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Practical Television

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AND TELEVISION TIMES

OCTOBER 1955

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Practical Television

& TELEVISION TIMES

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"The Practical Householder"

THE first issue of our new companion journal *The Practical Householder*, as briefly announced last month, will be published on September 8th. A reproduction of the cover appears below.

Every issue will contain a 24-page Practical Householder's Reference Booklet to pull out and keep. It contains a mass of information on all daily aspects of home maintenance and repair.

The following list of contents will give you some idea of the practical household policy which this journal will follow. Paperhanging Made Easy ; A Simply-made Table Lamp ; Interior Decorating ; Repairing Simple Plumbing Faults ; Making an Electric Gas-lighter ; Making Your Own Loose Covers ; Enamelling a Bath ; Uses for Repair Plates ; Laying Linoleum ; Reglazing and Painting on Glass ; An Electric Water Heater ; A Household Ozoniser ; An Automatic Draught Excluder ; Making Rugs ; Building Your Own Bungalow ; Concrete Paths and Floors ; An Ash-pan Improvement ; Making Pelmets ; Legal Notes—Landlord's Fixtures ; Checking Over Your Vacuum Cleaner ; Passing It On ; Painting, Staining and Varnishing Floors, etc. ; Making a Hall Lantern ; A Reliable Folding Table ; Letters to the Editor ; and The Home Mechanic's Shop Window.

You will only make certain of obtaining it month by month by placing a regular order with your newsagent now.

It is a "must" for every householder.

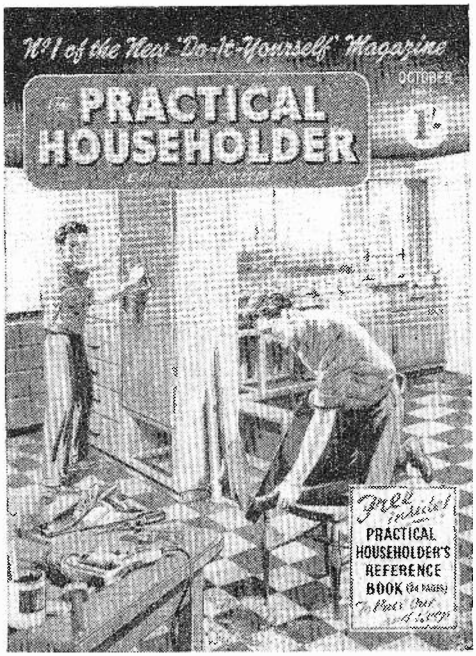
BATTERY TELEVISION

ONE of the surprises of the recent National Radio Show was the introduction by a famous maker of the first practicable portable television receiver operated by a battery. The receiver is designed for both battery and mains operation, and when operated from batteries it obtains its power supply from a 12-volt battery, the necessary voltage increase being obtained through a rotary converter.

Priced at £60, it represents a marked step forward and it brings television to those many thousands of homes still not equipped with supply mains.

The E.H.T. is, of course, obtained from the flyback in the usual way.

The late opening of the show due to the strike naturally affected the total attendances, and it caused many overseas buyers to cancel their visit. We hope next year that our advice is taken and an assurance secured from the Earls Court authorities that there will be no disputes after preparations for the show have commenced. It should be easy enough for the Earls Court people to obtain such assurance from all the unions concerned.—F. J. C.



R1124 Conversion for Sound

MODIFYING ANOTHER EX-GOVERNMENT SET FOR THE RECEPTION OF TELEVISION

By J. Stebbings

THIS receiver appears on the surplus market from time to time in considerable numbers. Those seen by the writer have been excellent value for the money, since they appeared to be unused and in sealed cardboard boxes. They may be bought for as little as 4s. without valves and 15s. with valves. The set is a six-valve superheterodyne with narrow band I.F. stages and is switch tuned to cover a range from 30-40 Mc/s. The valves have British seven-pin bases and their 13 volt 0.2 amp filaments are connected in parallel. The neat chassis has one side hinged to allow easy access to the interior and to a long tag board covering the whole of the hinged side. The top of the chassis is stepped, giving two different levels. Five coil cans for the R.F. and I.F. stages, together with a low-frequency transformer, are mounted on the higher level. The six valves and their screens are mounted on the lower step. The complete chassis slides into a container measuring 12in. × 9in. × 6in., having aerial and earth sockets at the rear. On the front panel is the six-channel selector spindle and a multi-way socket. A removable panel on the side of the container gives access to the 24 preset tuning capacitors, mounted flush with the side of the chassis.

