENCY WHERE RESPONSE CURVES ARE AVAILABLE

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

THE oscilloscope is invaluable in tracing faults in the timebase circuits of a television receiver. Properly applied it permits rapid tracing of elusive faults which might well take hours in locating without a means of observing the various waveforms. Receiver manufacturers, realising the asset of an oscilloscope in practical servicing, are now starting to include a selection of timebase (and other) waveforms in their service manuals.

Such specimen waveforms are essential in tracking down faults which provoke poor linearity, insufficient amplitude of scan, and other symptoms which demand a pattern waveform as a comparison. For example, apart from the shape of the waveform, which may or may not indicate that a certain section of the timebase circuit is responsible for impaired linearity, it is desirable to have a voltage comparison, so that one can quickly establish whether a fault, such as reduced scan amplitude, lies in the timebase generator or in the output stage. If the stipulated amplitude of drive is being applied to the output valve, then there is little object in extensively analysing the timebase generator circuits—that is, of course, so far as the symptom of reduced scan amplitude is concerned.

Moreover it is desirable to have some idea of the repetition frequency of the 'scope's timebase, for then it will be possible quickly to determine the frequency of the receiver timebase and thus expedite the location of time-constant faults.

It is often general practice to adjust empirically the timebase of the 'scope to suit the frequency of the waveform under examination, but such practice might well mislead the operator into concluding that the receiver timebase is at least running at the correct frequency. One can only be conclusive in this respect by knowing definitely that the 'scope timebase is running at a certain submultiple of the *correct* frequency of the receiver timebase. For example, if the 'scope timebase controls are marked and calibrated at, say, 25 and just over 5,000 c.p.s., the correct frame and line scanning speeds in the receiver itself will be revealed by the display of two complete cycles on the screen.

In order to use the 'scope to full advantage in timebase analysis, specimens and amplitudes of waveforms to be expected at various points in the particular receiver under examination will need to be available. Unfortunately, there are no waveforms which can be illustrated as "standard," since they vary so considerably with various receivers and their diverse circuit arrangements.

Nevertheless, in order to provide the experimenter with an idea of the kind of waveforms to be expected at various points, a frame timebase circuit complete with oscillograms is shown at Fig. 1. The low-value resistor R (about 20 ohms) shown inserted in series with the deflecting coils enables a voltage reflection of the current in the coils to be applied to the oscilloscope, for it must always be remembered that the C.R.T. is a voltage operated device.

If the timebase circuit has failed completely a few rapid 'scope tests will soon show up the faulty part. The correct procedure, of course, is to work backwards through the circuit, towards the generator, until a signal is located. For example, if waveform 4 is present, it would almost certainly mean that the deflecting coils are short-circuited, and that resistor R is acting as a load for the amplifier.

A signal present at the anode of V2 (oscillogram 3), but lacking across R is an indication of an open-circuited deflecting coil. In the line amplifier, it is not a good idea to make the 'scope connection direct to the anode of the line amplifier valve owing to the presence of large voltages which occur during the line flyback. The test is best made via a small value capacitor—a crocodile clip fastened to the insulation of the wire carrying the current will in most cases provide sufficient coupling.

The presence of a signal at the grid of V2 (oscillogram 2) but not at the anode will indicate a fault somewhere in the amplifier, and this should take little time to find by employing normal testing techniques. A signal at the anode of V1 (oscillogram 1) but not at the grid of V2 will obviously indicate a fault in the coupling circuit between the oscillator and the amplifier.

If no sign of a trace can be obtained at the anode or grid of the oscillator valve, the valve itself or an associated component is undoubtedly to blame. The ease with which a signal can be traced in any equipment without the necessity of disturbing the wiring or making numerous unsoldering and resoldering operations is one of the chief merits of the oscilloscope.

Poor linearity of either vertical or horizontal scan is generally a very difficult fault to trace by using conventional testing methods; with a 'scope, however, it is a simple matter to check the waveform at various points and then compare it with specimen waveforms given in the servicing data. The action of the negative feedback voltage in timebase linearity correcting networks can also be observed on the screen, and if a pattern is at hand it does not take long to find out whether or not this circuit is operating properly. In some cases it is necessary to follow up 'scope tests with routine voltage tests in order to find the faulty part, but in many cases correct use of the 'scope reveals the defect right up to the responsible component.

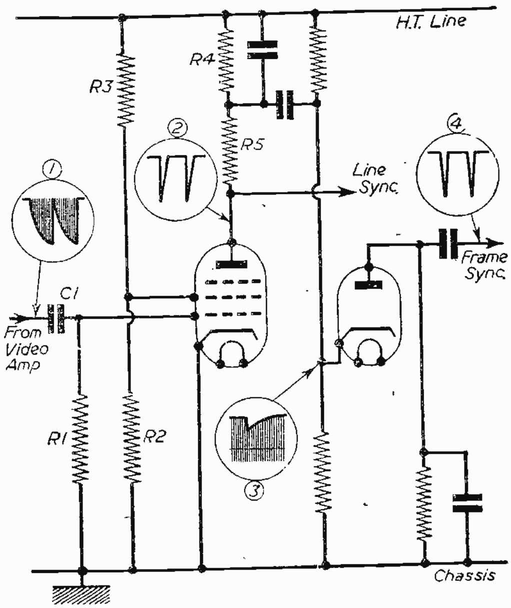


Fig. 2.—Circuit diagram of a sync separator showing the oscillograms which may be expected at various points.

Application in the Sync Circuits

In the sync separator circuit of a TV receiver waveform analysis most certainly aids in hunting out a fault. This is revealed in Fig. 2, which depicts a typical sync separator stage and frame pulse filter (the diode). Oscillogram (1) shows the composite picture and sync pulses; oscillogram (2) illustrates the appearance of the line sync pulses after the picture content has been removed by the limiting action of the pentode sync separator valve. Complete frames with frame sync pulses are depicted in oscillogram (3), while oscillogram (4) satisfactorily indicates a clear frame sync pulse free of line sync pulses as the result of the filter action of the diode.

A picture which tends to pull and creep about the screen as its content and brightness level changes is nearly always caused by some of the picture signal finding its way into the line timebase. A 'scope test on the anode of the sync separator would quickly establish this, for then, instead of the line sync pulse being clear-cut, it would reveal slight traces of picture signal.

This, of course, is a clear indication that the sync separator valve is not limiting as it should do, and is essentially the result of an alteration in the value of a resistor associated with the anode or screen circuits.

A similar 'scope symptom may result in pulling on whites, in which case the time-constant components in the pentode control grid circuit should be examined for value—it is often discovered that either C1 or R1 has altered in value, or that C1 has become very slightly leaky, and is thus transmitting a positive potential from the anode of the video amplifier valve to the control grid of the sync separator valve, causing a considerable alteration to the biasing of this valve.

When making tests of this kind or, in fact, any tests with a 'scope, it should be noted that the waveform may be displayed inverted as compared with a textbook illustration of a similar waveform. This is because the C.R.T. cannot say which way up a curve is, as it depends on which way round the voltage is applied to the "Y" plates.

For example, between grid and anode of a valve a complete phase shift occurs, so that if a spikey waveform is shown positive-going (this

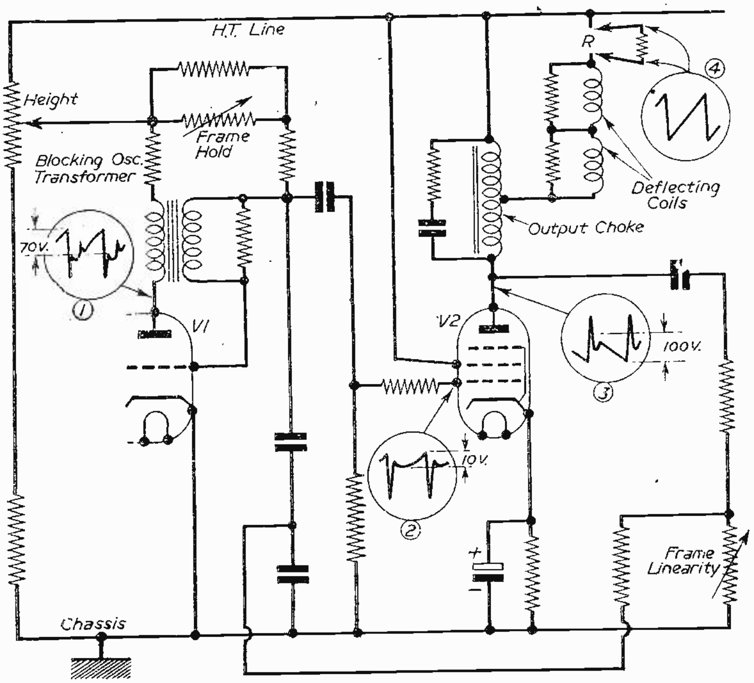


Fig. 1.—Circuit diagram of a frame timebase showing the oscillograms which may be expected at various points.

is with the spikes pointing to the top of the screen) on the grid of a valve, it will be displayed in inverted form on the anode of the same valve—a phase shift is, of course, occurring between oscillograms (1) and (2) on Fig. 2. A 380-degree phase shift will occur over two normal stages, so that the waveform will appear the right way up again.

A 'scope is a very useful instrument to have available during the process of adjusting the circuits of a home-built TV receiver. For example, the sync separator valve can be adjusted for optimum limiting while actually observing the output waveforms at the anode. It is a good idea to perform adjustments of this nature when the stage is in receipt of a constant-vision signal, such as that produced by Test Card "C."

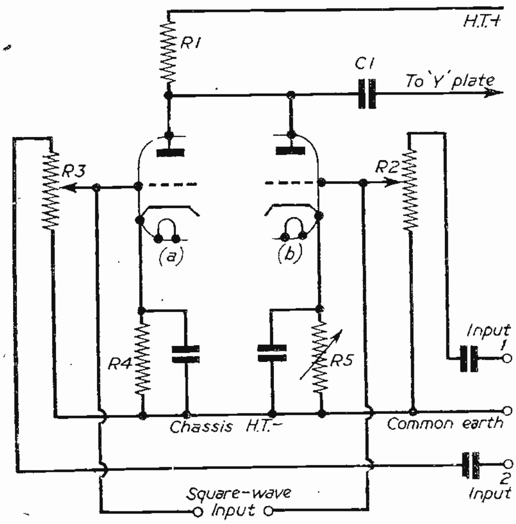


Fig. 3.—Illustrating the principle of electronic beam switching.

Electronic Beam Switching

It is often advantageous to view two entirely different waveforms simultaneously, particularly if it is required to obtain a comparison. Special double-beam C.R.T.s, made primarily by Mullard, Ltd., are available for this purpose.

It is not generally known, however, that an ordinary oscilloscope can be made to produce a pair of separately controllable traces in the "Y" direction. The problem is not very difficult, and simply demands an electronic switch or gating circuit arranged to switch alternately on and off two "Y" amplifiers.

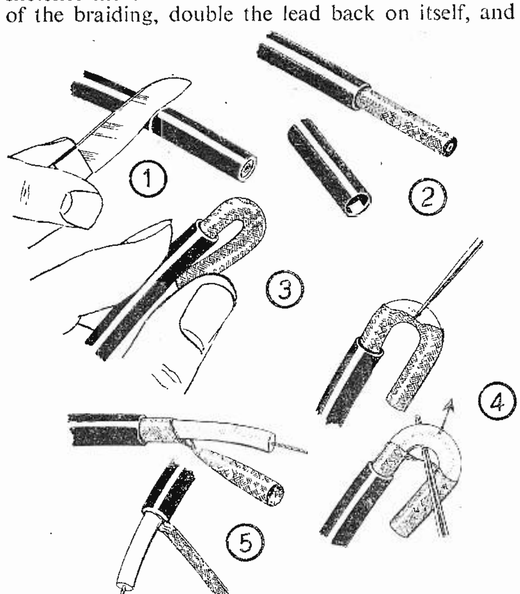
Fig. 3 shows two triode amplifiers connected to a common load resistor R1, and the voltage output developed across this conveyed through C1 to the 'scope "Y" plate. The two examination voltages are fed to the grids of the triode amplifiers via the variable controls R2 and R3. Normally, the valves are slightly over-biased and are also in receipt of a square-wave voltage. Now, on the positive impulse of the square-wave the corresponding valve is pushed into correct class "A" operation, and the applied examination signal is thus amplified and properly presented on the screen.

At the same time, however, the other triode receives a negative potential due to the square-wave, which virtually switches the valve off due to excessive over-biasing. The examination signal on the grid of this valve does not, therefore, record on the screen. At the next instant, depending on the square-wave repetition frequency, the conditions are reversed and a continuous changeover from one amplifier (or channel) to the other automatically takes place.

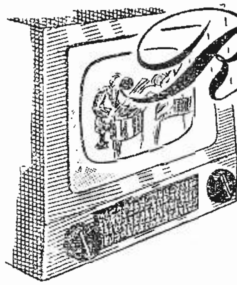
Each waveform is thus produced as a series of spots or dashes, and provided the change-over is sufficiently rapid in relation to the timebase speed, each display appears to consist of a continuous line. By altering the cathode bias on one of the triodes relative to the other, i.e., by means of R5, it is possible to separate the two traces.

Co-axial Ends

THERE is apparently a problem in terminating the ends of co-axial cable, whether for use as connections between various points, or in use in actual aerials. Correspondence in these columns recently (Inexpensive Indoor Aerial, July) shows that there is some difference of opinion concerning the best way of making "pigtails" for use as earthing connections. Whilst the method described in the letter referred to is very quick and easy to carry out, it is not, in the opinion of the writer, the best method. I always maintain the braiding *intact* which, I think, is the best plan, and the practice of trying to untwist the braiding is almost certain to lead to one or more strands being broken. The only precaution in the method illustrated here is that the penknife is not pressed too hard so that it cuts the braiding, and that the sharp pricker used to lift the braiding and open it as shown in Fig. 4 is not used too vigorously. Beyond this, it is perfect. To assist in following the sketches the details are as follows: bare about 2in. of the braiding, double the lead back on itself, and



then with a pointed implement *open* the braiding so that the polythene projects, when it may be pulled up and the end of the lead withdrawn through the bared space. The braiding, freed from the polythene but otherwise intact, is then twisted in the fingers and used as the anchoring piece.—W. J. D.



Receiving the I.T.A.

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

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

AFTER last month's discussion of the somewhat abstract—though nevertheless, important—factors associated with reception in the V.H.F. Band, we should now be in a position to appreciate the more practical problems relating to TV reception in this Band.

It does not seem very long ago that a considerable demand existed for converters enabling single-channel receivers to respond to the wavelength of the BBC's local TV station. With the advent of new high- and low-power transmitters in Band I many viewers discovered that a picture of enhanced quality could be obtained from their new local station, but that it was operating on a wavelength (channel) removed from that of the more distant station.

In order to obtain the better picture, therefore, it was necessary for these viewers either to alter their receivers to correspond to the new wavelength or to fit a channel converter to the front of the receiver so that the new wavelength could be altered to correspond to the receiver.

Viewers possessing receivers which could be tuned to any of the five channels in Band I had little trouble in receiving the new station, for the main problem involved was simply that of altering the aerial. Less fortunate viewers with fixed channel receivers either altered the coils and realigned the circuits or made use of a channel converter.

The necessity of conversions of this nature is now diminishing since most current television receivers embody facilities for readily selecting any one of the five channels operating in Band I.

Instead, however, a demand is existing for converters or adaptors to enable five-channel receivers (and fixed-channel receivers) to tune to Band III. It will also be required of the receiver to tune to the BBC stations in Band I, and for this reason—apart from other technical reasons—it is not feasible to alter the tuned circuits as could be done to change channel in Band I.

With this in mind, then, there exists two methods by which existing Band I receivers (whether five-channel or otherwise) can be arranged for the reception of the I.T.A. programmes.

One method makes use of a superhet converter designed to respond to, and convert, the relatively high frequency signals in Band III so that they are acceptable by the input circuits of a Band I receiver.

The other method is to use an adaptor—such as a Band I/Band III tuner-unit—which, by means of switched coils, responds either to any channel in Band I and any channel in Band III and converts the accepted signals to the intermediate frequency of the receiver itself. This arrangement is featured in present-day two-band receivers and proves to be quite successful.

A similar method employs a Band III tuning adaptor which can be plugged into a Band I receiver—of special design—and by switching arrangements the entire existing R.F. and frequency changer section appertaining to Band I can be switched in or out of circuit at will thereby permitting Band I/Band III changeover.

The Band Converter

There are on the commercial market at the present time several designs of band converter units, most of which are self-powered from the mains and incorporate a switch facilitating changeover from a Band I station to one (or in some cases more) station in Band III. Converters of this kind are extremely easy to install as it is only necessary to connect the converter to the receiver through a short coaxial connecting link, connect both the Band I and the Band III aerials to sockets on the converter, and connect the converter to the mains supply.

The band changeover switch is accessibly positioned on the converter control panel, and on some units a master mains on/off switch is incorporated which enables both the receiver and the converter to be connected or disconnected from the power supply. In this case, apart from the mains lead from the converter, an extra lead is taken from the on/off switch to carry power to the receiver, and the receiver on/off switch is usually left in the "on" position.

The wiring and switching arrangements relating to this type unit are illustrated in the block diagram at Fig. 4. From this it may be seen that when the converter is switched to the "Band I" position, the signal in the Band I aerial is conveyed through the converter wiring and changeover switch, and on through the converter-receiver coaxial link so that it arrives at the Band I receiver aerial terminals in the usual way.

When the switch is set to the "Band III" position, however, the signal in the Band III aerial is taken, via a filter, to the grid circuit of the converter R.F. amplifier valve; the signal in the feeder of the Band I aerial is short-circuited, and the converted Band III signal in the converter mixer anode circuit goes by way of the I.F.T. and band changeover switch, and on through the coaxial link, again to the Band I receiver aerial terminals.

The converter, then, simply performs the function of changing the frequency of the Band III sound and vision signals so that they correspond to the tuned frequency (channel) of the Band I receiver. For example, if we consider the Midland area case, the Band III channel 8 sound and vision signals—186.25 Mc/s and 189.75 Mc/s respectively—are changed in frequency to correspond to the co-sited

Band I channel 4 station—sound 58.25 Mc/s and vision 61.75 Mc/s.

In order to maintain the correct frequency relationship between the converted Band III sound and vision signals it is necessary to use an oscillator frequency equal to the incoming Band III signal minus the tuned frequency of the Band I receiver. For example, if we consider this from the point of view of the sound signal in Channel 4 and Channel 8, we find that the oscillator frequency will need to be 186.25 Mc/s minus 58.25 Mc/s, or 128 Mc/s. In either band a

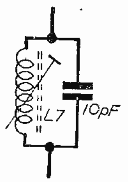


Fig. 6.—Circuit of a Band I Filter.

frequency of 3.5 Mc/s separates the sound and vision carriers, so it automatically follows that provided the converter oscillator is adjusted for maximum sound, the converted Band III vision signal will be presented to the Band I receiver in correct form.

We should add a qualification here, however, and that is when the converter is tuned for maximum sound, the converted Band III vision signal will have a single-sideband characteristic. This is, of course, because, as is common with the BBC's Band I transmissions in Channels 2 to 5, all Band III vision transmission are of the single-sideband mode.

So far as the Midland area is concerned, this is just what is required, since Sutton Coldfield in Channel 4 radiates a single-sideband signal and all the receivers in this area are adjusted for the reception of such a signal; the same applies to all stations operating in Channels 2, 3 and 5, which means that in the corresponding reception areas the converted Band III vision signal will be of ideal form for the receivers in use.

This may not be the case with all receivers in the London area (Channel 1), however, for here the BBC is radiating a double-sideband signal, and if a receiver is adjusted to respond fully to this kind of signal a certain degree of vision distortion will be evidenced on the application of a single-sideband vision signal—such as that obtained from a converted Band III vision signal.

Let us consider the London area problem in a little more detail. From the aspect of the sound signal a London Band III converter will need to use an oscillator frequency of 149.75 Mc/s (191.25 M/cs: Channel 9 sound—minus 41.5 Mc/s—Channel 1 sound); therefore the Channel 9 vision carrier frequency—194/75 Mc/s—will be preproduced at the output of the converter at 45 Mc/s (the vision carrier frequency of Channel 1).

On the face of it, this would appear quite in order, but, unfortunately, this is not so, because the ideal response of the vision channel of a single-sideband receiver is 6 db down at the vision carrier frequency, and this does not hold good on a receiver which is adjusted for double-sideband operation.

It is estimated that quite a number of Band I receivers in the London area will respond satisfactorily to a converted Band III vision signal, particularly the less vintage type. The older models, however, may not be suitable for one hundred per cent. conversion by this means, and certain receivers may demand realignment of the vision channel, especially those which are tuned to the higher sideband of the Channel 1 vision signal.

If a receiver does not possess the correct response characteristic for a single-sideband transmission, the lower vision modulation frequencies will tend to be over-emphasised and streaking of the picture will result. It may be found, however, that the effect may be alleviated by detuning the converter oscillator slightly off the maximum sound position.

Converter Design

Apart from the circuit, two of the most critical features relating to the design of any V.H.F. converter are mechanical stability and shortness of wiring associated with the tuned-circuits—a converter would be of little success if its frequency shifted several megacycles when subjected to vibration or slight pressure, and not much good would come from a converter whose coil-connecting wires were longer than the length of wire used for the actual coil.

It is essential, therefore, to build any V.H.F.

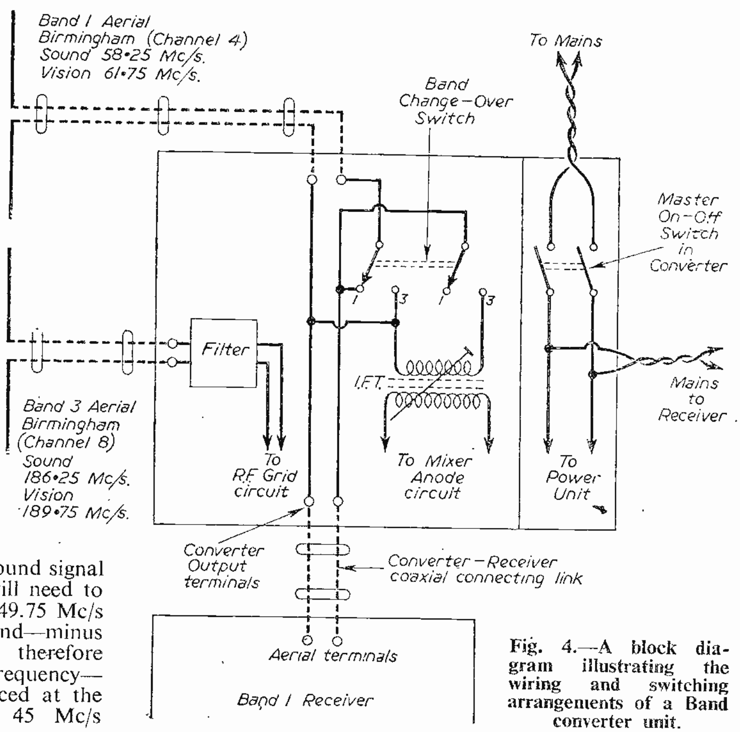


Fig. 4.—A block diagram illustrating the wiring and switching arrangements of a Band converter unit.

device on a really rigid chassis, and to arrange the coils in relation to the tags on the valveholders so that the shortest possible wiring can be used.

The decoupling resistors and capacitors should be of non-inductive type and, as is common with the R.F./I.F. sections of television receivers, a common earthing point should be fixed for each separate circuit.

Converter Circuits

A rather interesting converter circuit which employs a pair of EF80 valves is shown at Fig. 5. The first valve V1 operates as an R.F. amplifier, while V2 performs the function of a self-oscillating frequency changer.

The Band III signals are coupled by L1 and tuned by L2 and thus arrive at the signal grid of V1. The amplified signals are developed across L3 and fed through the 10 pF capacitor to the signal grid of V2. The screen grid circuit of V2 in conjunction with L4 is arranged to oscillate at the frequency difference between the incoming Band III signals and the frequency at which the Band I receiver is tuned.

The difference frequency due to heterodyning of the oscillator and the Band III signals is thus in Band I, and is developed in the anode circuit of V2 across the I.F. transformer L5, L6. This signal goes by way of S1A—when in the " Band III " position—to the converter output socket and from this, via the coaxial link, to the aerial terminals of the Band I receiver.

With all converters of this kind there exists a possibility of interference occurring on Band III as the result of breakthrough of the local Band I station. This arises mainly when a receiver is operated in a Band I " swamp " area where the signal strength is very high.

In order to avoid pattern interference from this cause it is essential that the coaxial link be restricted to, say, 3in. to 4in., and only best quality close-braided cable be used. The fact that the Band I feeder signal is shorted by S1B also assists in this respect.

Moreover, it is possible that some Band I signal may gain admittance to the receiver, via the Band III aerial and converter. If this happens the resulting pattern interference may be virtually eliminated by introducing a simple filter circuit (Fig. 6) in the input circuits of the converter.

Owing to the small power requirements of a two-valve converter a simple powerpack after the style of that shown in Fig. 5 is all that is generally necessary. The mains can be totally isolated from the converter chassis by using a small mains transformer with a H.T. secondary winding, but if the method shown in Fig. 5 is adopted, care should be taken to ensure that the chassis is connected to the neutral side of the mains supply.

Coil Winding Data

All coils wound on Aladdin low-loss $\frac{1}{4}$ in. dust-cored formers.

L1.—1 turn p.v.c. covered wire spaced $\frac{1}{8}$ in. from L2.

L2.—2 turns 20 s.w.g. spaced $\frac{1}{4}$in.

L3.—2 turns, wire and spacing as for L2.

L4.—4 turns, wire and spacing as for L2 and L3, tapped at 2 turns.

L5.—22 turns 26 s.w.g. insulated, close-spaced.

L6.—2 turns p.v.c. covered wire, spaced $\frac{1}{8}$in. from L5.

L7.—12 turns, wire and spacing as for L5.

The Coils

As the wiring capacitances represent a considerable factor governing the frequency of the tuned-circuits, the coil winding data should be treated mainly as a

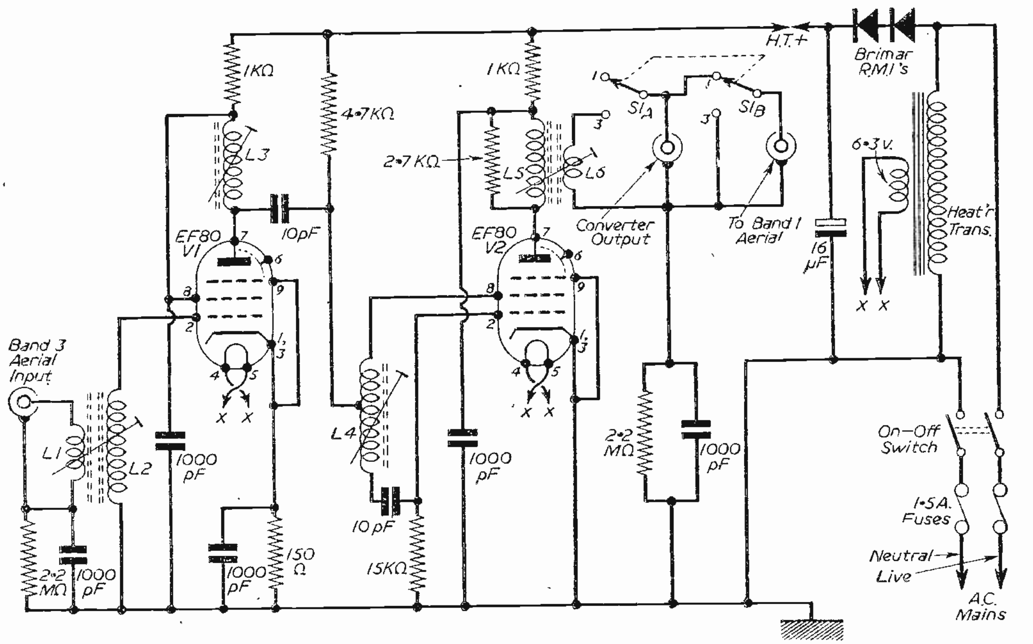


Fig. 5.—A Band III Converter Circuit employing Pentode valves. Coil Data will be found above.

guide. In most cases, however, it will be found that Channels 8 and 9 will be within the range of adjustment of the cores in coils L1/2, L3 and L4. If this does not resolve in practice, due to abnormal wiring capacitances, the desired range will almost certainly be found by altering the spacing between the turns on the coils—this applies particularly to coils L1/2 and L3, and most particularly to coil L4 (the oscillator).

Coils L5/6 and L7 are much less critical since they are tuned to a considerably lower frequency.

Tuning in the I.T.A. Signals

With the converter connected to the Band I receiver and with contrast and volume controls at maximum, L4 should be very slowly adjusted until the sound signal is heard. The core in L5/6 should then be adjusted for maximum sound. L1/2and L3 should next be adjusted for maximum sound, and at this stage the brightness control should be advanced slightly for it should now be possible to discern a picture.

L4 should be re-adjusted for maximum sound, consistent with optimum picture quality, and the remaining coils should be re-adjusted for a correct balance between sound and vision.

If any of the coils commence peaking with the core fully in, the turns spacing should be *reduced*, whilst the spacing should be *increased* if peaking commences as the core is coming out.

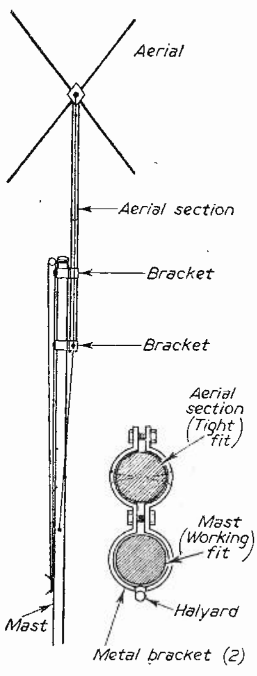
Next month a circuit employing the new type valves in a "cascode" circuit will be considered.

(To be continued)

An Aerial Mounting

By "Serviceman"

THIS aerial was originally mounted on the house chimney in the usual way and was quite satisfactory except for one big fault—it could not be maintained easily. Not many householders possess the necessary ladders or the head for heights which is an essential for such work. During the winter months the repair bills have been costly. Broken aerial sections and snapped coaxial cable have figured prominently. For one who prides himself upon being able to do all the electrical repairs in the house, including the radio and television (with the valuable assistance of the "Practical Group"), this state of affairs was intolerable, so when the last repair became necessary, the aerial was taken off the chimney for re-erection elsewhere.



An illustration of the aerial mounting described.

Though the overall size of it was surprising, the weight was negligible, so a 35ft. length of 2in. steel pipe was used for a mast. One end was sunk about 5ft.into very hard ground (it is surprising how hard it becomes whe deeper than 3ft.). The aerial was mounted on a 10ft. length of round wood, tapered at the end which goes hard into the pipe to a depth of a foot or so. Erecting this mast with aerial proved quite a job, but was successfully accomplished with the aid of friends. It stands quite steady without guys, though three are used as additional supports. The picture was certainly improved and full advantage of the directional properties of the "X" type aerial could now be utilised by rotating the mast.

However, a month later the coaxial cable broke at the upper end (it had to be at the top, of course) though how it could have done so without outside aid was a mystery, as it was neither tight nor loose and was clipped securely to the wooden section. The mast had to be unstepped for the repair and then re-erected. Later, an aerial section became bent, nearly horizontal, and the mast had to be taken down again. (Eight large birds were responsible for this.) Two repairs in three months was not so bad, but the cost was not a great deal cheaper after all.

Two months later the well-known snowstorm effect became evident on the screen and the aerial was again suspect after the receiver had been checked O.K. The coaxial cable was checked for continuity as far up as possible, by sticking pins right through and testing with an ohmmeter from the plug end. All was well there, so a bad connection was suspected at the top (as usual). The mast was taken down once more and the aerial removed from it. The tapered portion of the wooden section could not be drawn out so was sawn off, leaving the end of the pipe well plugged.

A strong steel halyard and pulley block were purchased. The halyard being long enough to form a continuous loop. The pulley block was bolted to the top of the mast and the halyard passed through it before jointing. The mast was then erected without the aerial. Two metal brackets were made to go round the mast—a good working fit. These brackets are 2in. wide and form runners. They are screwed to the wooden section which supports the aerial—2ft. apart and ½in. from the mast. The double halyard is fixed to both brackets and pulled tight. The aerial rises until the upper bracket rests hard against the pulley block.

There is no tendency to swing as the halyard holds the aerial fast. It can now be lowered easily for any repairs, though none have been necessary during the past two months.

Aerials that are out of reach have always been suspect whenever trouble is experienced such as snowstorms, crackling, weak picture, etc. It's grand being able to start testing from the aerial whenever things go wrong. A TV aerial which can be lowered for repairs seems to be a novelty and an extremely handy one.

GROUND-PLANE AERIALS FOR TELEVISION

SOME EXPERIMENTAL AERIAL IDEAS FOR THE AMATEUR

By S. A. Money

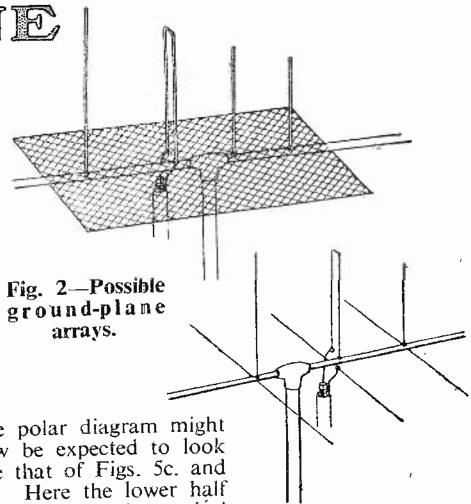


Fig. 2—Possible ground-plane arrays.

THE usual form of television aerial, such as the H or X type, is based on the use of a half-wave dipole as the active element. Among other possible arrangements there is the ground-plane type of aerial. This makes use of a quarter-wave vertical rod instead of a dipole. This type of aerial, though not frequently used for television, does have some advantage over the others, since it is much less sensitive to signals which come up to the aerial from the ground. Since most man-made interference comes from ground level this property of the aerial is extremely useful in those areas where such interference is prevalent.

The ground-plane aerial consists simply of a vertical rod a quarter of a wavelength long which is provided with its own earthed screen. This earthed screen often consists of four rods, known as radials, arranged to form a horizontal cross as shown in Fig. 1. This form of construction is generally used when the aerial is made for short-wave working. For the television frequencies, where the dimensions of the aerial are much smaller, it would probably be an advantage to use an earthed screen made of wire mesh. This would provide more efficient screening of the aerial from interference reaching it from the ground.

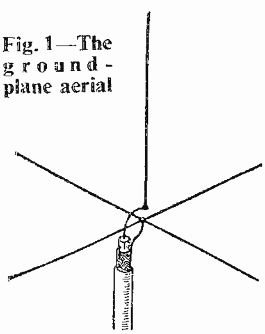


Fig. 1—The ground-plane aerial

Polar Diagram

Let us now consider the various properties of the ground-plane type of aerial as compared with those of a half-wave dipole. First let us have a look at the polar diagram or radiation pattern of the aerial. This is a diagram which shows the relative sensitivity of the aerial in various directions. Generally two polar diagrams are considered for any aerial, one for the vertical plane and another for the horizontal plane.

The vertical and horizontal polar diagrams for a half-wave vertical dipole are shown in Figs. 5a and 5b respectively. It will be seen that in the horizontal plane the aerial receives equally well from all directions. In the vertical plane the maximum sensitivity is in the direction broadside on to the aerial, whilst the sensitivity is very low off the ends of the aerial.

Suppose now the lower half of the dipole were to be removed, leaving a quarter-wave vertical rod. The polar diagram might now be expected to look like that of Figs. 5c. and 5d. Here the lower half of the lobe in the vertical plane has been removed. In actual fact the polar diagram would not be cut off so sharply, but the curve would be more likely to follow the dotted line as shown.

Let us now go a little further and place an earthed screen under the quarter-wave rod to form a ground-plane aerial. The polar diagrams will now be as shown in Figs. 5e and 5f. It will be noticed that although the pattern in the horizontal plane is still the same as for a half-wave dipole, the vertical pattern is considerably altered. It will be seen that the vertical pattern is now a fairly sharp lobe inclined at about twenty to thirty degrees to the horizontal. The sensitivity to signals coming from below, the level of the aerial would ideally be zero, but in practice the screen is not perfect so that a small amount of signal is received from this direction.

Power Gain

Another important property to be considered for television aerials is their relative power gain. This is the ratio of the power picked up by the aerial in question to that picked up by a half-wave dipole when the field strength of the signal is the same for both aerials. This is usually expressed in decibels. In general the greater the directional properties of the aerial the greater will be its power gain.

For the ground plane aerial the power gain relative to a half-wave dipole is about 5 to 6 decibels. It is interesting to note that this has been achieved without sacrificing the omni-directional properties of the aerial in the horizontal plane.

Impedance

The characteristic impedance of the aerial is a factor which must be considered when we come to feeding the signals from the aerial to the receiver. In the case of the ground-plane aerial the characteristic impedance usually lies between 35 and 40 ohms, approximately half that of the half-wave dipole.

The actual value of the impedance is altered if the radials are not horizontal. If the radials are set at an angle of greater than 90 degrees to the vertical rod, as shown in Fig. 3, the impedance becomes greater. As the radials are lowered the impedance increases until it becomes the same as for a dipole when they are in line with the vertical rod. At this stage the aerial is in fact a dipole. The properties of the aerial will vary from those of a ground-plane to those of a dipole as the radials are lowered.

In order to transfer the maximum signal from the aerial to the receiver it becomes necessary to make the characteristic impedance of the feeder cable, and the input impedance of the receiver, as nearly as possible equal to the characteristic impedance of the aerial. The normal input impedance of a British television receiver is about 70 to 80 ohms and the most popular feeder cable is the 70 to 80 ohm coaxial type. Hence, the best value for aerial impedance would be about 80 ohms. The ground-plane, however, has an impedance of only 40 ohms, so it is obvious that some form of matching device will be needed to match the aerial to the cable and the receiver.

Matching

When the aerial is being used fairly close to the transmitter, the amount of mismatching caused by using an 80-ohm cable can generally be neglected. The interference rejection properties are reduced by the mismatch, however, since the cable itself tends to pick up signals. In order to obtain a better match to the aerial, a 40-ohm cable could be used. The receiver matching being broader than that at the aerial end would produce very little loss of signal. If no 40-ohm cable is obtainable it is easy to make an equivalent cable by using two lengths of 80-ohm cable and connecting them in parallel.

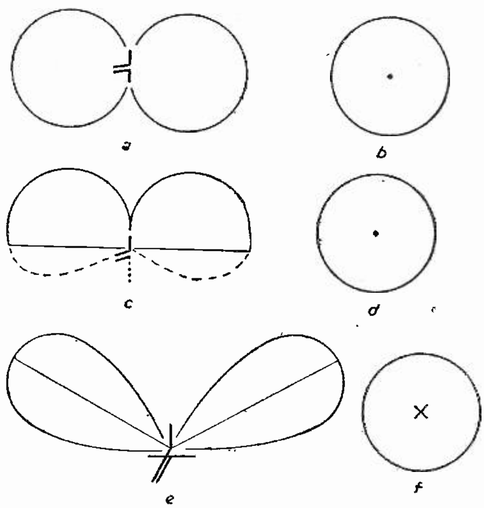


Fig. 5—Polar diagrams

In order to obtain a better match, 80-ohm cable is used for the feeder, so as to match at the receiver end, and it is matched at the aerial end by means of a quarter-wave matching section. This matching section consists of an *electrical* quarter-wavelength of cable of an impedance different from the feeder cable. The characteristic impedance of the matching cable can be found from the formula :

$$Zq=\sqrt{Za.Zf}$$

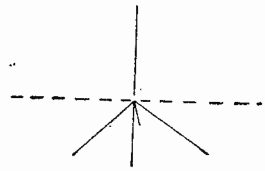
where Zq = Impedance of quarter-wave section.
Za = Impedance of the aerial.
Zf = Impedance of the feeder cable.

In order to find the length of an electrical quarter-wave we can use the formula :

$$\text{Length in ft.} = \frac{246}{f\ \text{Mc/s}} \times \text{V.F.}$$

where V.F. is the Velocity Factor of the cable, and this usually has a value of about 0.65 for coaxial cables.

For fringe area locations it is possible to make use of an aerial preamplifier for matching purposes. In this case a perfect match can be obtained and also any effects due to pick-up on the cable itself can be ignored.



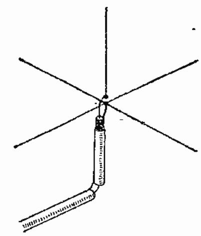


Fig. 3—(left) Lowered radials. Fig. 4 (right)—Matching section

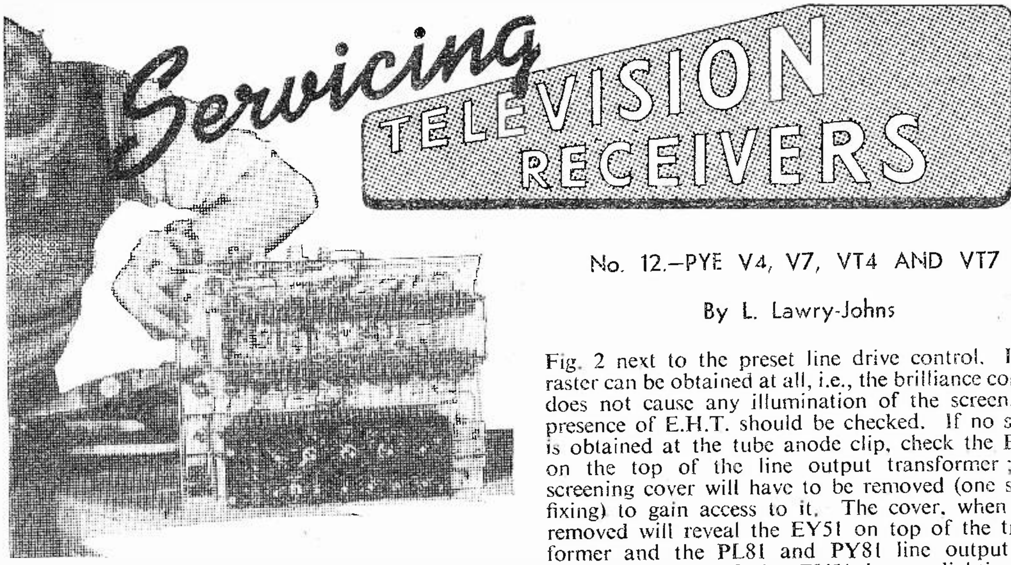
Construction

Now let us consider the practical details of construction of ground-plane aerials. The vertical rod should be 0.24 of a wavelength long and each of the radials should be at least 0.28 of a wavelength long. If a wire mesh screen is used it should be at least 0.28 of a wavelength radius. The dimensions of the elements for the various television channels is given in the table. Also included in this table are the lengths for the matching section required. If an 80-ohm feeder cable is used, the characteristic impedance of the matching section should be about 50 ohms. A reasonably good match would be obtained by using two lengths of 80-ohm cable connected in parallel. This matching section is then connected in series between the aerial and the cable, as shown in Fig. 4.

Channel	Rod length	Radial length	Matching Section length
	ft. in.	ft. in.	ft. in.
Alexandra Palace ...	5 4	6 5	5 7
Holme Moss ...	4 7	5 7	5 0
Kirk o'Shotts ...	4 3	5 0	4 7
Sutton Coldfield ...	3 11	4 7	4 2
Wenvoe... ...	3 7	4 4	3 10
Croydon I.T.A.	1 2	1 5	1 3

In order to retain a bandwidth wide enough for television purposes, it is necessary to use elements which are at least ⅜in. in diameter.

To obtain a higher impedance at the aerial terminals, the technique of folding the active element may be used. By connecting a second element in parallel with the main element, the impedance is increased by a factor of four. The impedance goes up as the square of the number of elements used. Thus, three elements gives an impedance nine times as great. The folded ground-plane has a wider bandwidth than the simple type and is useful if two channels are to be covered.



No. 12.—PYE V4, V7, VT4 AND VT7

By L. Lawry-Johns

THESE receivers exhibit several "usual" faults, some of which may be rapidly cleared due to their obvious nature, and others which are not so easily dealt with owing to their more confusing symptoms. The difference between the V models and the VT is, of course, the addition of the Band III tuner unit. This difference affects only the early parts of the receiver up to V2.