The Original Circuit

The R.F. and I.F. stages are shown in Fig. 1. L1 is the aerial coil tuned by any one of the 0-30 pF preset tuning capacitors selected by one pole of the five-pole six-way channel selection switch. Only two positions of this switch are shown in the circuit diagrams for the sake of simplicity. V1 is an R.F. amplifier transformer coupled by L2 to the frequency changer V2. Both the primary and secondary windings of L2 are tuned. The R.F. coil cans L1 and L2 are easily located on the top of the chassis. L3, the oscillator coil, is wound on a ceramic former which is attached to the six-way switch assembly below the chassis.

TABLE 1

Channel	Turns required			
	L1	L2 P	L2 S	L3
1	5	4	4	5½
2	4	3	4	5½
3	3	2½	3	4½
4	3	2½	3	4½
5	3	2½	3	4½

There are two intermediate-frequency amplifiers V3 and V4 operating at 7.0 Mc/s.; L4, L5 and L6 are the coupling transformers. Automatic volume-control is applied to V1, V3 and V4.

The detector and output stages are shown in Fig. 2. V5 is a R.F. pentode detector, and one of the output transformers T1 is in its anode circuit. V6 is a medium-impedance triode amplifier giving a second output by way of T2. There are two WX6 Westectors and one WX12, the original functions of which are not clear to the writer, but the A.V.C. line originates in this part of the circuit.

All components in the set bear numbers except those mounted on the tag board. A circuit number reference chart for this board is stuck to the opposite side of the chassis. The original circuit numbers are shown in Figs. 1 and 2.

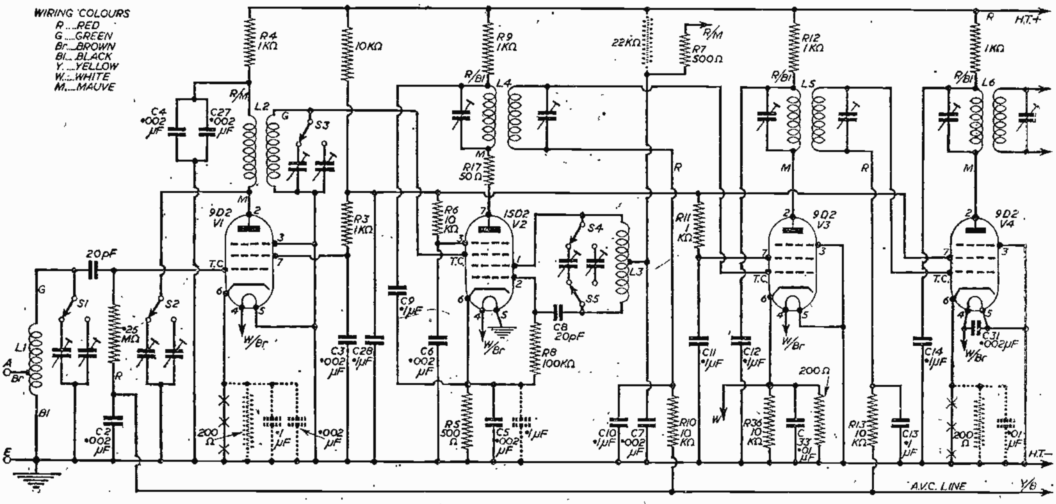


Fig. 1.—The R.F. and I.F. stages. Circuit alterations are shown by the broken lines.