The faults likely to be encountered are: no raster due to no E.H.T.; raster but no modulation (picture); horizontal tearing; unsteady frame scan; faint picture with weak sync.

The chassis is quite easily withdrawn for servicing purposes, leaving the tube mounted in the cabinet. In the V4 it is only necessary to remove the two fixing screws from the rear flange of the chassis, the right-hand one being visible, the left is concealed below the cardboard covers of the control panels. Next, slacken the screws retaining the aerial socket at the top right-hand side of the cabinet and remove the small panel. The E.H.T. lead to the tube anode may be removed until the chassis is free of the cabinet and the multi-cable form held clear whilst this is being done. The chassis may now be handled into the desired position, replacing the E.H.T. clip and ensuring that the aerial panel is not touching any H.T. points. A frequent fault encountered is that the line hold control is at the end of its travel and the picture still not locking. Normally this is due to the line oscillator ECL80 losing its emission, and a change of valve rights the trouble. On this receiver there are two line hold adjustments to cater for variations which may occur between different ECL80 valves. The normal line hold control is, of course, on the left-hand side at the rear of the chassis, but the other is a pre-set condenser mounted beneath the chassis as shown in Fig. 2. The correct method of adjustment is as follows: rotate normal line hold to centre of its travel and then adjust the preset control to obtain picture lock.

There is a resistor in the line hold circuit which may affect the adjustment and make a positive lock difficult. It is a 1MΩ resistor and is shown in Fig. 2 next to the preset line drive control. If no raster can be obtained at all, i.e., the brilliance control does not cause any illumination of the screen, the presence of E.H.T. should be checked. If no spark is obtained at the tube anode clip, check the EY51 on the top of the line output transformer; the screening cover will have to be removed (one screw fixing) to gain access to it. The cover, when it is removed will reveal the EY51 on top of the transformer and the PL81 and PY81 line output and efficiency diode. If the EY51 is not lighting up, the single wire end of the valve, i.e., the ring further away, should be tested for the presence of E.H.T. by means of a screwdriver blade. If a spark—a healthy blue one, not a faint tiny pinprick—is drawn off, the EY51 may safely be replaced, taking care to make the soldered connections properly.

If, however, with the EY51 not lighting up and with no healthy spark available at the anode, it is safe to assume that the fault is either in the line oscillator or output stages.

If no audible whistle is present at all, the fault should be looked for in the oscillator stage, but should a faint whistle be heard which varies with rotation of the line hold control, it may be assumed that the oscillator stage is in order and that the output is at fault.

The most common cause of the output stage failing to operate properly is the failure of the PL81 output valve. After this has been cleared as a possible cause, the PY81 should be suspected. If this valve is in order the next most common cause of non-operation of the line output stage, is a defect in the line output transformer.

Replacement is the only sure method of checking this, but before doing so the following components should be checked. The .5 μF condenser marked C106 in Fig. 2: this may cause heavy damping of the line output stage, resulting in low E.H.T., if it is leaky, as well as a complete failure of the stage. The width and linearity coils should be measured, or at least their continuity established. These are the two coils which partially obscure the PY81 when viewed from the rear, L23 and L24. As well as testing these for continuity, it should be ensured that they are not too close, as this may cause sparking between the two, and line "tearing" if not a complete cessation of operation of the output stage.

Line Drive Control

If these points are checked it is reasonably safe to replace the line output transformer, as this is almost sure to be the culprit.

As in most modern receivers, a line drive pre-set condenser is fitted and is marked C101 in Fig. 2. C97 is the pre-set horizontal hold already referred to. It is evident from many readers' letters that the function and adjustment of this line drive condenser

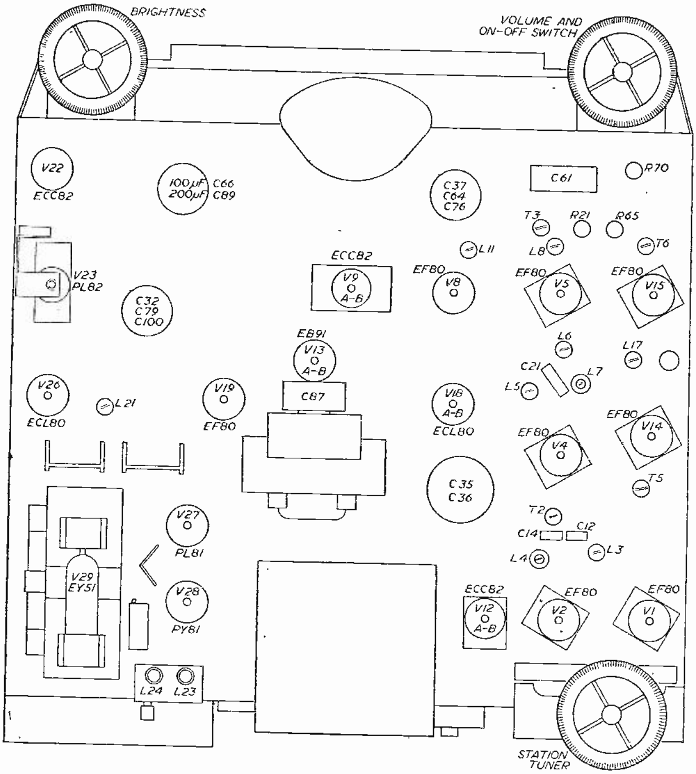


Fig. 1.—Note position of EY51, L24, L23 and V26 line oscillator. This illustration shows the screening cover of the line output stage removed.

is not clearly understood. It has a profound effect upon the operation of the line output valve and the correct adjustment is essential both from a viewing standpoint and the working life of the line output valve. With a voltmeter connected from the cathode of the PL81 (pin 3) and chassis, the control should be adjusted for *minimum reading on the meter.* Before this point is reached kinks or a bright white line will be observed to the left of the screen. Hence many queries.

Before leaving the line timebase, a few points may be noted. The core of L21 marked in Fig. 1 must *not* be adjusted. This is the coil control of the *auto-sync* circuit, and synchronisation will be affected if this is disturbed.

The PY81 has ceramic insulation between the heater and cathode and, therefore, takes longer than is normal to reach operating efficiency. Two to three minutes is usual. The ECL80 (V26) line oscillator is used as a multivibrator and thus uses no blocking transformer. The small transformer mounted beneath the chassis under the line output transformer is the *auto-sync* transformer and is usually trouble free. The 250 mA fuse at the rear of the receiver is in series with the H.T. feed to the line output stage.

This receiver features automatic contrast control and the bias applied to the vision section is obtained via the line output stage. Therefore a device is necessary which will limit the signal applied to the video amplifier to avoid overloading whilst the PY81 takes its time to reach operating level. The device employed is known as the "overload diode" and is a crystal diode connected between the grid of V8 (video amp) and the cathode of V27 (PL81 line output).

Thus, the grid of the video amplifier is virtually earthed until V27 becomes operative and the cathode voltage of this valve renders the diode inoperative.

Obviously a fault in this diode will result in a weak picture and sync due to the signal being shunted to chassis from the grid of the video amplifier. Replacement of the overload crystal diode is the only reliable test although as a rough guide the diode should measure a few hundred ohms one way and approximately 4 MΩ the other.

Negative Picture with Hum Bars

This may be caused by a heater to cathode leak in the ECC82 signal sampler (V12B). A negative picture is so termed because the blacks tend to turn white and the whites black, this of course being also a symptom of a failing C.R.T. when the contrast is well advanced. On this receiver the presence of hum bars (wide bands of light and dark across the tube face) completes the diagnosis and directs suspicion to the ECC82.

This ECC82 (V12) is a double triode, the other triode section being used as the local oscillator on the V4, V7 models, and is rendered inoperative on Models VT4 and VT7. Although referred to as the signal sampler, V12 is actually the amplifier part of the circuit, the actual signal sampling being done by V13 (EB91).

Raster with no Modulation

By this is meant that the brilliance control may be advanced to show the blank illumination, but no picture on the tube face. This may, most often, be caused by the failure of emission of an EF80 valve. If no sound is received valves 1 and 2 should be substituted. If, however, sound is being received valves 4 and 5 should receive attention first, then V8 video amp. The cathode of the tube is signal fed from the cathode of one triode section of an ECC82 (V9), the other section is the white spot suppressor, this, therefore, is a cathode follower. The point being that the tube receives its modulation from V9 and not from the anode of the video amplifier as is normal practice. V3 is a crystal diode (CG6E) interference suppressor which limits the interference level to .5 volt, thus preventing V4 from being overloaded.

V6 is a CG5E crystal diode which operates as the vision detector, whilst V7 is the before-mentioned overload diode. Lack of both vision and sound may, of course, be due to the failure of the local oscillator (one section V12) ECC82, but normally this is less suspect than the EF80 stages. Should the valves prove faultless, lack of vision only is often due to the vision detector V6, crystal diode CG5E, developing a fault. Again substitution is the only reliable check. The position of this diode is indicated in Fig. 2. Should the signal still be lacking, the other crystal diodes referred to should be checked for short-circuit, V3 and V7. The majority of this fault location applies to the V and the VT models, but there are several variations such as the triode section oscillator of V12 not being in use on the VT models, the oscillator being the triode section of the PCF80 in the channel selector unit. The pentode section of this valve serves as the mixer, and the other valve in the unit is a PCC84 double triode connected as a cascode R.F. amplifier. The output of the mixer is fed to the grid of what is termed V2 in the V models, and which was used as the mixer in these, this then becoming the first common I.F. amplifier.

Vision Defect on VT Models

This usually shows as ringing, a black or white second image on the picture, and is nearly always due to the fine tuner being out of adjustment. The position of this fine tuner is rather critical and some patience may be required to obtain good definition with freedom from ringing and good sound.

Sound Channel

V14 and V15 are the two sound I.F. amplifiers and both are EF80 valves. V16 is the sound detector and is a crystal diode CG6E. The signal then passes through V17, which is a WX6 interference limiter, to the triode section of V18, an ECL80. The pentode section is used as the sound output to the speaker.

On several occasions a rather peculiar fault has developed, which takes the form of a hum on the sound accompanied by distortion of the frame scan.

In each case this has been found due to an internal leak in the 100+200μF condenser can C66/C89 marked in Fig. 1. These condensers are the bias decouplers of the ECL80 sound output and PL82 frame output valves.

Obviously a leak between the two sections of this condenser can will result in an amount of interaction between the circuits. The sound channel is reasonably trouble free. Lack of sound should direct attention to V14, V15 and V18 first, and then the crystal diode. Distortion may usually be tracked down to the interference suppressor or its load resistor (2.2 MΩ). If distortion is not located here the diode detector should be suspected and if this proves good, the ECL80 sound A.F. and output V18 will most likely be at fault. This, of course, may be checked first.

These faults are not listed with the easiest to check placed first, but in order of the most likely cause.

Frame Timebase

This part of the circuit consists of an ECC82 double triode V22, which functions as a multivibrator. This being followed by the PL82 frame output V23. The ECC82 is pulse fed from an interlace circuit consisting of two WX6 rectifiers which ensure that the circuit is triggered at the right instant. Loss of frame hold may be due to several factors depending upon the symptoms. The frame hold (vertical hold) control will enable the fault to be localised. If the picture is rolling one way and as the control is rotated the rolling slows down and then commences to roll in the opposite direction, it may be assumed that the fault is lack of adequate frame pulses and not a fault in the timebase itself. Check the sync separator V19 (EF80) and then the interlace diodes (WX6) previously referred to. If, however, the picture roll is in one direction whatever the position of the hold control, the ECC82 should be substituted and if this does not cure the fault check the series resistor from the slider of the hold control (820 KΩ) coloured grey, red, yellow.

Poor linearity, that is uneven spacing of the scanning lines leading to vertical picture distortion which cannot be corrected by adjusting the frame (vertical) linearity control, should direct attention to the ECC82 and then the PL82. If no improvement

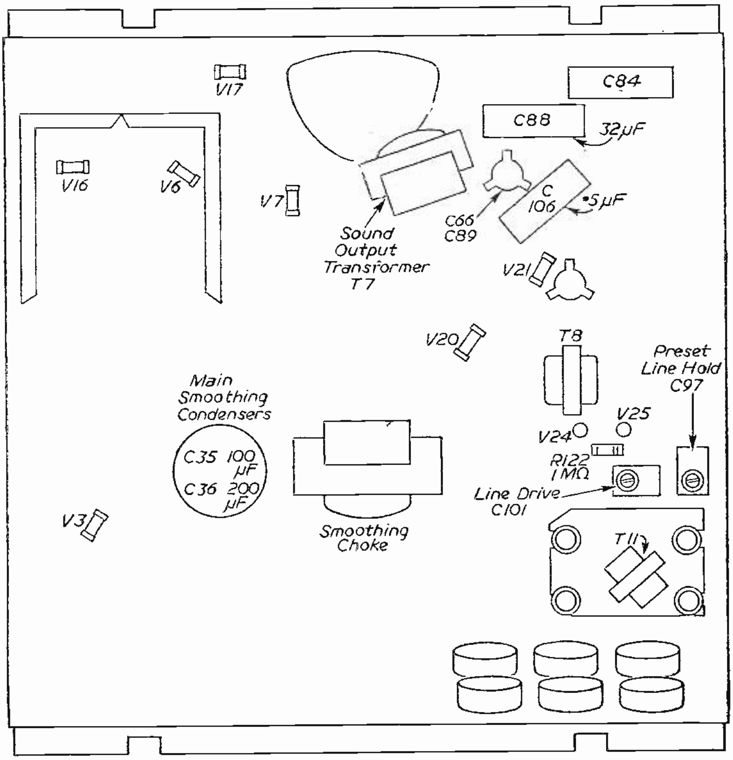


Fig. 2.—Showing the position of line timebase pre-set condensers. The various crystal and metal rectifiers and components mentioned in the text are simplified so that they may be seen more clearly.

is apparent by replacing these valves, and the poor linearity is accompanied by decreased height, check the screen decoupling condenser of the PL82, C88 (32 μF) and the previously mentioned C89 cathode bypass.

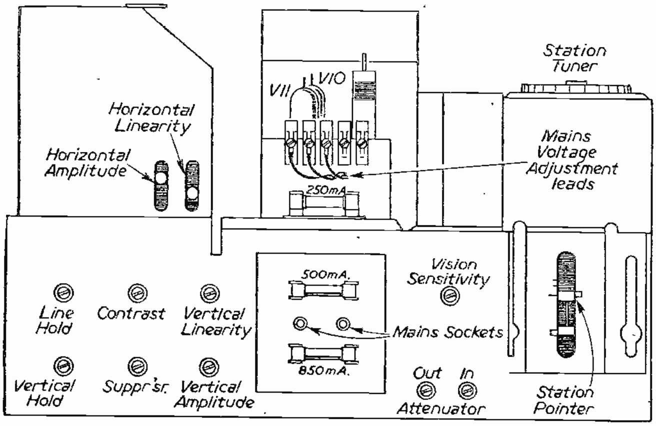


Fig. 3.—Rear view of V4 and V7 models.

Weak Sync

If no sync pulses line or frame are being received, and this is shown by inability to lock either the frame or line timebases properly, first check V19 (EF80), then its 12μF screen decoupling condenser and then the vision detector crystal diode, peculiar though this may seem. This presupposes that a reasonably strong modulation is being displayed on the tube face even if it is scrambled.

If the modulation is weak, however, and of very poor contrast, valve replacement having no effect, the overload diode should be suspected, and the vision detector diode if the overload seems to be up to standard.

Power Supplies

H.T. is obtained from two PY82 rectifiers which give very little trouble, a 30 ohm surge limiting resistor is in series with each cathode, the centre point of the two being taken to the reservoir capacitor and smoothing choke and thence to the H.T. line. All valves, plus C.R.T., have their heaters connected in one chain so that the failure of one will render the others inoperative.

Fuses

Three are fitted, one in the chassis side of the mains supply rated at 850 mA anti-surge.

Another is fitted between the mains selector resistors and the valve heater chain and is rated at 500 mA. The 250 mA fuse has already been referred to as being in the H.T. supply to the line output stage.

Final Notes

The VT models operate satisfactorily on Band III, using " sprigs " (clip-on elements) fitted to an existing well sited, H or X aerial up to 20 miles from the transmitter, depending upon the locality. Beyond this distance, and sometimes inside this distance, a multi-element array is essential. In this case both aerial leads are taken to a junction box from which one lead is taken to the receiver.

The V models are converted by a specially made adaptor, made by Pye for easy fitting. It will have been gathered from the above remarks that these receivers are rather complicated, and unless the function of the various components is understood, second thoughts should be indulged in before any involved servicing is undertaken.

It would appear that there is some confusion about the correct method of centring the picture on the screen. Viewed from the rear of the tube, the first component on the tube neck is the ion-trap, this is always adjusted for maximum brilliance as described many times in these pages.

The next item is the focus magnet with its lefthand control lever. Behind this will be found two metal plates with small finger-grip extensions. These are the centring plates, and each varies the vertical or horizontal position of the picture upon rotation. In front of these again is the scan coil unit with the thumb screw at the top giving a tilt adjustment, i.e., adjustment will slightly rotate the picture. A drawing is provided in case these directions are not understood.

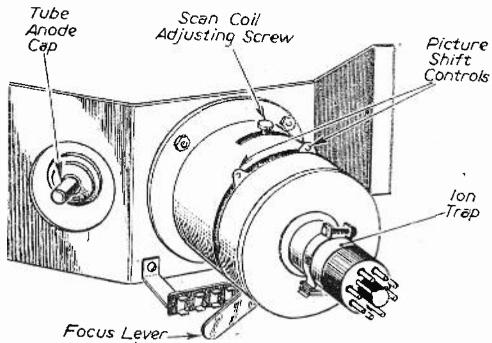


Fig. 4.—Rear view of the tube assembly.

I.T.A. PROGRESS REPORT

TWO further contracts with ARTV and Granada were signed recently. All contracts are for 10 years, but it is unlikely that their contents will be published.

Good progress has been made regarding the siting of transmitters. The ITA received planning permission for Winter Hill (near Bolton), where a station, sited 1,450ft. above sea-level, will serve the Lancashire area. The architects expect building to begin shortly, so that the station can transmit by the spring of '56. From an initial signal strength of 100 kW., power will be stepped up to about 200 kW.

Coverage will extend to Barrow-in-Furness, Lancaster and Settle in the north; Stoke-on-Trent, Crewe and Wrexham in the south; Liverpool and Colwyn Bay to the west; and points inward from Rochdale to the east. In all, the potential audience equals the population of London, i.e., 7 million people.

Midlands.—The Midland transmitter now being tested at Cambridge should be ready for the opening of a Birmingham station at the turn of the year. It is the first Band III station to be built by Pye.

THE NATIONAL RADIO SHOW

August 24th to September 3rd

List of Principal Exhibitors in Alphabetical Order, with Stand Numbers

Name	Address	Stand No.
Aerialite, Ltd. ...	Castle Wks., Stalybridge, Cheshire	33
Airmec, Ltd. ...	High Wycombe, Bucks.	108
Antiference, Ltd.	Bicester Rd., Aylesbury, Bucks.	64
Argosy Radiovision, Ltd.	Argosy Wks., Hertford Rd., Barking, Essex	35
Arrell Electrical Accessories, Ltd.	Vincent Wks., New Islington, Manchester, 4	111
Assimil (England), Ltd.	10, Pembridge Sq., W.2	312
Automatic Coil Winder & Elec. Equip. Co., Ltd.	"Avocet Hse.," 92-96, Vauxhall Bridge Rd., S.W.1	116
Balcombe, Ltd., A. J.	52-58, Tabernacle St., E.C.2	21
Belling & Lee, Ltd.	Gt. Cambridge Rd., Enfield, Mddx.	46
British Communications Corporation, Ltd.	Second Way, Exhibition Grounds, Wembley, Middx.	217
Bulgin & Co., Ltd., A. F.	By-Pass Rd., Barking, Essex	59
Bush Radio, Ltd.	Power Rd., Chiswick, W.4	22 & 57
Champion Elec. Corpn., Ltd.	Champion Wks., Drove Rd., Newhaven, Sussex	62
Channel Electronic Industries, Ltd.	Princess St., Burnham-on-Sea, Somerset	212
Cole, Ltd., E. K....	Ekco Wks., Southend-on-Sea, Essex	12 & 121
Collaro, Ltd. ...	Ripple Wks., By-Pass Rd., Barking, Essex	39
Co-operative Wholesale Society, Ltd.	1, Balloon St., Manchester	60
Cosmocord, Ltd.	700, Gt. Cambridge Rd., Enfield, Middx.	201
Cossor, Ltd., A. C.	Cossor Hse., Highbury Grove, N.5	23
Cossor Instruments, Ltd.	Cossor Hse., Highbury Grove, N.5	114
Decca Record Co., Ltd.	1-3, Brixton Rd., S.W.9	32
Domain Products, Ltd.	Domain Wks., Barnby St., N.W.1	305
Dubilier Condenser Co. (1925), Ltd.	Ducon Wks., Victoria Rd., North Acton, W.3	221
Dynatron Radio, Ltd.	"The Firs," Castle Hill, Maidenhead, Berks.	24
E.A.P. (Tape Recorders), Ltd.	546, Kingsland Rd., E.8	303
E.M.I. Institute, Ltd.	10, Pembridge Sq., W.2	311
E.M.I. Sales & Service, Ltd.	Hayes, Middx.	215
Edison Swan Electric Co., Ltd.	155, Charing Cross Rd., W.C.2	58
Electric Audio Reproducers, Ltd.	17, Little St. Leonards, S.W.14	216
English Elec. Co., Ltd.	Marconi House, 336-7, Strand, W.C.2	31
Ever Ready Co. (G.B.), Ltd.	Hercules Place, Holloway, N.7	54
Ferguson Radio Corp., Ltd.	105-109, Judd St., W.C.1	14 & 103
Ferranti, Ltd. ...	Hollinwood, Lancs.	13 & 120
Garrard Eng. & Mfg. Co., Ltd.	Newcastle St., Swindon, Wilts.	47
General Elec. Co., Ltd.	Magnet Hse., Kingsway, W.C.2	37
Gibbs, Ltd., Herbert, E.	First Avenue, Montague Rd., Edmonton, N.18	209
Goodmans Industries, Ltd.	Axiom Wks., Wembley, Middx.	20
Gramophone Co., Ltd.	Hayes, Middx.	48 & 49
Hart & Co., Ltd., Alfred	249, Upper St., N.1	210
Hartley Baird, Ltd.	Princess Wks., Brighouse, Yorks.	52
Hunt (Capacitors), Ltd., A. H.	Bendon Valley, Garratt Lane, Wandsworth, S.W.18	8
Iliffe & Sons, Ltd.	Dorset Hse., Stamford St., S.E.1	202
Invicta Radio, Ltd.	100, Gt. Portland St., W.1	53
J. B. Mfg. Co. (Cabinets), Ltd.	86, Palmerston Rd., E.17	219
J. Beam Aerials, Ltd.	Weedon Rd. Estate, Northampton	104
Kolster-Brandes, Ltd.	Footscray, Sidcup, Kent	16
Labgear (Cambridge), Ltd.	Willow Place, Cambridge	204
McMichael Radio,	190, Strand, W.C.2	40
Marconiphone Co., Ltd.	Hayes, Middx.	50
Masteradio, Ltd.	10-20, Fitzroy Place, N.W.1	36
Matthews (Radio & TV), Ltd.	419, Old Ford Rd., Bow, E.3	211
Mullard, Ltd. ...	Century Hse., Shaftesbury Ave., W.C.2	18

Name	Address	Stand No.
Multicore Solders, Ltd.	Maylands Ave., Hemel Hempstead, Herts.	63
Murphy Radio, Ltd.	Welwyn Garden City, Herts.	29
NEWNES, LTD., GEORGE	**Tower Hse., Southampton Street, W.C.2**	**107**
Pam (Radio & T/V) Ltd.	295, Regent St., W.1	61
Pamphonic Reproducers, Ltd.	17, Stratton St., W.1	34
Permanoid, Ltd.	Vincent Wks., New Islington, Manchester, 4	111
Peto Scott Elec. Instruments, Ltd.	Weybridge Trading Estate, Surrey	55
Philco (Overseas), Ltd.	Romford Rd., Chigwell, Essex	15
Philips Elec., Ltd.	Century Hse., Shaftesbury Ave., W.C.2	27 42 & 43
Pilot Radio Ltd. ...	Park Royal Rd., N.W.10	56
Plessey Co., Ltd....	Vicarage Lane, Ilford, Essex	122
Portogram Radio Elec. Ind., Ltd.	Preil Wks., St. Rule St., S.W.8	65
Pye, Ltd.	Radio Wks., Cambridge	30
RCA Photophone, Ltd.	36, Woodstock Grove, Shepherds Bush, W.12	110

"PRACTICAL WIRELESS" AND "PRACTICAL TELEVISION" STAND NO. 107

Name	Address	Stand No.
RadioGramophone Dev. Co., Ltd.	Eastern Av. West, Mawneys, Romford, Essex	11
Radio Society of Great Britain	New Ruskin Hse., Little Russell St., W.C.1	310
Radio & T/V Retailers' Assn., Ltd.	26, Fitzroy Sq., W.1	302
Regentone Radio & Tel. Ltd.	Eastern Avenue West, Mawneys, Romford, Essex	38
Roberts' Radio Co., Ltd.	Creek Rd., East Molesey, Surrey	117
Rola Celestion, Ltd.	Ferry Wks., Thames Ditton, Surrey	17
Rudman, Darlington (Electronics), Ltd.	Wednesfield, Staffs.	208
Sapphire Bearings, Ltd.	96a, Mount St., W.1	304
Simon Equipment, Ltd.	Recorder Hse., 48-50, George St., W.1	10
Slingsby, Ltd., H. C.	89, 95/7, Kingsway, W.C.2	112
Sobell Industries, Ltd.	Langley Park, Slough, Bucks.	19
Specto, Ltd. ...	Vale Rd., Windsor, Berks.	206
Standard Tel. & Cables (Brimar), Ltd.	Brimar Vale Division, Footscray, Sidcup, Kent	1
Standard Tel. & Cables, Ltd. (SenTerCel)	Connaught Hse., Aldwych, W.C.2	119
Stella Radio & Tel. Co. Ltd.	Oxford Hse., 9-15, Oxford St., W.1	51
Tape Recorders (Electronics) Ltd.	3, Fitzroy St., W.1	66
Taylor Electrical Instruments, Ltd.	Montrose Ave., Slough, Bucks.	6
Telegraph Condenser Co., Ltd.	North Acton, W.3	45
Telerection, Ltd....	Antenna Wks., St. Paul's, Cheltenham	7
Telequipment, Ltd.	1319a, High Rd., Whetstone, N.20	105
Television Society	164, Shaftesbury Ave., W.C.2	315
Trix Elec. Co., Ltd.	1-5, Maple Place, Tottenham Court Rd., W.1	26
Ultra Elec. Ltd. ...	Western Ave., Acton, W.3	41
Valradio, Ltd. ...	New Chapel Rd., Feltham, Middx.	118
Vidor, Ltd. ...	West St., Erith, Kent	28
Westinghouse Brake & Signal Co., Ltd.	82, York Way, King's Cross, N.1	101
Whiteley Elec. Radio Co., Ltd.	Mansfield, Notts.	25
Wolsey Television, Ltd.	43-45, Knight's Hill, S.E.27	5
Wright & Weaire, Ltd.	131, Sloane St., S.W.1	218

Marconi TV Centre

THE Broadcasting Division of Marconi's Wireless Telegraph Co., Ltd., have established at St. Mary Abbot's Place, London, W.8, the first fully equipped television training studio of its type in Britain.

The advent of Commercial Television has posed serious problems to the many organisations, throughout Britain, interested in the television medium. To all such, the Marconi Television Centre offers the following facilities :—

A complete training course in the operation and maintenance of television studio equipment is undertaken by the Marconi College.

The Centre is available to any organisation wishing to use the equipment for training their own studio and production staffs.

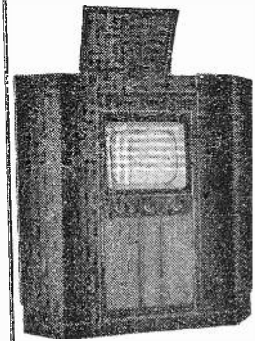
It can be used by any organisation, large or small, for rehearsals or auditions under true operational conditions. Telecine equipment is available for those wishing to appraise filmed programmes on television. A complete mobile Outside Broadcasting Unit is attached to the Centre and can be used.

Arrangements can be made for live broadcasts to be originated from the Centre, which has a stage of approximately 2,000 sq. ft.

The Marconi Television Centre, which has been in operation since June 2nd, has already proved to be an unqualified success in the training of personnel upon the latest equipment. Among those already making extensive use of the facilities are Associated-Rediffusion, Ltd.

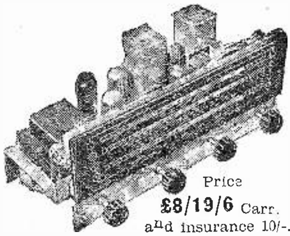
SUMMER SALE — *Special Prices This Month*

THIS MONTH'S SNIP



Corner Console. A massive cabinet but being corner fitted is not out of place even in a modern small living-room. Overall dimensions of this cabinet are 47in. wide x 31in. (deep to corner) x 50in. high. Made to house "15" Televisor, Radio Unit, Amplifier, Tape Deck, etc. Originally £18—our price. £10, plus 30/- carriage.

5 VALVE SUPERHET



5-valve superhet, long, medium and short. Fine clear dial. Latest loctal valves. Ready to operate. Chassis size 15in. x 6in. x 6in.

Price £8/19/6 Carr. and insurance 10/-. Cabinet to suit, 37/6.

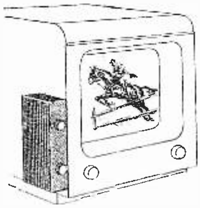
10/- Carr. 3/6.

BAKELITE CABINET

Two tone with built-in handle. Note.—All have slight imperfections but these are hardly noticeable and will not affect the soundness of the set.

T.V. BAND III NEWS

ADD-ITA



This is a ready-to-work adaptor which fixes to the side or back of your T.V. and will give you the new commercial station by the flick of a switch. You do nothing to your set, just plug in mains and aerial leads. Suitable for any T.V. Price £6/10/- or 30/- deposit and six payments of £1.

3 INSTRUMENTS FOR 25/-

THE "ELPREQ" Band III SIGNAL GENERATOR is very efficient and it :—

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

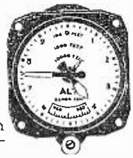
All the parts including valves, tuning condenser and metal chassis are available as a Kit at 25/- post free. Constructional data free with Kit or available separately price 2/6.

BUILD YOUR OWN CONVERTER

The Elpreq Band III Converter has given very satisfactory results from the experimental Beulah Hill station. It uses 2 valves, is not at all difficult to make and can be lined up with the simple 25/- instrument described above. Price for all the components, including constructional data, is £3/10/- —data available separately price 2/6.

3/6 Post 1/-.

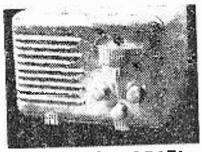
ALTIMETER



(imperfect).

These contain aneroid barometer movement.

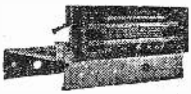
14/6 Post 2/6.



CONSTRUCTOR'S PARCEL

Bakelite cabinet, complete with dial, metal chassis and back, and plans of T.R.F.

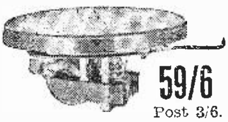
12/6 Post 1/-



CONSTRUCTOR'S PARCEL

Five valve superhet chassis—size 15 x 5 x 2in. with three waveband glass scale, pulley, driving head, etc.

Also **TABLE CABINET** Veneered and polished—takes the above chassis. 39/6. Post 2/6.

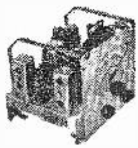


59/6 Post 3/6.

THREE-SPEED GRAM MOTOR

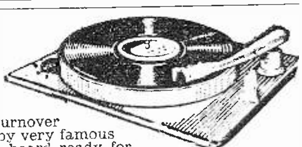
200-240 A.C. mains-operated, complete with turntable—plays 33, 45 and 78 r.p.m. records.

BEETHOVEN CHASSIS



Chassis size approx. 9½ x 7½ x 8½. First-class components. A.C. mains operation. Three wave (medium and two shorts). Complete with five valves, ready to work. Special cash-with-order price this month, £5/19/6, carriage and insurance 7/6

3 SPEED RECORD PLAYER



3-speed record player with pick-up using the famous Acos "Hi G" turnover crystal—motor also by very famous maker. All on unit board ready for installation. A wonderful bargain at £5/10/-. plus 5/- carriage.

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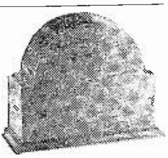

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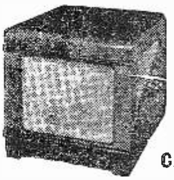

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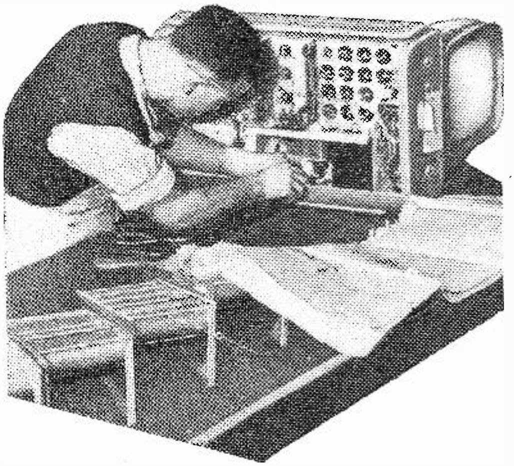


EFFICIENCY DIODE SYSTEMS

ALTHOUGH almost universally used in the present-day television receiver, the working principles of the efficiency, or booster diode circuit, are not clear to all constructors and servicemen. When the working is understood, many obscure faults such as horizontal non-linearity, vertical shaded bands and the various forms of picture "kinking" can be remedied without great difficulty.

Consider Fig. 1 where a typical double-wound type of line transformer is used in an efficiency circuit. Although the auto-transformer method of connection is now quite common where the scan coils are fed across a section of a single winding instead of a separate secondary coil, the working principles to be discussed are, of course, unaltered. In the figure the anode of the output amplifier valve V1 is connected to one end of the primary winding of the transformer, the other end of this section being returned to the H.T. rail through a condenser C1. From the operating point of view this condenser might just as well be considered as returning to earth, and in many practical circuits it is so connected. The overwind portion of the "primary" winding is wired to the anode of the E.H.T. rectifier diode V3, whose filament is lighted from a separate, highly-insulated winding of a few turns.

The main secondary winding connects to the scan coils through a blocking condenser C3, which keeps the D.C. from passing through the windings, and a series variable inductance L2 generally referred to as the width control. The efficiency diode V2 is wired between one side of the secondary and a further condenser C2 returned to the H.T. line (or earth).

The anode voltage supply is fed in on the other side of the secondary winding and the feed to the anode of the amplifier V1 is, therefore, by way of the secondary winding, the efficiency diode, the linearity coil L1 and the transformer primary winding, in that order. In practice the secondary of the transformer is wired so that it provides a reversed polarity to that generated by the primary flux; the anode current which flows in both windings does not, therefore, saturate the core to the extent it would if the magnetising currents were in phase.

Equivalent Circuit

Before considering the action of the efficiency diode it is best to visualise the circuit conditions at the scan coils in the absence of the valve. The scanning coils can be considered as a simple parallel-tuned circuit as shown in Fig. 2, where the resistance R of the windings is drawn in series with the inductance L, and the wiring capacity is represented as a parallel capacity C. The switch S replaces the output amplifier valve and the battery E the normal H.T. supply line. If the switch has been closed for some appreciable time, a steady D.C. will be flowing in the circuit having a value of I amp; nothing will upset this condition until the switch is opened, which in practice is equivalent to suddenly cutting off the output valve by a heavy bias.

It is fairly easy to show that the current in the circuit does not then fall evenly to zero as it would in the case of a pure resistance in place of L, C and R, but oscil-

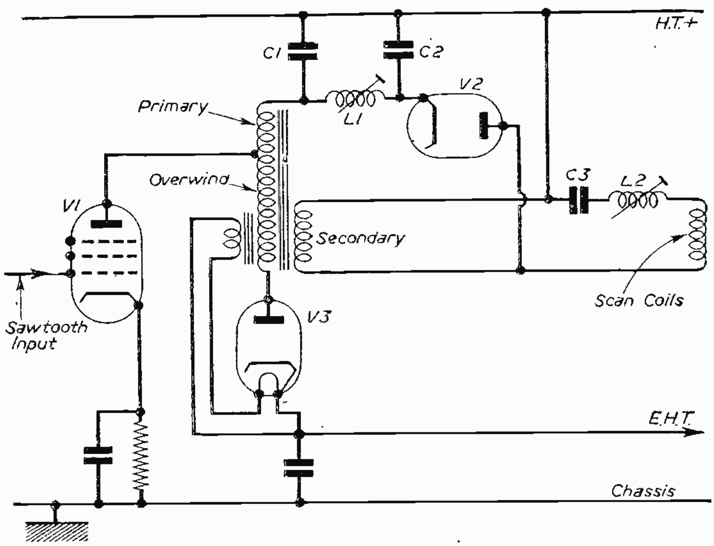


Fig. 1.—A typical efficiency diode line output circuit.

lates backwards and forwards around the circuit at a frequency given roughly by the familiar formula of the tuned circuit, $f = \frac{1}{2\pi\sqrt{LC}}$. The oscillation is, of course, damped out quite quickly by the resistive losses and consequently appears as shown in Fig. 3(a),

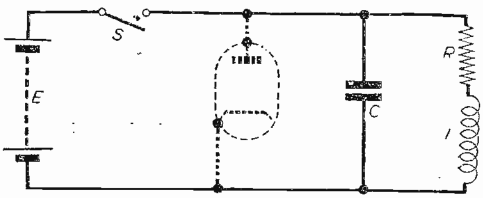


Fig. 2.—Equivalent circuit of scan coils.

becoming negligible after a very few cycles.

Over the same period the current in the inductive arm is very similar in waveform, being displaced by 90 deg. from the oscillation mentioned above, and falling over a few cycles of damped oscillation from the normal steady current value I to a very small figure. This is shown in the figure at (b). The conclusions drawn from an inspection of these two waveforms are, therefore, that when the circuit is suddenly opened: (a) the voltage across the scan coils builds up to a very high value and oscillates sinusoidally until damped out by the resistive component; (b) the current falls from its initial value of I and oscillates at the same frequency as the voltage, but leading the latter by 90 deg.; (c) the greatest negative excursion of the current occurs at the *same instant* as the voltage wave passes through zero on its negative swing. This point is shown at π in the figure.

If now a diode is introduced into the circuit of Fig. 2 as shown in the broken lines, wired in such a way that it becomes non-conducting for positive-going voltage, its action in the practical circuit should be quite clear. When the scan coil current swings from its initial positive value I to its maximum negative value (slightly less than I), the diode is cut off and has no effect on the circuit; when the current tries to swing upwards on the next half-cycle, however, the diode conducts and effectively shunts the circuit with a very low resistance. The oscillation is therefore immediately absorbed.

As the switching cycle is actually identified with the flyback period of the normal scan, the scan coil current and voltage conditions in the working circuit are therefore as shown in Fig. 4, the sine and cosine "sections" of the appropriate waveforms of Fig. 3 having been transferred there. If the oscillations are not damped out at once at the end of the flyback period, a ringing occurs at the front of the next line-scan and the picture is marked into vertical bars on the left-hand side. By a proper design of the damping conditions all of the oscillation should have been damped out in the flyback period.

The capacity C of the scan coil windings may be neglected provided the resistance of both the windings and the efficiency diode are very small. The effective load resistance of the diode can be adjusted by L1 to

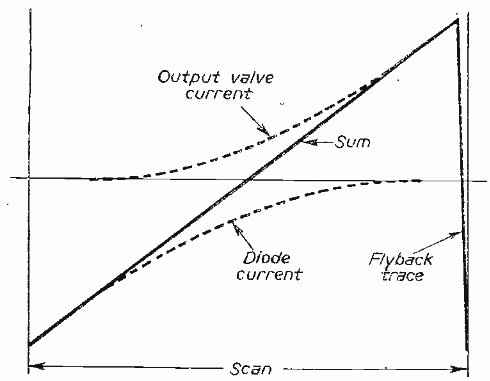


Fig. 5.—Change-over conditions during the scan.

allow the proper rate of fall of the current to match to the rise of current in the coils towards the middle of the trace which is provided by the output amplifier itself as conduction re-commences. Fig. 5 shows the take-over conditions, the output valve being brought

(*Concluded on page 124*)

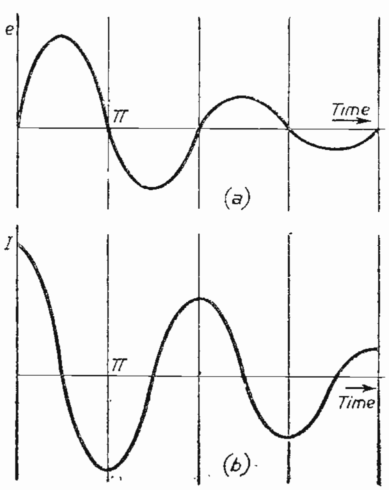
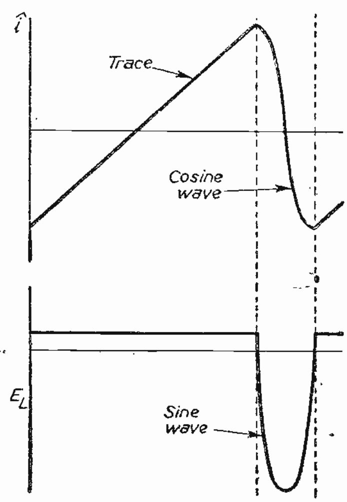
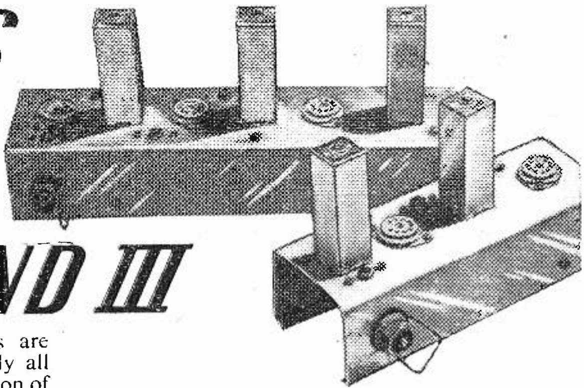


Fig. 3 (Left).—Oscillatory conditions in the scan coils in an undamped circuit. Fig. 4 (Right). — Scan coil current and voltage conditions over one scan period.



CONVERTERS FOR BAND III



THE FIRST OF A SERIES OF CONVERTER UNITS FOR THE RECEPTION OF THE ITA

COMPLETE Band I-Band III tuner units are available commercially, but they nearly all use an intermediate frequency in the region of 35 Mc/s with the oscillator working high (that is, above the signal frequency), so that the sound I.F. is higher in frequency than the vision I.F. This mode of operation was advised by the British Radio Equipment Manufacturers' Association (B.R.E.M.A.) and the G.P.O. as a means of reducing TV and F.M. interference, which is otherwise liable to occur as the result of oscillator radiation and second-channel pick-up.

Therefore, as the older style receivers use I.F.'s of considerably lower frequency (in the order of 14 to 19 Mc/s), and in some cases use a lower than signal frequency oscillator, so that the vision I.F. is higher than the sound I.F., it is not feasible to adapt such receivers to cater for a two band tuner-unit.

The Band Converter

There is still a way left open to the would-be Band III viewer who is the owner of either a Band I superhet or T.R.F. receiver, however. That is by making use of a band converter which operates by converting the frequency of the Band III signal to the frequency of the Band I receiver. It is, of course, necessary to arrange the conversion so that the sound and vision signals are altered in frequency in their right relationship.