The New Circuit

It was decided to make a start on the output end of the set and work back to the input so that each section could be tested in turn with a signal generator as the alterations progressed. The writer, not being a radio engineer, confesses unashamedly that he was somewhat hazy as to the detailed workings of V5, V6, and the Westectors in the original circuit. The line of least resistance was therefore taken and those stages rewired on more conventional lines. Those readers having greater knowledge of circuitry might be able to make better use of the original layout.

It was at first decided to try the two WX6 Westectors as detector and A.V.C. diode. They are, however, designed for a maximum frequency of 1.5 Mc/s, and their efficiency was found to be too low at the I.F. of 7.0 Mc/s. Two germanium crystal diodes were then wired in place of the WX6s, with excellent results.

Fig. 3 shows the circuit employed. V5 is a low-frequency triode amplifier using the original 4D1 valve (originally V6). This is coupled to the new output pentode V6 for which a 7D8 was purchased.

A few minor alterations were required to the I.F. and R.F. stages as shown in Fig. 1. These will be listed in detail later. The R.F. and oscillator coils, of course, had to have turns removed, but before doing this the set was checked with a signal generator on the original 30-40 Mc/s band.

TABLE 2

Reference Numbers of preset tuning capacitors
CT1—CT6 aerial tuning L1
CT7—CT12 H.F. transformer tuning L2 primary
CT13—CT18HF transformer tuning L2 secondary
CT19—CT24 oscillator main tuning
CT19A—CT24A oscillator fine trimming

Wiring the New L.F. Stages

A start on the removal of unwanted components was made by detaching the potentiometer R26 and the transformers T1 and T2. C26 and C30 were removed with T1. The 2+2 μF block C19 and C20 with R29 attached was removed from the side of the chassis. The yellow and black lead attached to C20 was marked "A.V.C. line" for future identification.

Next, the components occupying the end nine rows of the tag board at the front end were removed, starting with the Westector W3 and finishing with C15 and R15. These parts can be identified from Fig. 4. R31 was left in place to avoid disturbing adjacent capacitors, but the lead from it to R21 and R22 was removed. R32 and R33 were also detached.

The red H.T. positive line along the tag board was identified and marked; a brown lead to the cathode of V6 and a green lead to its grid were also identified for future use. The white leads from the cathodes of V3 and V5 to the power socket were next removed. Finally, R30 and R35 attached to the cathode of V5 were removed.

The rewiring of V5 and V6 presented little difficulty. The new low-frequency volume control was mounted on the front panel above the chassis and a six-way tag strip was mounted vertically in the space previously occupied by T2 alongside L6. The two germanium crystal diodes, the 50 pF and 100 pF capacitors, and the 0.1 M and 0.5 M resistors were soldered to this six-way tag strip. The mauve lead from the top of L6 was convenient for reconnection, and the red lead from L6 which passed down below the chassis was led up again outside the can through a hole drilled in the chassis top.

The A.V.C. filter resistors 0.25 M, 0.5 M and the 0.1 μF capacitor together with the remainder of the components for V5 and V6 were mounted on the hinged tag board in the space previously cleared.

The removal of unwanted components left the side of the chassis next to the selector switch assembly clear. It was decided to fit a small loudspeaker in this space which measured $5\frac{1}{4}$in. $\times 4\frac{3}{4}$in. Unfortunately this was just too small for a 5in. diameter speaker but a slot was cut in the top of the chassis to allow the rim to project through above it. (The depth of the speaker from front to back had to be less than 2in. to avoid fouling the spindle of the channel selector switch.) Four large holes were cut in the chassis with a tank cutter as seen in Fig. 6. The output transformer was mounted below the chassis on the front panel.