The block diagram at Fig. 1 shows how this may be achieved. Here it will be seen that the signals from the Band III aerial are first amplified and then fed to a mixer stage which is also in receipt of a signal produced by an internal oscillator. The frequency of the oscillator is chosen so that when the two signals are mixed a heterodyne signal equal in frequency to the difference between the incoming Band III signals and the oscillator is produced which corresponds to the acceptance frequency of the Band I receiver. In order to maintain correct relationship between the sound and vision signals the oscillator must be lower in frequency than the incoming signals. If, for example, the oscillator were made higher in frequency the converted sound signal would have a higher frequency than the converted vision signal and both would not be accepted simultaneously by the Band I receiver.

A band converter of this kind (units which convert the Band III signals to an intermediate frequency are generally known as adaptors) operates quite successfully in practice, but it has limitations which are as well to bear in mind. Its chief shortcoming is that when used in an area of high Band I signal strength it is extremely difficult, and in some cases almost impossible, to eliminate breakthrough of the Band I signals on the Band III programme.

How true this can be may be realised readily by some viewers who find that they are well able to receive the BBC signals—and a reasonable picture—by removing the aerial from the receiver. The signal, being so high in such areas, is picked up directly by the wiring and first stages of the set itself!

It is, therefore, fairly obvious that a simple switch in the converter which disconnects and short-circuits the Band I aerial when switched to Band III is not going to be wholly successful in eliminating completely Band I breakthrough. In extreme cases of this kind it may be essential to alter the channel of the Band I receiver when using a converter.

Another source of Band I interference is due to pick up of the signals by the Band III aerial and conveyance of them through the converter. This presents much less of a problem, however, for a simple filter interposed in the Band III aerial feeder is all that is generally required. A filter of this style is shown in Fig. 2. Preferably it should be built into a thoroughly screened box and mounted as close as feasible to the converter Band III input. Its trimmer should be adjusted for minimum Band I breakthrough

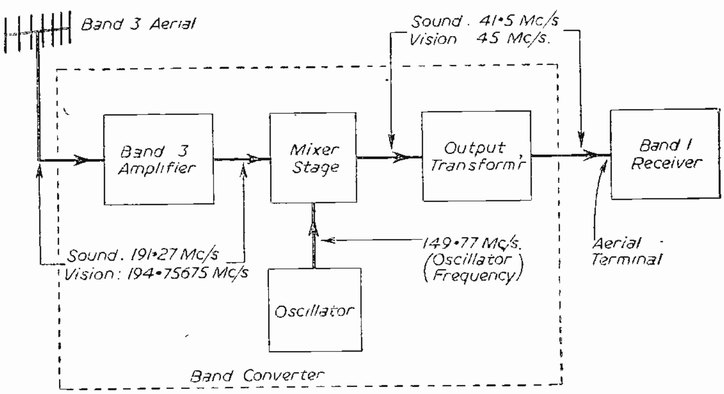


Fig. 1.—Block diagram showing arrangement of a converter.

on the Band III programme; in this respect vision breakthrough is the more troublesome as it causes patterning on the picture.

It is interesting to note, however, that extensive experiments relating to Band I breakthrough reveal that the main source is after the converter and that very little Band I signal actually gets through the converter itself.

We propose to describe the construction of four or five different models of converter so that every type of reader will be covered and at least one model should be found to suit any individual preference.

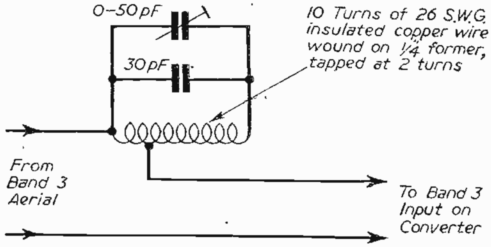


Fig. 2.—Band 1 aerial filter

It has been found that the incorporation of a power pack complicates the design unnecessarily, and accordingly these models rely for their power supply on the receiver with which they are employed, but as the H.T. requirement is quite small and most receivers have sufficient heater power available this should present no difficulty. Alternatively, a separate power pack may be used, and its construction will be described.

Band III Coils

At the outset channels 8 and 9 will be employed and coil winding details given will cover both channels with some further spread on each side. The coils are not at all difficult to make and explicit instructions will be given for their construction.

Alignment

The Band III coils cover a wide bandwidth and there should be no difficulty with the alignment. So that the best results can be obtained detailed instructions are given for the alignment of each model and if these instructions are followed carefully no difficulties should be experienced.

SERVICE AREA MODEL No. 1

Circuit Description

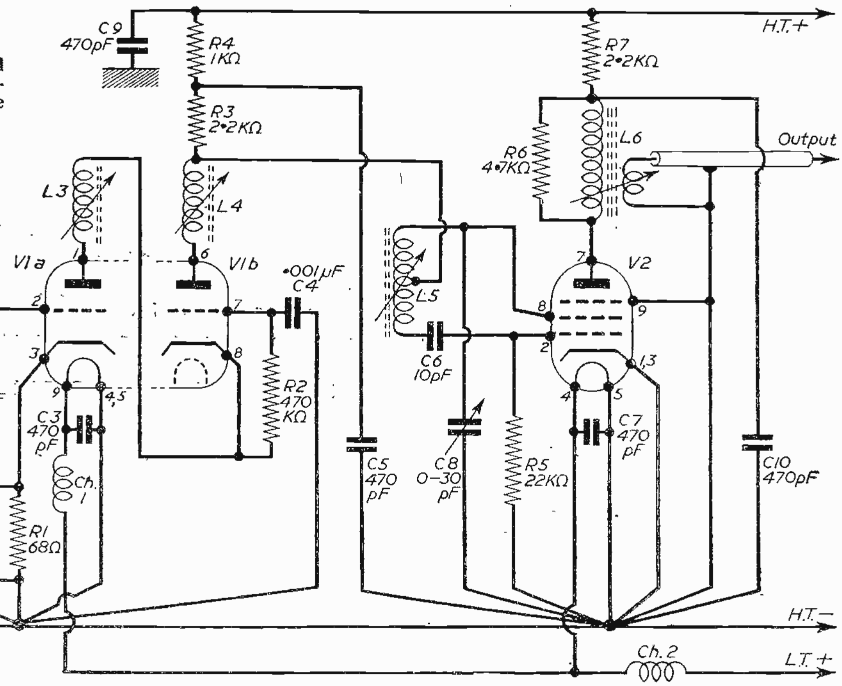
Fig. 3 shows the circuit of the service area model. This model is intended for use where there is an adequate signal. This will not necessarily correspond to the same areas as the Band I transmitters; by reason of the greater attenuation of the Band III signal the service area will be much smaller and many viewers who are at the moment within the normal service area of the Band I station will find themselves in the fringe area of the Band III transmitter.

If the constructor is in any doubt as to whether or not he is in the fringe area, then he is advised to build a fringe model.

In all cases a good aerial system is recommended. This should be as efficient as possible.

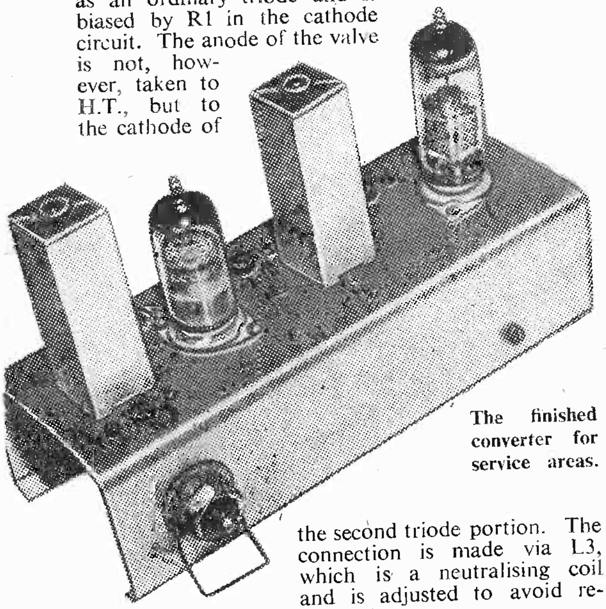
The aerial circuit (Fig. 3) is designed for normal 80 ohm coaxial cable input, the feeder being fed directly into the first R.F. coil L1, which is tapped to effect matching. The tap is arranged at half a turn up the coil. If the aerial employed uses a 300 ohm balanced twin cable, then a separate coil of one complete turn must be used to terminate the feeder cable.

Fig. 3.—Theoretical circuit of the converter for service areas.



L2 is simply a wavetrap tuned to the local Band I transmitter. The signal is fed to the grid of V1a, which is the first section of the ECC81 or double triode.

It will be seen that this section of the valve acts as an ordinary triode and is biased by R1 in the cathode circuit. The anode of the valve is not, however, taken to H.T., but to the cathode of the second triode portion. The connection is made via L3, which is a neutralising coil and is adjusted to avoid re-generation.



The finished converter for service areas.

The grid of V1b is grounded via the large capacity condenser C4, and the output of the valve is fed to the mixer via the centre tap of the oscillator coil L5. L4 is tuned to the local station and will be found to be fairly sensitive.

V2 (an EF80) is the combined oscillator and mixer. The screened grid is used in a conventional Colpits circuit, the core being tuned by an iron dust core, C8 acting as an auxiliary. It would have been possible to have used the core solely for the tuning, but the arrangement of the circuit with additional capacitative tuning materially assists in the avoidance of oscillator drift.

The output of the mixer is taken to the I.F. coil L6, which also acts as a step-down transformer to take the output of the converter to the input of the televisor. This coil is made from a Haynes coil unit to obtain the greatest efficiency and screening.

It will be noted that the theoretical diagram shows the earthy end of components going to single earthing points. This feature is carried out in practice as common earthing connections do much to prevent losses and to improve stability.

The "live" side of the heaters has been decoupled by the use of small chokes and decoupling condensers.

Construction

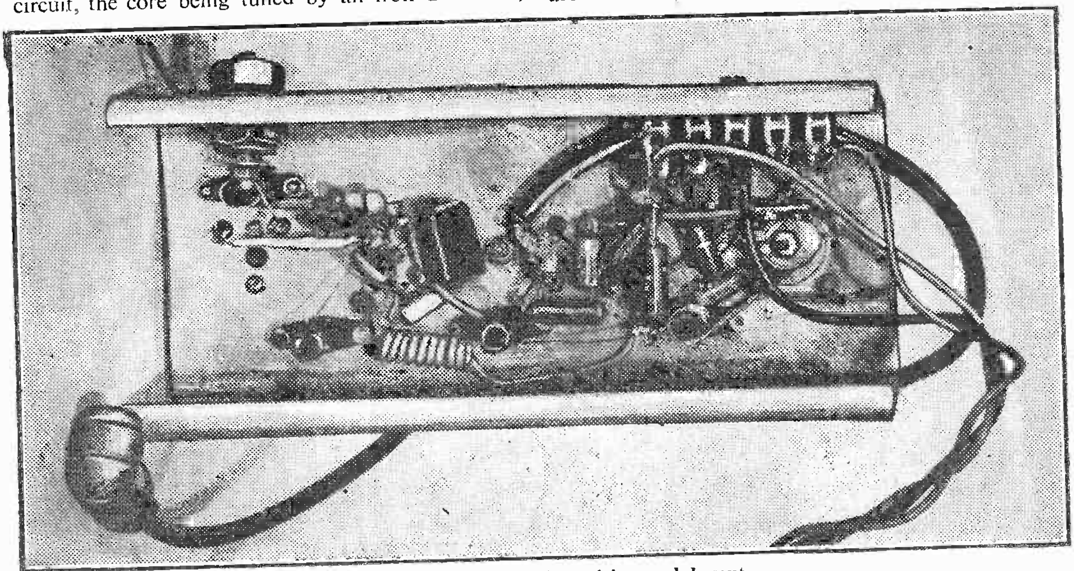
The first step in construction is to make the chassis. This is quite a simple job as it can be made from a single aluminium sheet.

Fig. 4 shows the main dimensions of the chassis. The valve holes and holes for aerial socket and coils should be drilled before the chassis is bent into shape. The holes for the Haynes coils should be drilled as given in the diagram. Two holes are needed for the retaining bolts and the other holes for the connections.

Having drilled the holes, then the chassis can be bent into shape. This is best done by bending over the edge of a block of wood, using a second piece of wood to force the metal.

The next step is to insert the valveholders and care should be taken to ensure that they are correctly positioned so far as the pins are concerned ; a tag should be inserted under the retaining bolt for the common earthing.

After the valveholders have been fitted the formers for L1, L3, L4 and L5 should be placed in position, and the tag strip at the end of the chassis. The coils are not wound at this stage.



Underside view showing wiring and layout.

It may be necessary to reduce slightly the height of L1 coil form so that it comes directly under the input socket.

Pye aerial sockets were used in the prototype as they are inexpensive and easy to obtain; the more modern type of socket can be used if desired. The output plug for plugging into the television receiver should be of the same type already fitted.

Heater Chokes

The first step in the wiring is to wire in the heater chokes. These are very simply made by wiring 10 turns of insulated wire about 22 s.w.g. on to a former about ⅛in. in diameter. When the coil is taken off the former the natural springiness of the wire will increase the diameter. The turns should be wound on the former so that adjacent turns touch.

Anything can be used as a temporary former, such as a knitting needle. Fig. 5 shows the method.

A long "tail" should be left on the coil and the short end wired directly to the valveholder of V1, the other end of the long tail being wired to the valveholder of V2. The second choke has the short end wired to V2 and is stood vertically underneath the tag strip.

COMPONENT LIST

Half-watt resistors and ceramic miniature condensers as in Fig. 3. Additional components:
Two B9A valveholders.
Four ¼in. diameter coil forms with cores.
Two Haynes coil forms and cans.
One Coaxial aerial socket.
Chassis as in Fig. 4.
One 5-way tag strip.
One ECC81 valve.
One EF80 valve.

The Haynes Coils

The Haynes coils can be wound next. Each coil unit consists of coil former, side wires, top paxolin strip, cores, screened can and mounting screws.

L2 is a filter coil and is wound at the bottom end of the coil form. The wire used should be about 28 s.w.g., enamelled, or insulated with silk or cotton. The number of turns should be according to the frequency of the local channel. Table 1 gives the number of turns for each channel.

To make up the coil first slightly roughen the coil form where the windings are to be mounted with some fine sandpaper. This will assist in keeping the wires in position.

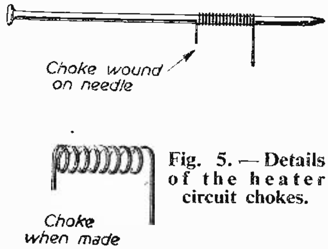


Fig. 5.—Details of the heater circuit chokes.

TABLE I.

Coil Data.

Channel 1	11 turns
Channel 2	9 turns
Channel 3	8 turns
Channel 4	7 turns
Channel 5	6 turns

If the enamelled wire is used bare the end of the wire with emery and slip it through one of the small holes in the bottom of the mounting adjacent to the side wire eyelet. Wind on the required number of turns, making adjacent turns touch one another and take the other end of the wire to another convenient hole. Coil dope of the polythene variety can be used, if desired, to keep the turns neatly in position.

Now fit the top paxolin holder and mount the side wires. These are kept in position by a spot of solder at the base eyelet. Do not allow a lot of solder to accumulate on the other side of the eyelet or there may be danger of contact with the chassis.

In the case of L1 two side wires only are required: after they are in position the ends of the coil should be soldered to them so that the coil is held firmly in position.

C1 is now soldered to the side wires. It will be found that if the condenser is mounted on the slant it will be possible to solder it directly to the side wires without it fouling the can when placed in position.

The coil form can now be fitted in position and the can bolted on.

(To be continued)

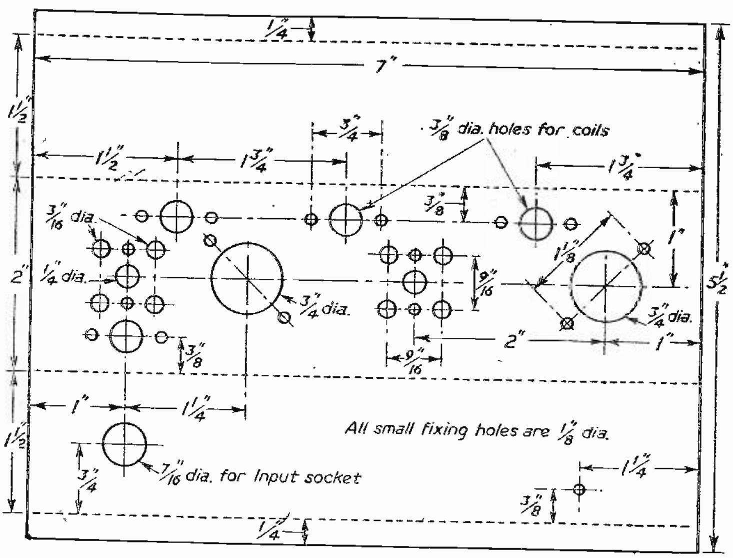
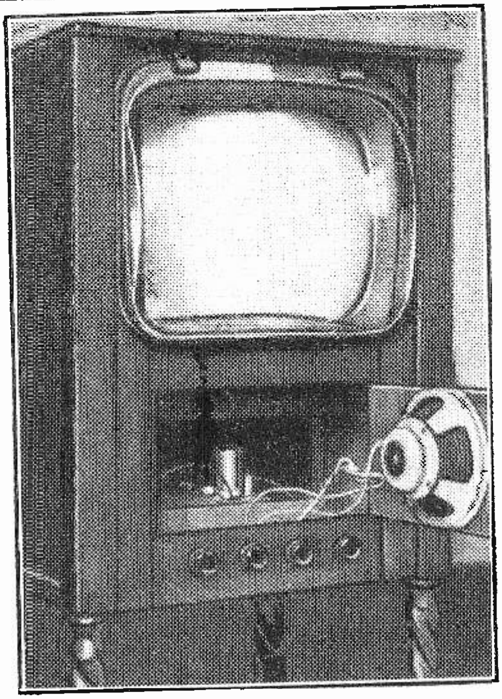


Fig. 4.—Chassis drilling and cutting data.

Amateur Chassis Construction

THE IMPORTANCE OF RIGIDITY AND SOME SUGGESTIONS FOR THE CONSTRUCTOR

By P. Green



UNDOUBTEDLY now that commercial TV is about to commence, more home-built receivers will be used, and a few hints on one of the most important parts of a TV receiver, and one which generally gets the least consideration, i.e., the chassis, would be of assistance to many amateur constructors.

Experience has shown that in many amateur-built receivers the rigidity of the framework supporting the chassis has been neglected, and this weakness brings annoying troubles when finally setting up the receiver. With two-tier construction it is especially important to make the framework perfectly rigid, and this must be able to support the timebase, and sound and vision chassis without causing distortion to them when moved from bench to cabinet.

The chassis themselves should be free from warping due to heat. They should not be too thin, and, if possible, be reinforced on the edges. The simplest way of doing this is by bending down the edges. The bolting-down feet are best bolted to the frame independently, and made adjustable by means of slotted holes. This avoids any distortion of the frame if the mounting position is uneven.

Any distortion of the chassis would disturb the wiring and coils, and this must be avoided at all costs with short-wave receivers, as this causes trimming troubles. Therefore, be sure to make the frame and chassis strong and rigid.

Servicing of the receiver will be required at some future date. Therefore leave plenty of space, and make removable ends to boxed-in assemblies, so that it will be possible to reach all component parts easily. A little planning at the beginning will save time if trouble starts.

Example

A good example of frame construction is shown in Fig. 1. This assembly was used for the "View Master," and it consists of $\frac{3}{4}$in. × $\frac{3}{4}$in. × $\frac{1}{8}$in. angle uprights, tied together securely both top and bottom by removable end pieces.

The timebase chassis at the top is made from $\frac{1}{16}$in. thick dural, and is wired up before placing in position. The removable end pieces allow for any servicing that would be required in the future.

Both the front and rear supports at the bottom, for mounting the sound and vision chassis, are $\frac{1}{16}$in.

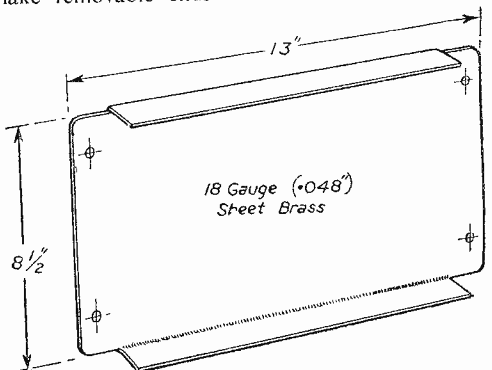


Fig. 1.—Sound and vision chassis showing edges bent down.

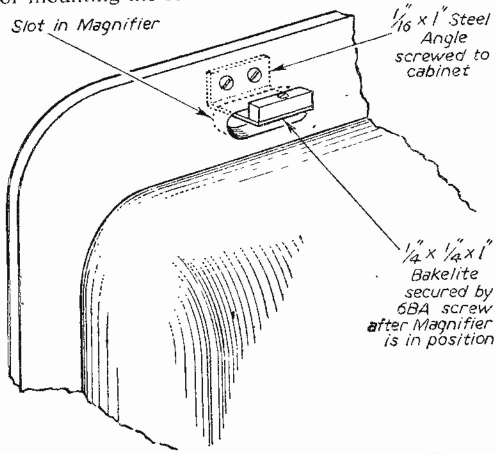


Fig. 2.—A method of hingeing a magnifier.

thick dural, and on these are mounted the various controls. The removable bolting-down feet are clearly shown, and these may be mounted on either side of the cross-pieces.

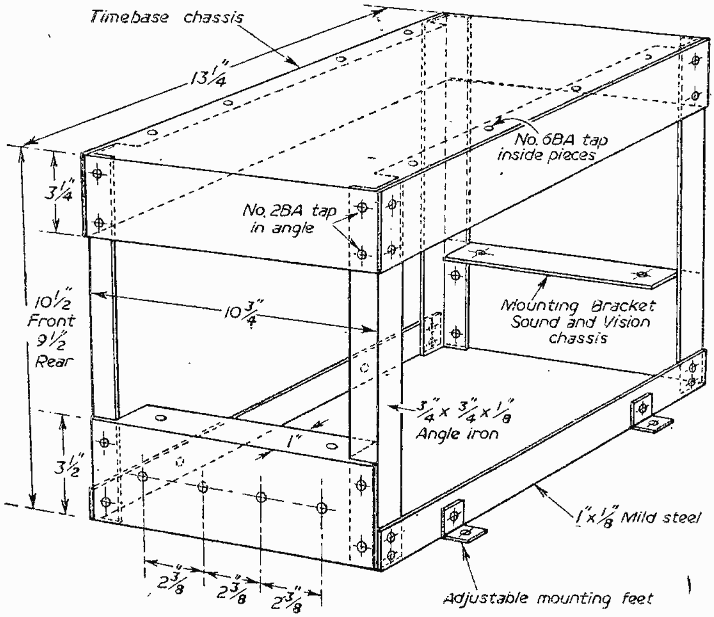


Fig. 3.—An example of frame construction.

Fig. 1 shows the sound and vision chassis, made from not less than 18 g. (048) thick brass sheet ; the edges are shown bent over to give added strength. A good point is to rivet, or bolt, in various positions on the chassis, copper soldering tags, as it is easier to solder a connection to a tag than direct on to the chassis. This prevents dry joints. Soldering tags must always be securely fixed to aluminium chassis.

The photograph shows a "View Master" constructed with a frame and chassis as described, and has proved very successful. As will be seen, this set is fitted with a magnifier. The fixing straps we reremoved, and a hinged arrangement was made ; a constructional view is shown in Fig. 2. This is an excellent idea, since there is no safety-glass in front of the tube, and the magnifier and tube can easily be kept free from dust. This saves periodic dismantling for cleaning, with all its hazards and disadvantages. A front opening door has been provided, and on this the speaker has been mounted. Through this door opening final adjustments can easily be made. From the speaker terminals, additional leads are taken to a jack socket, mounted on the bottom of the cabinet. To this may be connected a phone for a deaf person, or connections may be made to a tape-recorder.

An alternative housing arrangement would be to include the television receiver in a larger cabinet housing a high-quality amplifier used for record and radio reproduction. The sound side of the television set would, in this case, terminate at the sound detector, and this point would be taken to a change-over switch. The radio and pre-amp for gramophone would also go to the switch and a simple operation would then give the highest quality on radio or television or records. The only difficulty here would be in the avoidance of interaction resulting from the long leads, but I have found that standard coaxial is ideal, as well as lending itself ideally to coaxial plugs and sockets which are vibration proof.

EFFICIENCY DIODE SYSTEMS

(*Concluded from page* 118)

back into conduction by proper grid-voltage control, at about one-third along the forward scan period. The grid input sawtooth is, therefore, arranged to carry the valve into conduction about one-third along the slope.

In a practical circuit, the efficiency diode does not simply shunt the coils as shown in Fig. 2, but is wired effectively in series with the anode voltage supply to the output amplifier. This connection consequently adds the diode voltage to that available on the H.T. rail proper, and increases of 100 to 200 volts are easily possible over the normal supply.

The E.H.T. for the tube anode is derived from rectification of the inductive kick which occurs when the primary current in the transformer is suddenly interrupted by the cut-off of the amplifier valve. The overwinding acts as a step-up auto-transformer in the usual way (a ratio of some 3 to 1 is usual) and a very high voltage pulse is produced at the outer end of the coil. As the pulses are sharp, the peak inverse voltage across the rectifier is barely 10 per cent. or so in excess of the D.C. developed at the cathode.

It should be stressed again here, for the benefit of those who are not familiar with this part of the circuit, that no attempt should be made to measure the voltage on the anode of either the line timebase output valve or the efficiency diode. Although it is possible to do this with special apparatus the ordinary type of voltmeter will be destroyed, as well as the user running the risk of a severe shock from the back E.M.F. kick which arises and which is of the order of kV.

Whatever the pleasure
Player's complete it

Player's Please

[NCC 910Q]

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FULLY SHROUDED UPRIGHT

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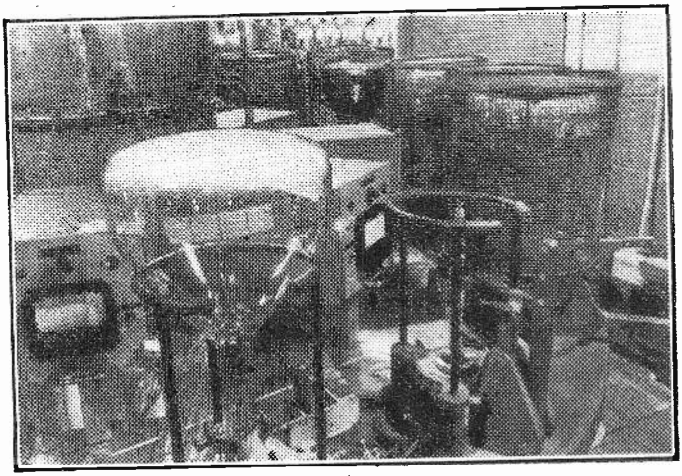
Picture Tube Developments

SOME INTERESTING INFORMATION CONCERNING THE LATEST PICTURE TUBE PROCESSES

By "Physicist"



EXCEPT for an increase in the screen size, there has been very little change in the design and construction of television picture tubes for several years. Recently, however, some interesting developments have been disclosed which may lead to the production of better picture tubes. Some of these developments are described below.

The Flat Picture Tube

The normal television picture tube is a bulky, awkwardly shaped object which calls for a large cabinet in which to house it. How often would experimenters have wished to have a large screen picture tube of not more than a few inches in depth? It is not difficult to imagine the changes in television receiver cabinet design which such a tube would bring about: the receiver proper could then be housed in a small cabinet, and the picture tube separately housed and hung on a wall in the same manner as a picture or painting.

Impossible? The Electronics Division of Willys Motors—an American company—has, in fact, developed just such a tube, consisting of a fluorescent screen mounted between two flat glass plates which are arranged to form a shallow rectangular box (see Fig. 1). The gun which provides the electron beam is located at one corner of the box and the whole of the interior of the box is completely evacuated. To date, these new picture tubes have been produced with a picture area equivalent to that of a normal 24in. tube, and even at this screen size the overall depth of the box is no more than 3in.!

Reference to Fig. 1 will help to make the principle of operation of this tube clear. An electron beam is projected horizontally from the electron gun and passes immediately below a series of deflector plates, D, near the top of the box. By applying suitable voltages to these plates, the electron beam can be deflected along any one of a number of vertical paths. Another set of transparent deflector plates, D2, are mounted horizontally behind the fluorescent screen, and by adjusting the voltages on these the beam can again be deflected, this time so that it moves in a horizontal direction and impinges on the fluorescent screen. A raster can therefore be produced on the fluorescent screen by varying the voltages on the two sets of plates in a regular manner.

In addition to the improvement in the shape of the picture tube, it is also said to give a very fine spot, which makes it an ideal tube for high-definition television systems (a 2,000-line raster is claimed as a possibility). The small spot size is also advantageous for purposes in which an optical enlargement of the picture is desirable.

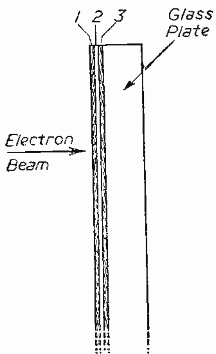


Fig. 2.—The structure of a colour television screen; 1, 2 and 3 are insulated transparent layers, each of a different colour phosphor. The depth of penetration of the electron beam is controlled by varying the potentials on the three layers.

Flat Tube Colour TV

The flat picture tube has been suggested for use in colour TV systems. For this application, the single phosphor fluorescent screen would be replaced by multilayer screen comprising three separate layers of transparent colour phosphors (see Fig. 2). The three colour layers would be electrically insulated from each other, and the three separate colour rasters which go to make up the picture would then be obtained by applying different potentials to the individual phosphor layers.

Flat Tube for Aircraft Navigation

It is also intended to use the flat picture tube in U.S. naval aircraft. Two such tubes are to be employed to provide the pilot with information re air speed, wind velocity, altitudes, etc., by displaying these figures visibly on one tube, whilst the other will show a radar map of the ground over which the aircraft is passing.

The Light Amplifier

In television picture tubes, light is produced when a beam of high velocity electrons impinges on a phosphor-coated screen. The light output from the tube is very small, so much so that it is impossible to project an image from, say, a 12in. screen on to a wall, and thus obtain a reasonably sized picture. Admittedly, some progress in the direction of projection television has been made by using specially corrected lens systems and projection tubes, but the high cost of this equipment and the inferior quality of the picture that often results, does much to mitigate against its widespread adoption.

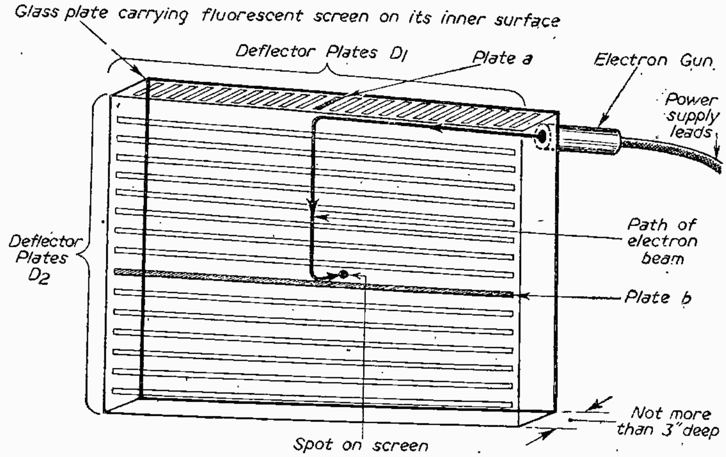


Fig. 1.—The flat picture tube. The voltages on the two sets of deflector plates, D1 and D2, are derived from timebases; the path of the beam of electrons is shown in continuous line. The two shaded deflector plates, a and b, are those which would be largely responsible for bending the beam as shown.

An apparatus recently demonstrated by the General Electric Research Laboratory in America might go a long way towards solving the light intensity problem in TV receiver tubes. The apparatus, known as the light amplification cell, consists essentially of a glass plate upon which a thin, transparent, electrically conducting film of titanium dioxide is evaporated (see Fig. 3). A thin insulating layer of zinc sulphide-phosphor, activated with manganese, is deposited on top of the first layer and this in turn is covered by a thick conducting layer of silver. Reference to Fig. 3 will show that the arrangement thus obtained is equivalent to a parallel plate condenser having the transparent conducting film of titanium dioxide and the layer of silver as plates and the insulating zinc sulphide layer as the dielectric.

Whenever a weak source of ultraviolet light falls on the glass plate, a faint yellow image is obtained. If, now, a D.C. potential be applied across the two conducting layers and slowly increased from a small value, the image will become many times more bright. The precise mechanism underlying the phenomenon is rather obscure, but it has been suggested that a photo electric effect within the insulating layer of phosphor produces many more photons than were present in the light incident on the glass plate. Even when the potential difference across the electrodes is only 100 volts, 10 times more light is emitted than was incident on the plate.

Possibly, future television tubes might have such a light amplifier incorporated within them and in this way intense images, suitable for projection, may result. Additionally, since the device is remarkably simple in its construction and does not require a source of extra-high tension, uses such as slave screens can be envisaged. Thus, provided some light of the right wavelength from the master picture tube screen in the television set proper, can be directed on to faces of several light amplifiers, a reasonable image should be obtained from each of these (see Fig. 4).

R.C.A. Single Screen Colour Television Tube

A new 21in. picture tube, 21AXP22, now has the phosphor dot screen deposited on the surface of the glass face instead of on a plate mounted within the envelope. Another interesting point about this tube is that the three electron beams which go to make up the colour picture are directed on to the same group of three phosphor dots each of a different colour, by three ferro-magnetic pole pieces which are built in the electron gun assembly. These internal pole pieces are energised via external pole pieces which are magnetically linked to adjustable permanent magnets. Correct colour registration is achieved by adjusting the magnets. The correct convergence of the three beams is maintained over the whole picture area by correction coils mounted on the external pole pieces and energised with a varying current derived from the scanning systems associated with the tube (see Fig. 5).

Some idea of the composition of the colour phosphors that are used in the R.C.A. single screen system can be obtained from the information divulged in the recently published British Patent 728,179. The red emitting element is stated to be zinc selenide or zinc-cadmium selenide in which there are at least eight parts by weight of zinc to one part by weight of

(*Concluded on page 131*)

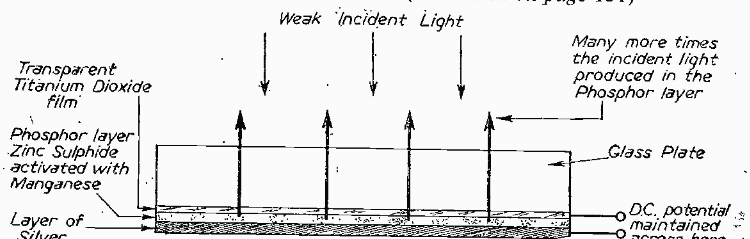


Fig. 3.—The light amplification cell.

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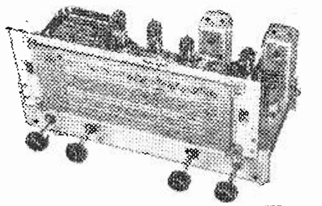

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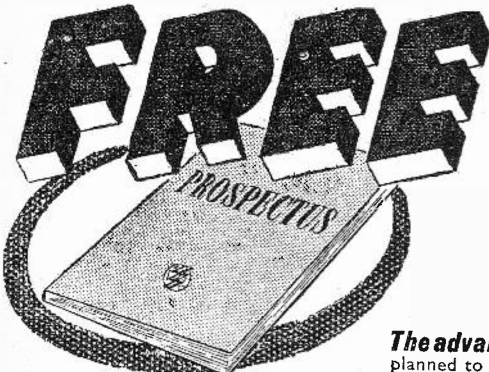

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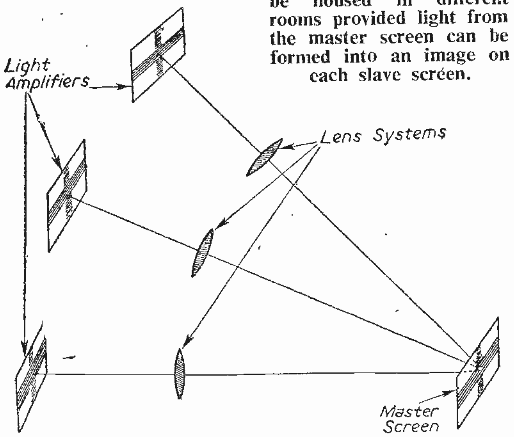
cadmium, plus 0.003 per cent. to 0.03 per cent. by weight of copper activator. The blue emitting phosphor is either zinc sulphide or zinc selenium

Fig. 4.—A possible arrangement of light amplifiers working as slave screens from a single master screen. There does not appear to be any reason why the amplifiers should not be housed in different rooms provided light from the master screen can be formed into an image on each slave screen.



sulphide in which there are eight parts by weight of zinc to one part by weight of selenium, plus 0.005 per cent. to 0.025 per cent. by weight of a silver activator. The green emitting phosphor is zinc silicate with 0.1 per cent. to 1.0 per cent. by weight of a manganese activator.

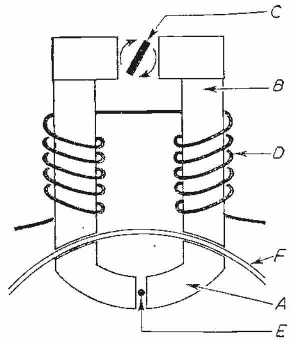


Fig. 5.—Schematic diagram of beam convergence adjustment on a R.C.A. tri-colour screen tube, type 21AXP22. A.—Internal pole pieces of ferro-magnetic material. B.—External pole pieces assembled to correspond with the internal pole pieces. C.—permanent magnet which is adjusted as shown to give the correct beam convergence. D.—Coils energised from scanning circuits to maintain the right convergence all over the picture area. E.—Electron beam from one colour. There are three such set-ups in and around the tube neck, one for each primary colour of the picture. F.—Glass envelope.

The information disclosed in this patent gives some idea of the high purity materials which must be used in the preparation of the phosphors and emphasises the small amount of activator that is usually necessary to produce fluorescence.

Colour TV Progress

According to the American Industrial Correspondent of the *Financial Times*, innovations in colour television were demonstrated by leading U.S. manufacturers of TV studio equipment and receivers at the recent trade show of the National Association of Radio and Television Broadcasters. The new equipment evidenced further progress in the direction of lower-cost colour telecasting.

Chief attraction at the show was the "Vitascan" equipment made by the Allen B. Du Mont Laboratories, Inc. This permits television broadcasting in colour of live studio shows without the use of television cameras.

The Vitascan equipment emits light from a cathode-ray tube instead of a conventional lens. The beam of light from the tube scans people and objects in the studio. The light reflected from these is picked up by multiplier phototubes. The phototubes convert the light into an electric signal, which can be passed on to a regular TV transmitter.

Du Mont states that the new equipment can be operated by one person, and can also be used with regular black-and-white telecasting. It is engineered to complement the company's "Multi-Scanner," already widely in use in the United States for producing pictures in black and white or colour from films, slides or photos.

Vitascan equipment alone costs a little over $9,000, the company states. Complete with Multi-Scanner equipment, the price is around $32,500. Du Mont points out that the Vitascan is not adapted to use out of doors, or indoors with programmes involving a great deal of movement. For other types of programmes, it eliminates the high expenses usually associated with colour telecasts, it is claimed.

R.C.A. Transmitter

At the same show, the Radio Corporation of America unveiled a new transmitter for colour as well as black-and-white broadcasting on ultra-high-frequency channels, which costs about 25 per cent. less than similar equipment previously offered by the company.

This is a 25-kilowatt transmitter capable of a million-watt effective. It takes up no more space than a 12½-kilowatt transmitter, uses many fewer electron tubes than previous models, and offers savings of up to $20,000 annually in studio costs, the company states.

R.C.A. states that the new equipment will be available commercially this year.

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).

AERIAL CONSTRUCTION HINT

SIR,—You helped me about 18 months ago with a home-made "X" aerial described in PRACTICAL TELEVISION, using a four-way by ¾in. electric junction box. It was very satisfactory. It was, however, difficult to fix the rods tightly in the sockets, owing to the good fit of the rubber sleeves. I got over this by slitting the tubes and squeezing them in a vice, to a smaller diameter, and then expanding to full size after putting in the short metal tubes and rubber sleeves—by driving a ⅜in. dowel rod into the end of aluminium tubes, for about 6in. This also stiffens tube. I also used rubber walking stick ferrules to protect and insulate joints.—S. RANDELL (Purley).

FOREIGN TRANSMISSIONS

SIR,—I can assure G. Little (PRACTICAL TELEVISION, July) that the interference during May definitely was French television. It was received clearly here on many evenings in May and June, when it completely blocked out the Belfast TV. station at Glencairn.

I received a steady, clean picture, with powerful sound on a Pye FVI. One evening of particularly high field strength the programme viewed was the newsreel, including helicopter ascent of Mt. Blanc and a cycle race, followed by "Magazin Feminin."

I might add that Glencairn is very weak here, but doubtless the new station with its better positioned aerial and greatly increased power, will provide more opposition in the future.—N. GRAHAM (Co. Derry).

T.R.F. RECEIVERS

SIR,—I was glad to see in the June issue that T.R.F. receivers will still be useful when commercial starts. I had been "reliably" informed by a dealer that I would have to scrap the set and it would not be possible to convert it. Reading the article, I see that you give confidence to those of us who have old sets, and you may be interested to hear that during July a neighbour built himself a converter and after telling me of his results on the test transmission, he brought it in to me to see if it would give the same good results on my set. It was connected (it has its own power supply), and with no trouble at all the Saturday morning test picture was adequate and compared with the BBC signal, with good sound and no interference or trouble whatsoever. I do not know what it will be like during the dark periods in the winter, but obviously it will not be difficult to make any slight adjustments to make up for any increased signal gain.—K. R. HARDCASTLE (Stanmore).

VIEWING IN THE DARK

SIR,—I do not agree with Mr. Dunn concerning the best way of viewing modern TV. Leaving aside all questions of eye strain, there is a very important psychological effect. First, the picture is too small to be used as any attempt at "reality." One has, therefore, to reconcile oneself to the fact that one is looking at a picture, which is a "live" reproduction of something, on the lines of the cinema screen. That being so I feel that it is best to make some attempt to make the screen look what it is, in the same manner that the cinema decorates the screen with an ornamental proscenium. One manufacturer attacked this problem last year, and following the idea used there I have sunk the tube face of my set about 1½in. behind the cabinet front, and surrounded the space between tube and cabinet front with a piece of theatrical lighting coloured plastic (deep orange). On each side of the screen I have a 15 watt pygmy bulb joined to the input to the set. When switched on these light up and give a deep orange halo to the tube and flood slightly forward. I think this makes the picture crisper and more "black and white," and at the same time gives sufficient light in the room to enable one to move about comfortably. Unfortunately, the summer months call for complete blacking out of the room. —G. F. R. TUNNEY (S.W.3).

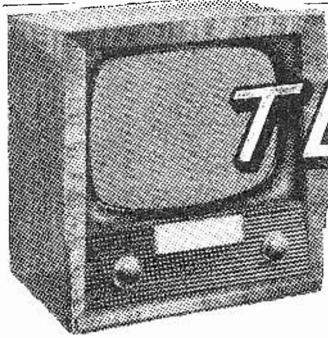
NO MARATHON COMMENTARY

SIR,—The television broadcasts from Wimbledon this year have been extremely well handled by the BBC and all praise to them, except for one small yet annoying point.

Richard Dimbleby showed us on election night and the day after how it is possible for one man to act as compere or commentator on a TV programme for almost 24 hours practically non-stop. His was a superb piece of TV commentating, which brings me to that small, annoying point concerning the outside broadcasts from Wimbledon. Why do we have to put up with commentators who, after about 20 minutes only of occasionally coming out with remarks like: "Set point now to the Australians" or "Now it's Miss Hart to serve to Hoad," tell viewers triumphantly, "And now I am handing over to Roy So-and-so for a further commentary"? One would think theirs had been another Dimbleby marathon by the way they continually pass the microphone backwards and forwards to each other. One commentator, please, for a whole afternoon's broadcast. —H. JAMES (Bromley).

WIDER TV SCREENS

SIR,—The cinema industry began many years ago with a rectangular screen of a 4:3 ratio. A couple of years ago it was forced to alter this ratio to produce a more spectacular effect and possibly bring back the customers to the cinema. This has greatly improved motion pictures, in my opinion, and I do not see why the TV back-room boys could not develop a screen of the same ratio as that which takes films in CinemaScope. This would be advantageous in many respects. We should see more continuous play in sports broadcasts such as soccer and cricket and bigger and more enterprising plays. Of course, the old ratio screen could still be employed where necessary, just as in the cinema; tennis, for instance, would come over better on the 4:3 ratio due to the shape of the court. Indeed, one could even fit curtains to the edges of one's C.R.T. to be adjusted according to the ratio being used for each broadcast. Can you imagine Sylvia Peters saying the following: "That is the end of our tennis broadcast from Wimbledon and we are now going over to Lord's to see play in the first Test Match. As this transmission will be in Wide-screen, viewers are now advised to adjust their curtains to the full length, accordingly"? Perhaps I am looking much too far ahead.—K. N. CHANT (Hounslow).



TELENEWS

Television Licences

THE following statement shows the approximate number of television licences in force at the end of May, 1955. The grand total of sound and television licences was 14,000,795.

Region	*Number*
London Postal	1,139,192
Home Counties	504,271
Midland	839,939
North Eastern	674,495
North Western	674,603
South Western	260,298
Wales and Border Counties ...	252,827
Total England and Wales ...	4,345,625
Scotland	253,328
Northern Ireland	24,964
Grand Total	4,623,917

Commercial Equipment Order

ASSOCIATED-REDIFFUSION, LTD., have ordered most of their studio and outside broadcast equipment from Marconi's Wireless Telegraph Co., Ltd., through their technical advisers, Central Rediffusion Services, Ltd.

Complete installations for three three-camera studios, one two-camera studio and two complete three-camera TV outside broadcast vehicles are included in the initial order.

TV Production Increase

THE General Electric Co., Ltd., is to transfer production of domestic radio sets from its Spon Street works to another Coventry factory so that the whole of the space previously occupied can be devoted to the manufacture of television receivers.

It is calculated that potential output will be increased by more than 50 per cent. in this way.

BBC Reorganisation

MR. H. J. G. GRISEWOOD has been designated Chief Assistant to the Director-General, with the personal rank of Director. The post of Director of the Spoken Word has been abolished and the Talks Division now comes under the Director of Sound Broadcasting.

Blaen Plwy Aerial

THE BBC has placed a contract with the J. L. Eve Construction Co., Ltd., of London, S.W.19, for the design, supply and erection of the 560ft. stayed mast for the television and V.H.F. station to be built at Blaen Plwy, Cardiganshire, to serve the coastal areas of West Wales.

Mullard Reference Book

MULLARD dealers have been issued with a 36-page booklet entitled "Television Receivers Equipped with Mullard Valves." This booklet contains a table giving lists of receivers grouped according to the makers' names. Against each receiver is given its valve complement. Another set of tables lists Mullard valves and tubes and against each type is given a list of the sets in which it is used.

Industrial Television

MARCONI industrial television equipment was demonstrated recently to officials of the British Electricity Authority at the BEA power station, Little Barford, Hunts.

Three cameras were applied to give close-up viewing of furnace flame conditions, a boiler water-level gauge and a feed pump.

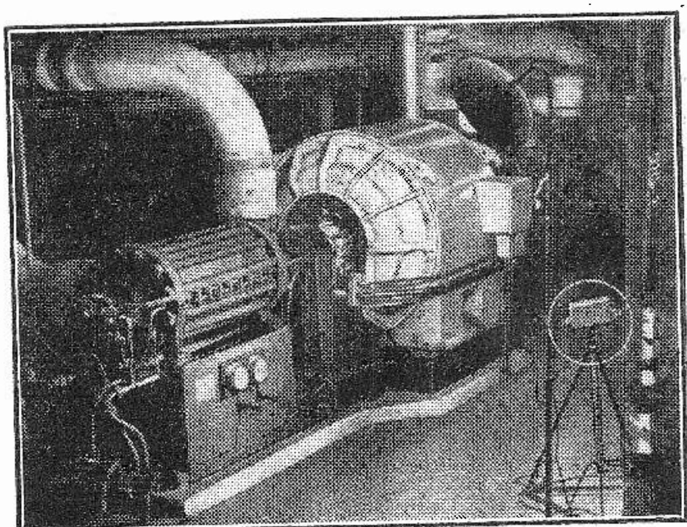
Alternative Service's Opening

THE ITA has confirmed that its London transmitter at South Norwood Hill, Croydon, will start high-power test transmissions during the first half of September and regular service will begin on Thursday, September 22nd.

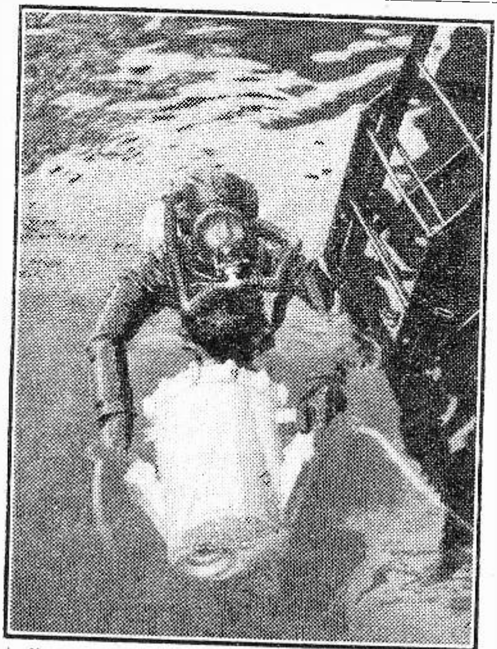
Colour on Tape

A RECORDING on tape of a colour television broadcast was transmitted for the first time in America recently.

The transmission originated from the N.B.C. studios in New York and was relayed over a closed circuit to St. Paul, Minnesota.



A white circle indicates the small camera (right) mounted for observing a feed-pump at the B.E.A. power station. (See "Industrial Television.")



A diver prepares to submerge to test equipment to be used on the Arctic patrol. (See "Underwater Television.")

Suppressors to be Fitted

FLUORESCENT street lighting in Crawley, Sussex, is causing interference to radio and television reception in the town.

Following complaints, suppressors are to be fitted to the lamps.

Link With Europe

THE G.P.O. has informed the BBC that the first section of the permanent vision link between London and the Continent, ordered last January, will be completed in September.

This section consists of a two-way coaxial cable circuit between London and St. Margarets Bay.

Swedes Begin Service

SWEDEN expects to commence operating her own television service on July 1st, 1956, with approximately 50 transmitting stations.

The television committee planning the service anticipates that within 14 years of the inauguration of a regular service there will be nearly a million licence-holders.

Interference Danger

IN his inaugural speech as president of the Radio Industries' Club, Mr. Harold Bishop, director of BBC Technical Services, emphasised the danger in over-simplifying the design of television receivers. This could result in interference from line timebases, he explained.

Advertising Shorts

JACK TRAIN is making a series of short advertising films for Currys radio shops.

Underwater Television

WHEN the Canadian Navy Arctic patrol vessel *Labrador* begins northern operations this summer in the sub-Arctic she will use the first underwater television equipment ever used in Canada.

The gear will be employed for surveys and underwater beach approaches, as well as for the study of the behaviour of divers in the cold waters of the Arctic region.

Name Change

IT is learned that products previously sold under the names of E.M.I. Factories, Ltd., E.M.I. Engineering Development, Ltd., and E.M.I. Research Laboratories, Ltd., are now being handled by E.M.I. Electronics, Ltd., of Blyth Road, Hayes, Middlesex.

Advertising by Post

IN an effort to boost the popularity of television in Belgium, the postal authorities are having letters franked with a stamp which reads: "Be Televiewers."

From Effects to Producing

FEW viewers who saw the third edition of "The Ted Ray Show" on July 16th will realise that the show's producer, George Inns, was responsible for the sound effects in the first play ever to be televised—"The Man with a Flower in his Mouth."

Theatre Purchased

GRANADA LIMITED, one of the contractors for commercial television, has bought the Embassy Theatre, Swiss Cottage, London.

After redecoration and repairs Granada will probably use the premises for theatrical productions, and dramas may also be filmed there for transmission from the Granada Northern TV station.

Sir Alexander Korda

FOR its first showing in America Sir Alexander Korda's film, "Richard III," will earn for him a fee of 500,000 dollars.

The National Broadcasting Company is to pay this amount to show the film on television.

Colour Demonstration

STUDENTS at Bradford Technical College recently attended a demonstration of large-screen colour television. This was incorporated in the last lecture in a series entitled "Modern Developments in Radio and Television."

Isle of Man Broadcasting

THE BBC has been in consultation with His Excellency the Lieutenant-Governor of the Isle of Man and the Lt.-Governor's Advisory Committee on Broadcasting concerning the development of television and sound broadcasting for the island but, as yet, no definite plans have been announced.

The Editor will be pleased to consider articles of a practical nature suitable for publication in "Practical Television." Such articles should be written on one side of the paper only, and should contain the name and address of the sender. Whilst the Editor does not hold himself responsible for manuscripts, every effort will be made to return them if a stamped and addressed envelope is enclosed. All correspondence intended for the Editor should be addressed to: The Editor, "Practical Television," George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2.

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Practical TV Aerial Manual for Bands I and III, by R. Laidlaw, **4s. 6d.** postage 3d.

TV Fault Finding, a Data Publication, 5s. 0d. postage 3d.

Television Engineers' Pocket Book, by E. Molloy and J. P. Hawker, **10s. 6d.** postage 4d.

Television Test Equipment, by E. N. Bradley, **5s. 0d.** postage 3d.

Basic Television, Principles and Servicing, by Bernard Grob, **45s. 0d.** postage 1/-.

The Oscilloscope and its Applications, by Philips, **5s. 0d.** postage 6d.

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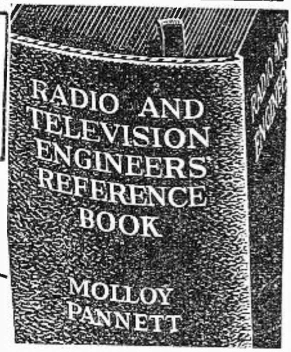

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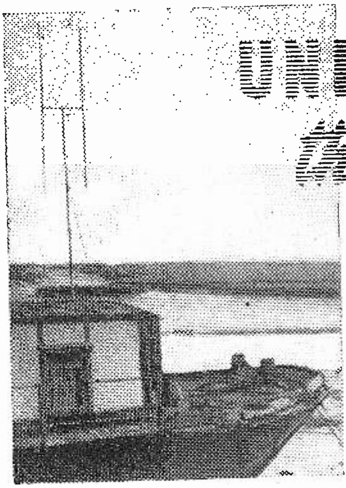


UNDERNEATH the DIPOLE

TELEVISION PICK-UPS AND REFLECTIONS

By Iconos

EFFECTS OF COMPETITION

NEW faces, changed routines, more technical gimmicks, new concepts—all of these symptoms are indications of the internal revolution of ideas which is going on at Lime Grove and other BBC television centres. The competition of sponsored TV has to be faced in the autumn and the prospect is having the healthy astringent effect of getting BBC producers and technicians out of the groove.

TV's NEW LOOK

TELEVISION drama progresses slowly but steadily, establishing and consolidating a set of stagecraft conventions which lie midway between stage and screen. It is the "feature" type of programme which enables the creative boys (and girls) to try out their new ideas, and the engineers to display their electronic virtuosity. Take the Jack Payne *Off The Record* programme for example. Here is a type of feature programme which, a year or so ago, would have been put over on routine, conventional lines, somewhat in the style of *Café Continental*, and would have amused without causing much enthusiasm. The mounting of that long-running TV feature was of secondary consideration to the talent of the artistes and yet the fussy setting, the crowd players and the balloons did bring some sense of warmth and audience participation to what was really nothing more than a variety parade, principally featuring Continental artistes. To-day, under the skilled direction of Francis Essex and Claude Whatham, disc recording stars and personalities are introduced with avuncular charm by Jack Payne and paraded with all the technical aids of inlay, overlay, back-projection and stylised settings. Ruby Murray, the attractive youngster with the fine recording voice, was seen putting over a number with a real sea background (probably either film back-projection or electronic inlay) instead of being draped in front of some palms from the property room.

The avuncular link has also been exploited by J. B. Priestley in his series, *You Know What People Are*, in which he comperes a series of satirical sketches. These are in the style of the intimate revues, such as "Airs on a Shoe String" and the Globe and Lyric revues, but again put over with every possible technical gadget from the BBC engineering bag of tricks. If it is true to say that the series has been a little uneven, the same can be said of even the finest West End theatre intimate revues; satirical humour has a highly selective appeal, and different items in the same show appeal to different members of the audience.

One of the most attractive features of this series is the incidental music of Roberto Gerhard, though the highly stylised decor of Bruce Angrave also contributes much to its success. The sketches are an amusing comment on the contemporary scene, put over with verve and pace by Clive Morton, Frances Rowe, Natasha Parry and John Stratton—sometimes with so much speed that it is a relief to return to the more measured tones of Uncle Jack Priestley himself.

AUTUMN PARADE

CHRISTIAN SIMPSON has often been mentioned in this column for his stylised direction in ballet and musical presentations. His handling of tableaux, group movements and pictorial design has always been outstanding. The preview of autumn fashions by the Apparel and Fashion Industries Association might have been just another routine mannequin display of somewhat restricted appeal had not the keen choreographic direction of Christian Simpson added that special indescribable polish to the show. Even a mere male will sit through the verbal technical jargon of tulle, broderie Anglais and triple-ninon (whatever that is!) if he can watch beautiful women display these things attractively, both individually and in groups, in a manner which suggests that the models actually enjoy what they are doing.

THE RETURN OF THE CLOWN

THE red-nosed comic and the musical clown, popular in the music-hall and circus years ago, seem to be on their way back. Grock, Noni and Partner and Barton, the tramp who nearly rode a bicycle, were top-liners years ago. Then came the period of the evening dress comedian, whose possibilities have now been almost exhausted by TV and radio. Hal Monty made a big success on television when he completely changed his style and reverted to a dumb red-nosed clown act, relying upon physical comedy and a variety of musical instruments. This act has been booked up by the music-hall people and Hal Monty is now cutting out all patter and repeating his TV clown act, topping bills in the No. 1 provincial music-halls. Hal has found that silence is golden —thanks to TV.

THE COMMERCIAL DRIVE

THE ITA has commenced a big drive to induce London viewers to have their sets converted and fit new aerials capable of receiving the sponsored TV programmes from Croydon. Extensive advertising in the London Tube stations and evening papers features the names of Bob Hope, Gracie Fields, Norman Wisdom, Orson Welles and Sir John Barbirolli on posters in the style of a variety bill. The ITA seems to be determined to open up to a full audience of viewers which, of course, is essential for the advertisers who put up the money. Some viewers are still taking a poor view of the prospect of being subjected to advertising plugs. Yet the same viewers cheerfully pay their money to see cinema programmes which likewise contain a small quota of advertising plugs for next week's films, for local shops and for a couple of nationally sold products such as soap flakes and chocolate. Nobody seems to object to this 10 or 15 minutes extra to the programmes—in fact, to be really effective, the advertising "short" must be entertaining and attractive.

A TV SCHOOL

ASSOCIATED REDIFFUSION seems to be way ahead of all the sponsored TV films in getting prepared for the autumn opening. Not only is the preparation of Wembley Studios and the Granville TV Theatre, Walham Green, well in hand, but TV films have been made at Shepperton, Barnes and other film studios to form a stock-pile of entertainment for next winter's sponsored TV. In addition, the small but very well equipped Viking Studios at Kensington have been taken over as a school for potential producers and technicians, who are trained in the use of both film and Marconi TV equipment. After a five weeks' initial course at Kensington the successful trainees pass on to the Granville TV Theatre, where they receive a further five weeks' training. The first course is timed to end there on August 27th, when the graduates will be ready to proceed to the Wembley Studios in time for the start of commercial TV on September 22nd. This all seems to be first-class planning in the D-Day style.

THE ELECTRONICAM

NOT long after the appearance in American TV studios of the Video-Film camera (recently described in this column), a similar type of camera has been announced under the name of Electronicam. Like the Video-Film camera, the Electronicam comprises a television camera and a motion picture camera mounted side by side on the same base and utilising a common lens system. However, unlike the Video-Film camera, which uses a prismatic beam-splitter for sharing proportions of the rays between a vidicon tube and a motion picture film gate, the Electronicam tackles the problem differently. When the motion picture film is being pulled down to the next frame (which occurs 24 times a second) a shutter interrupts the light path in the normal way. The front of this shutter is polished and reflects the image into the optical path of the image orthocon tube of a TV camera. The Electronicam can be thus used for direct film recording while a high quality television signal is being simultaneously broadcast. Alternatively, the TV side can be used purely for control, monitoring and production purposes, enabling a TV film director to stop and start cameras and generally direct (via headphone intercom.) their movement in the approved TV manner, thus attaining the speed of production for films equal to pure electronic methods.

TITLE GIMMICKS

THE BBC producers spend a lot of time thinking about titles, backgrounds to titling and mechanical devices for changing the wording. A great deal of ingenuity is used by both art and engineering departments, who bend over backwards in their attempts to be original. I think it can be said that they now surpass the film trailer makers, whose adjectives have loomed up on the cinema screens until we have become almost stunned. The BBC television titling is now of a very high standard, excepting when the original old routine "roll up" titling is used. This mechanical device is frequently unsteady and jerky and has improved very little since the early days at the Alexandra Palace. The sponsored TV people are tackling the problem with a simple motorised device. A rotary drier of the type used in photographic works for glossing and drying prints is used. The titles are printed on long strips of paper which are fixed with adhesive tape to the cloth belt of the drier. The title strip will then move up with the belt in front of the TV camera, the speed of travel being regulated by the normal control resistance. In this manner, a steady flow of titles is ensured, including the all-important cast, directional credits and "The End."

TV LIGHTING

LATELY there seems to have been considerable deterioration in the lighting and camera work at the Lime Grove Studios. Some shows have suffered severely. Celia Lipton was lit most unbecomingly in Richard Afton's *Saturday Night Date*, and other shows have been subject to poor camera movements, tracks and panoramas. Perhaps there has been a thinning of the ranks of the experienced TV camera operators at the BBC since the sponsored TV companies started getting into operation. At any rate, some of the most elementary rules of camera operation are broken time after time. These rules are: for normal camera panning, camera movement should be motivated by the artiste being televised; the actor should make the first move (such as an exit towards a door) and then be followed by the camera, with only a slight lag. The anticipation by the camera of such moves by actors is extremely bad technique. Similarly, the sudden tracking-in of a camera in anticipation of a movement by an actor is not good. The producers are, of course, partly to blame for these faults. An example of the camera handling at its very best was the transmission of the Cup Final. Precision following of the game with long-focus lenses, zoom lenses and long shots was all carried out most expertly. The combination of absolutely first-class camera operation coupled with beautifully timed cutting from shot to shot was an example of what can be done by first-class technicians who no longer require an "L" plate!

MORE STUDIOS

ENORMOUS studio premises are to be erected in Manchester by the Granada TV organisation. These will take many months to plan and build. The construction is to be on the lines of the elaborate American TV centres and an American expert is acting as consultant. In the meantime other sponsored TV companies have opened studios converted from other uses. The Vandyke Cinema and Café at Barnes has been reconstructed into a TV film studio with three stages with respective dimensions of 75ft. by 42ft., 48ft. by 32ft. and 25ft. by 18ft. (for trick work), together with dressing rooms, offices and workshops. Several TV features have already been made there with success. Motion picture cameras are used in conjunction with RCA recording equipment. The speed of shooting is 24 frames per second, as compared with 25 frames used by the BBC. Most studios making TV films have ignored this slight difference in film travel speed which affects the pitch of music by a semi-tone.

News From the Trade

NEW 2-BAND TELEVISION RECEIVERS BY MARCONIPHONE

TWO completely new television receivers —a 14in. and 17in. table model respectively—are now released by Marconiphone.

Specifically designed for first-class reception of Band I and Band III programmes, these new models incorporate a tuner unit of the incremental inductance type with built-in coils for all 13 channels. This is an integral part of the chassis and therefore permits the channel selector and the fine tuning control to be mounted in the logical and most convenient position—on the front of the cabinet.

Further simplification for the user is afforded by the single co-axial aerial socket, catering for a combined Band I and III feeder.

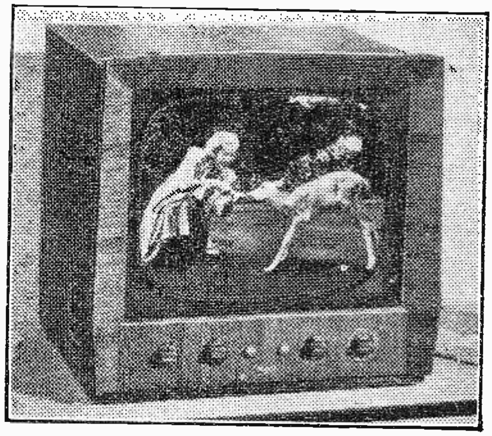
Circuit features include: flat-faced aluminised Emiscope picture tube with in-built dark screen and special non-reflecting mask; frame fly-back suppressor enabling full use to be made of the extended brightness range, stable pre-set permanent magnet focusing system, "sync cancelled" vision A.G.C. to counteract fading, aircraft flutter and differences in signal strength between Band I and Band III signals. This obviates major adjustments by the user when the set is switched from one band to the other.

Interference is effectively dealt with in three ways. Impulsive interference on vision is drastically reduced by a very efficient adjustable "black spotter" type of limiter. An automatic suppressor circuit takes care of sound interference. For diathermy and similar kinds of interference there is a wide-range tunable filter which can be connected at will via alternative sockets for the feeder cable.

H.T. supply is from two rectifier valves instead of metal rectifiers.

The 17-valve circuit has a high degree of sensitivity, designed to provide the best possible reception on both bands. Easily accessible controls for picture shift, squaring, linearity, etc., make for quick initial setting-up of the receiver.

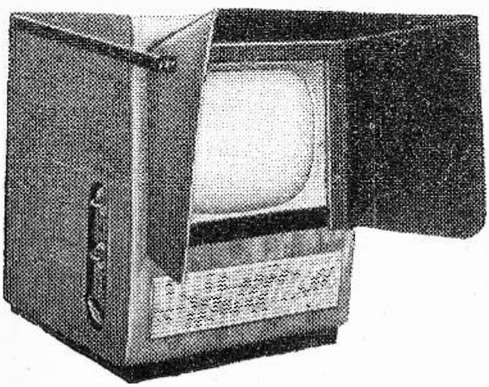
Well-tried components are used throughout, but the servicing aspect has not been overlooked. The tube is carried on the chassis and this can be easily removed as a complete unit if necessary. A number of test points have been provided and brought out to the back of the chassis for servicing measurements *in situ*.



Marconiphone Model VT69DA.

These receivers operate on D.C. mains voltages from 195 to 255 volts, or 50 cycle A.C. mains of similar voltages. Consumption is approximately 130 watts.

Both models are housed in cabinets in highly-finished walnut veneers. Prices: Model VT68DA (14in.), 66 gns. (tax paid); Model VT69DA (17in.), 79 gns. (tax paid).—The Marconiphone Co., Ltd., Hayes, Middx.



The Vendoma Television Screen Mask.

VENDOMA SCREEN MASK

TO avoid difficulties due to light from windows or room lights, a shade round the screen is very useful and a novel type of screen is now available and shown here. Made from stout card, with the inside covered with sprayed black felt, this is very simply attached with the aid of suction cups and an adjustable elastic band. The set will not be marked in any way, and the material lends itself well to adaptation in the case of special cabinets, as it may readily be cut. Models are available at present for 12in., 14in., 15in. and 17in. screens and the retail prices are as follows (free of Purchase Tax): 12in. and 14in., 17s. 9d.; 15in., 18s. 6d.; 17in., 19s. 6d.

The makers are Vendoma (TV), Ltd., Station Buildings, Preston Park, Brighton.

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

VIEW MASTER

My "View Master" TV is fitted with a Mazda CRM 121B C.R.T. and in order to get the full benefit from it I have increased the E.H.T. from approximately 6 kV to 9 kV. Since I increased the E.H.T. the picture will not fill the screen at the top and bottom.

By reducing the E.H.T. to 6 kV. again the picture fills the screen, but the quality is not so good.

I have been told that now I have boosted the E.H.T. I will have to increase the frame and line scan outputs. If this is so could you please give me details of the necessary modifications.—P. Blamire (Stafford).

You are correct in assuming that if the E.H.T. is increased it would be necessary also to increase the scan amplitudes and frame timebases. As you say that the height is short we suggest that you make the following modifications.

In the first place check that the voltages in the V11 and V12 stages are exactly as specified as this is essential. Break the connection between the top of R60 and the junction of R57 and C48 and connect a $1 \mu F$ condenser across these points; reduce the value of R66 to 220Ω, connect a $1,000 \Omega$ resistor in parallel with R65. Delete R67, then readjust R64 and R65. If necessary, connect a 330 pF condenser across the line scan coils, tags L1, L2.

SIMPLEX

I have recently completed the Simplex televisor and have obtained a picture. The trouble is that the vision is slightly blurred, more especially objects that are at the back of the picture. I have modified the video amp. by connecting another valve in parallel with the existing video valve and tried staggering the coils, but although there is some improvement the blurr is still there. I cured the frame linearity distortion which was very apparent by connecting a 2.5 kV. condenser, of $.1 \mu F$ capacity between number 10 connection on the tube and chassis. The line hold is extremely critical and I have to make frequent adjustments to preserve sync, and the frame seems to tremble when I advance the contrast beyond a certain point. I suspected oscillation in one of the R.F. stages so I spent quite a time making certain that this trouble did not exist. I have tried three VR97 tubes and there seems little difference between them. I find I can stop the frame tremble by touching the top cap of the sync separator.—G. Cook (Southampton).

The first thing to ascertain is that the horizontal lines focus correctly. If this is so then the fault lies in the tuning of the vision receiver; if this is not the case then a resistor in the bleeder network has altered in value; each one must be checked preferably by substitution.

It must be remembered that the studio cameras do not keep everything in exact focus; this is particularly noticeable in close-ups.

The frame trouble may be cured by doubling the value of C24.

To secure better line hold add a 50 pF condenser across C20.

K/B. KV35

After renewing a fuse which had blown, the picture is very dull. It cannot be seen in daylight.

Having an Avometer Model 7 and service chart, I measured all the volts between the valve sockets and chassis, I found them all normal except two. The voltage on screen of valve 50CD6G was 140 volts instead of 95 volts as on service chart. The voltage on first anode cathode-ray tube (C14FM) was 75 volts instead of 330 volts as on service chart.

I replaced the 1 meg. resistor on the lead to the first anode of tube and it still gives 75 volts. The reading on the other side of this resistor was 400 volts.

Would the drop from 330 volts to 75 volts be the cause of the dull picture? If so, how can I rectify this?—R. J. McClure (Belfast).

We feel that the low voltage reading on the picture-tube first anode is the result of the measurement being taken on a relatively low-resistance meter—a valve-voltmeter or a very high-resistance meter is essential to obtain an accurate reading at this point.

The trouble you describe is either caused by a low emission picture-tube, or misplacement of the ion-trap magnet on the neck of the tube. You should check these possibilities.

EKCO TSC91

The framehold slips many times during the evening, necessitating frequent readjustment of the framehold control. I am not certain whether this has occurred as a result of fitting a new valve, or whether it is just a coincidence. The slipping is often triggered off by a change in the picture transmitted, and is bound up with the black and white relation to the sides of the picture.

I would much appreciate any guidance you can give me on tracing and curing this trouble.—F. A. Chappell (Kingston-on-Thames).

The new valve may be defective and should be substituted before going any further.

Should the picture continue to roll intermittently, the resistors in the T41 circuit should be suspected of changing their value as the temperature of the set varies. This may also cause a condenser in this part of the circuit to vary in capacity. A hot soldering-iron placed near to, but not touching, the suspected component may provoke the symptom and give a definite lead.

The electrolytic condensers in the video-amplifier valve circuit should receive attention. The sync separator circuit and the valve itself should be checked to ensure correct working.

ARGUS

I have searched through your issues for two years back to find some reference to a fault that has developed in my "Argus." Perhaps you will be kind enough to enlighten me.

When I turn down the brilliance control to fade out the raster, it fades out—but at the same time the complete raster moves sideways off the screen and no result is obtainable.—F. Nicholls (Whitley Bay).

Movement of the raster with operation of brilliance is due to leaky condensers connecting the deflecting plates to the timebase valves. Check C54, 55.

PHILIPS 12IN. MODEL

I have a Philips 12in. television set and have been getting excellent reception, both vision and sound, but for quite a while now I have been troubled by a very loud hum. I have had a service engineer and he has examined it to see if it is a mains hum, but apparently it is not. It is possible to reduce it by altering the attenuators at the back of the set, but this means a consequent loss in vision. A friend suggests it may need tuning. Could you be so kind as to give me your opinion ?—N. Millar (Everton).

It is not stated whether the hum is present when no vision signal is being received. Assuming it is only present when the vision signal is "on," it can be put down to vision on sound.

The cure for this is to change the setting of the oscillator, probably a concentric trimmer mounted on the top of the chassis adjacent to V2. No precise instructions can be given as the model number is not supplied. Tune the trimmer to maximum sound by rotating it to find its best position.

If the trouble happens again after a short period (say, a week), change the UF42 oscillator-mixer valve. This is a common failing (drift).

K/B. HF40

Your help would be appreciated on the following : After the set has been on for about 10 minutes, the picture folds up for about half an inch at the bottom. I have changed the frame output valve with another in the set but the trouble still persists.—P. F. Harrington (E.11).

The valve with which you substituted may also be slightly defective and while working without trouble in another section of the receiver, the defect may show, in the form you describe, when used as frame amplifier. You should, if possible, prove this possibility by checking with a valve of known goodness. You would also be advised to check the condition of the frame generator valve.

Once you have proved conclusively that valve trouble is not responsible, you should investigate in the frame timebase circuits for a resistor which alters in value as it increases in temperature.

LOOSE ELECTRODE ASSEMBLY

After moving my set the other day to another part of the room I noticed that, when it was reconnected up, on switching off the spot that remained was enlarged and very blurred, and when viewed in a dark room with no raster on screen (aerial disconnected), a red glow could be seen in the centre of the screen and it was possible to see through it and see the electrode system in the neck. I assumed that the tube must be at fault as no other part of the set had been touched, so I moved the tube round to another position and noticed that the spot this time was a little better and nearly normal on switching off. Could this be a faulty electrode in the tube as when it is moved to another position the effect on the spot is changed, and it is possible to see through the coating on the tube? There is no heater cathode short and control of brilliance is perfect and emission appears O.K. Is there any way of curing this, what appears to be a loose connection in the electrodes which only affects it when any vibration is caused to it ? I would appreciate details of any process on rejuvenating tubes apart from fitting the low-loss transformer to heaters.—N. Shaw (Salford).

It is possible that the electrode assembly in your tube is loose, and if this is the case, unfortunately, nothing can be done by way of rejuvenation. Under certain conditions it is quite normal to observe slight illumination from the tube heater through the screen. This should only occur, however, when the tube is viewed in a darkened room with the brightness control fully retarded—it should not be visible when the screen is illuminated by a picture or raster. If it does, then we feel that the emission of the tube is somewhat impaired.

NOISE SUPPRESSION

Can you help me as regards this problem ? I am using a U.H.F. unit, 2 RF. and det., described some years ago in "Practical Wireless." Used with a three-stage amplifier it gives me good reception of TV sound, the only snag is car interference, living, as I do, on a main road. I have been trying various noise limiter circuits as used in modern TV sets, the basis of which is a double-diode valve, but they do not reduce the noise even a little bit. I even built up the D.X. aid described in the current "Practical Wireless," but all it did was to drop considerable volume and distort the output. Maybe I am experimenting on the wrong lines and I cannot claim to understand the way these noise suppression circuits work, so perhaps you can suggest a possible line of experiment.

As this area is on the fringe for F.M. reception, car interference again will be a serious drawback. Aircraft causing sound flutter is another snag, but that has no remedy—it will just have to be endured it seems ! —F. V. Trent (Bognor Regis).

The essential requirement of any sound unit in which a limiter is incorporated is that it should possess a reasonably wide bandwidth, 100 kc/s is usual.

This is because the original shape (spikes) of interference pulses must be preserved in order for the time constant of the limiter to be effective.

Interference on F.M. receivers does not cause trouble because of the limiter circuit which "levels" the response before discrimination. A.G.C. applied to the sound stages should limit aircraft flutter.

QUERIES COUPON

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

PRACTICAL TELEVISION, AUGUST, 1955.

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DD620	7/-	EL84	12/3	N37	12/-	UL41	11/6	1S5	7/6	6B4	6/-	6K7M	6/9	7H7	8/-	12H6	5/-
DDL4	4/-	EL91	8/-	PCC84	12/6	UY41	10/6	1T4	7/6	6B8G	4/-	6K8G	8/-	7Q7	8/-	12J5	6/-
DH73M	10/-	EM31	9/-	PCF80	12/6	VP23	8/-	1U5	8/-	6BA6	8/9	6K8GT	9/6	7R7	8/6	12K7	9/-
DH63	9/6	EY51	13/6	PCF82	12/6	VR105/30	5/6	215SG	7/-	6BE6	8/-	6L1	11/6	7S7	8/6	12K8GT	9/-
DH81	10/-	EY91	7/6	PEN25	8/-	VR116	4/-	220VSG	6/9	6BR7	9/6	6L19	12/6	7Y4	8/6	12Q7GT	9/-
EA50	2/-	EZ40	10/-	PEN46	8/6	VR150/30	9/-	2A3	6/9	6BW6	8/6	6L6G	9/-	75	10/-	12SC7	7/6
EB34	2/-	EZ41	11/-	PL81	12/6	VT52 (EL32)	8/-	2X2	5/-	6BX6	14/6	6L7M	7/6	77	8/-	12SH7	5/6
EB41	11/-	E1148	2/-	PL82	10/-	VT75 (KT44)	7/6	3A4	8/-	6C4	8/-	6N7	7/6	80	8/6	12SJ7	8/6
EBC33	7/6	FW4/500	11/6	PL83	12/-	VT501 (TT11)	8/-	3D6	7/-	6C5GT	7/6	6Q7G	9/-	807	7/6	12SK7	6/6
EBC41	11/-	GZ32	12/-	PM12M	10/-	VU39 (MU12/14)	8/6	3Q4	9/-	6C6	6/6	6Q7GT	9/-	866A	7/6	12SL7	9/-
EBF80	11/6	GZ34	12/-	PM22B	5/6	VU111	3/6	3Q5	10/-	6C9	8/-	6R7G	8/-	8D2	2/9	12SQ7	8/6
EC52	6/3	H30	5/-	PV30	7/6	VU120A	3/-	3S4	8/6	6CD6G	13/6	6SA7GT	8/-	9001	5/6	12SR7	7/6
EC91	7/6	H63	7/9	PY80	9/6	W61	9/-	3V4	8/-	6D3	8/-	6SG7	7/6	9002	5/6	20D1	9/-
ECC33	8/6	HL1320	3/9	PY81	10/6	W61M	10/6	4D1	3/-	6D6	7/3	6SH7	6/-	9003	5/9	20F2	12/6
ECC35	8/6	HL23DD	7/6	PX25	15/-	W76	9/6	42	8/-	6F6G	7/6	6SJ7GT	8/-	9004	5/6	20L1	10/-
ECH35	13/-	HP210	6/9	S130	8/6	W77	8/6	5U4 (U52)	8/6	6F6M	8/6	6SK7	6/3	9006	6/-	30L1	11/-
ECH42	10/6	HP211C	7/6	SP220	6/9	W81	10/-	5Y3GT	8/6	6F8G	7/-	6SG7	8/-	954	2/-	20P3	11/6
ECL80	12/6	HR210	6/9	SP61	3/9	X78	14/-	5Z3	8/6	6F13	13/6	6SN7GT	9/-	955	4/9	20P4	11/-
EF8	6/6	KT2	5/-	SP41	3/6	OZ4	6/-	5Z4G	8/6	6F14	12/6	6SQ7	9/-	956	3/6	25A6G	10/6
EF36	6/-	KT32	10/-	TH233	7/9	1A3	9/-	6A7	10/6	6F15	11/6	6SS7	8/-	10C2	13/6	25L6GT	8/6
EF39	6/6	KT33C	11/6	TP26	9/-	1A5GT	6/6	6A8G	10/6	6G6G	6/6	6ST7	7/6	10F1	10/-	25U4GT	12/-
EF41	10/-	KT63	9/-	U10	9/-	1A7	11/6	6AC7	6/6	6H6	3/6	6U5G	8/6	10F9	13/-	25Z4G	9/-
EF50Syl	8/-	KT66	11/6	U22	8/-	1C5GT	8/-	6AG5	7/6	6J5G	5/-	6V6G	7/6	10LD11	11/-	25Z5	7/9
EF50	6/-	KT74	8/-	U25	14/6	1L4	7/6	6AJ5	9/-	6J6GT	5/6	6V6GT	7/6	10P13	11/6	35L6GT	8/9
EF54	7/-	KTW61	7/9	U281	10/6			6AK5	7/-	6J5M	6/6	6W2	15/-	10P14	11/6	35W4	10/-
EF80	11/6	KTW63	7/9	U404	10/-			6AL5	7/-	6J6	8/-	6X4	8/-	12A6	6/9	35Z4GT	8/6
EK32	8/-	KTZ41	6/9	UAF42	12/-			6AM5	7/6	6J7G	6/6	6X5GT	7/9	12AH8	11/6	50L6GT	8/6
EL2	12/6	LD210	6/9	UB41	9/-									12AT7	9/-		

CHASSIS

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

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

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

SENTERCEL RECTIFIERS

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

METAL RECTIFIERS

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

GOLDRING PICK-UP HEADS. Pick-up head type No. 112 (2,000 ohms), complete with lead. Price 17/6 each.

NYLON DRIVE CORD

25 yard reel nylon drive cord on wooden reel, 2/9 ea.

BI CONDENSERS

Waxed cartons, with flying leads. 4 mfd., 500 v., 1/6 ea.; 4 × 4 mfd., 500 v., 3/4 ea.

METERS

0-50 m/a Milliammeter by Ferranti—Panel Mounting. 7/6 each.

LOUDSPEAKER UNITS

R. & A. 10in. unit .... 25/6 ea.
Plessey 6½in. lightweight unit .... 16/6 ea.
Rola 6½in. standard type .... 17/6 ea.
Lectrona 6½in. with transformer ...... 18/- ea.
Truvox 6½in. wafer type .... 20/- ea.
Plessey 8in. lightweight unit .... 17/6 ea.
Mains energised 8in. unit, 1,000 Ω 21/- ea.
Mains energised 6½in. unit, 600 Ω ... 17/6 ea.
Lectrona 5" .... 17/6 ea.
Rola 5in. unit .... 17/6 ea.
Goodmans 5in. unit .... 18/6 ea.
Plessey 12in. lightweight unit ...... 37/6 ea.

CRYSTAL DIODES

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

PENCIL RECTIFIERS

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

SELF-TAPPING SCREWS (PK)

No. 4, ¼in. long, 3½d. doz.

JUNCTION BOXES

Type 5X/2234 20 Way. 1/6 each.

OSMOR COIL PACKS

Type H.O., 48/- each. Type LM., 40/- each. Type T.B., 50/- each. Type TRF, 40/- each.

SPRAGUE CONDENSERS

.05 mfd., 500 v.; .01 mfd., 1,000 v.; .1 mfd., 350 v.; .02 mfd., 750 v. All 9/- doz.

CONDENSERS

8 × 8 mfd. 450 v. .... 4/- ea.
8 × 16 mfd. 450 v. .... 4/- ea.
8 × 24 mfd. 350 v. .... 3/- ea.
8 × 32 mfd. 475 v. .... 3/9 ea.
12 × 4 mfd. 450 v. .... 2/- ea.
16 mfd. 450 v. .... 3/- ea.
16 × 8 mfd. 350 v. .... 4/- ea.
16 × 16 mfd. 350 v. .... 3/3 ea.
16 × 16 × 8 mfd. 350 v. .... 3/6 ea.
20 × 20 mfd. 400 v. .... 4/9 ea.
24 mfd. 450 v. .... 2/9 ea.
24 × 16 mfd. 350 v. .... 3/6 ea.
23 mfd. 450 v. .... 3/- ea.
32 × 8 mfd. 350 v. .... 3/6 ea.
32 × 16 mfd. 350 v. .... 4/6 ea.
32 × 32 mfd. 450 v. .... 6/11 ea.
32 × 32 × 8 mfd. 350 v. .... 5/6 ea.
32 × 32 mfd. 350 v. 25 25 mfd. 25 v. .... 5/9 ea.

60 mfd. 450 v. .... 2/9 ea.
64 mfd. 350 v. .... 2/- ea.

Dubilier (B.R. Range):

BR. 850 8 mfd. 500 v. .... 2/9 ea.
BR. 1650. 16 mfd. 500 v. 3/3 ea.
BR. 2050. 20 mfd. 500 v. 3/6 ea.
8 × 8 mfd. 500 v. .... 4/- ea.
BR. 501. 50 mfd. 12 v. 1/9 ea.
16 × 16 mfd. 500 v. .... 5/- ea.
16 × 8 mfd. 500 v. .... 4/9 ea.

PERSPEX IMPLOSION GUARDS

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

U.S.A. INDICATOR UNIT

Type B.C429A at £3.19.6.

B.S.R. MONARCH AUTOMATIC RECORD CHANGER

Model UA6, fitted HFC37. Cartridge. 3 speeds; 33 r.p.m.; 45 r.p.m., 78 r.p.m. Complete with full instructions, £9.19.6. Carriage 3/6.

SPECIAL OFFER

1 Pair 866A VALVES. 12/6 PAIR. POST 1/6.

SPECIAL OFFER

VRC97 TUBES PICTURE TESTED. 20/- EACH. CARRIAGE 3/6.

MAINS TRANSFORMERS 3-WAY MOUNTING TYPE

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

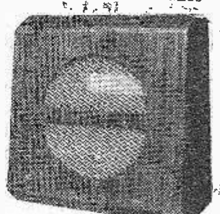
MT2
Primary: 200-220-240 v.
Secondaries: 350-0-350 v. 80 mA. 0-6.3 v. 4 amp. 0.5 v. 2 amp. Both tapped at 4 v. .... 17/6 ea.

HEATER TRANSFORMERS

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

L.E.M. Silver Mica, 1,000 PF, 10% 3½d. ea.
L.E.M. Silver Mica. 100 PF. 5% 3½d. ea.
T.C.C. Silver Mica, 50 PF, 10% 3½d. ea.
L.E.M. Silver Mica, 300 PF, 10% 3½d. ea.
Hunts Silver Mica, 374 PF, 1% 3½d. ea.
L.E.M. Silver Mica, 330 PF, 10% 3½d. ea.
L.E.M. Silver Mica, 25 PF, 20% 3½d. ea.
T.C.C. Silver Mica, 1,000 PF, 10% 3½d. ea.
Tubular Condenser, .5mfd., 500 v. 6d. ea.
Yaxley Switch, 1 pole, 8 way, 1¼in. Spindle .... 1/9 ea.
Arrow Toggle Slotted Dolly S.P. ... 1/9 ea.
Single Screened Cable .... 8d. yd.

LOUDSPEAKER CABINETS



This attractive walnut finished cabinet is available for 6½in. or 8in. speaker units. Metal speaker fret complete with back and rubber feet. 6½in. type: Measures 8¼in. × 8½in. × 4½in. at base. Price 16/6 each. Post 1/6. 8in. type: Measures 10½in. × 10½in. × 5in. at base. Price 20/6 each. Post 1/6.

TERMS: Cash with order or C.O.D. Postage and Packing charges extra, as follows: Orders value 10/- add 9d.; 20/- add 1/-; 40/- add 1/6; £5 add 2/- unless otherwise stated. Minimum C.O.D. fee and postage 2/3.

MAIL ORDER ONLY

WHEN ORDERING PLEASE QUOTE "DEPT. P.T."

ALPHA RADIO SUPPLY CO.

5/6 VINCES CHAMBERS, VICTORIA SQUARE, LEEDS 1.