The 7D8 output valve employed has an optimum load of 8,500 ohms requiring a transformer with a ratio of 53 to 1 for a 3-ohm speaker. An alternative which has not been tried is the 7D5 with an optimum load of 7,000 ohms and requiring a bias resistor of 410 ohms. By changing the valveholder to an inter-

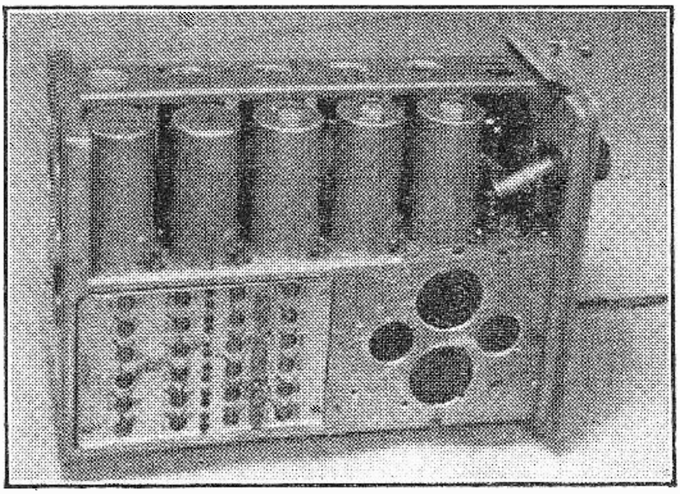


Fig. 6.—The completed conversion. The loudspeaker mounting can clearly be seen, and above, next to the I.F. coil can, is the tag strip carrying the detector components. The volume control mounted on the front panel is also visible.

national octal a 12A6 could be used with a bias resistor of 370 ohms. The same output transformer would be suitable for these alternative valves.

No plug was available to fit the power socket so this was removed. A three-core flexible lead was taken through the front panel for H.T. positive, 12 volts A.C. for filaments, and earth. The power required is 250 volts 85 mA and 12 volts 1.3 A.

Alterations to R.F. and I.F. Stages

The alterations to the R.F. and I.F. stages consisted of amendments to the biasing arrangements and connecting the oscillator anode to H.T. positive.

1. A 200-ohm resistor was inserted between the cathode of V1 and the chassis and soldered between the pins of the valveholder. A 0.1μF tubular capacitor with a .002μF mica type in parallel were also connected between the cathode and chassis. They were mounted on the end of the chassis.

2. A 0.1μF tubular capacitor was connected in parallel with C5 on the tag board.

3. The white lead from the cathode of V3 to the socket was removed. The original 10 k bias resistor R36 was removed and a 200-ohm resistor connected in its place between the valveholder pin and chassis.

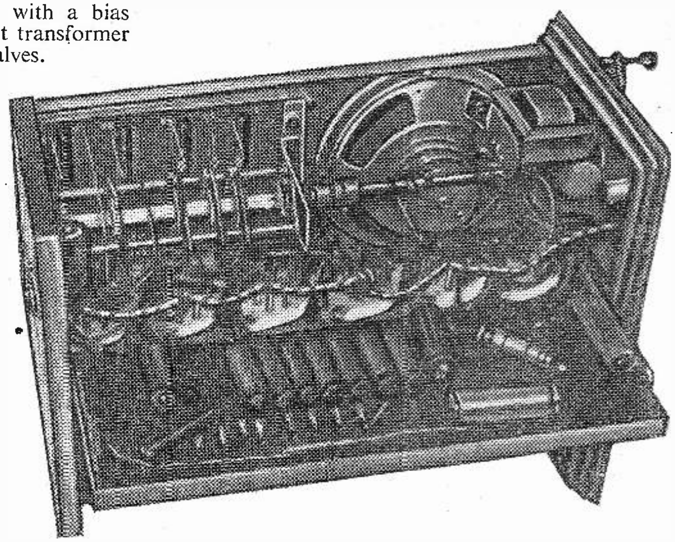


Fig. 5.—The underside of the chassis viewed with the hinged flap open. Above the six ceramic valveholders can be seen the channel selector switch and the new loudspeaker with its separately mounted transformer.

4. A 200-ohm resistor with a .01μF mica capacitor in parallel were inserted between the cathode pin of V4 and the chassis.

5. The red and mauve lead from the power socket to

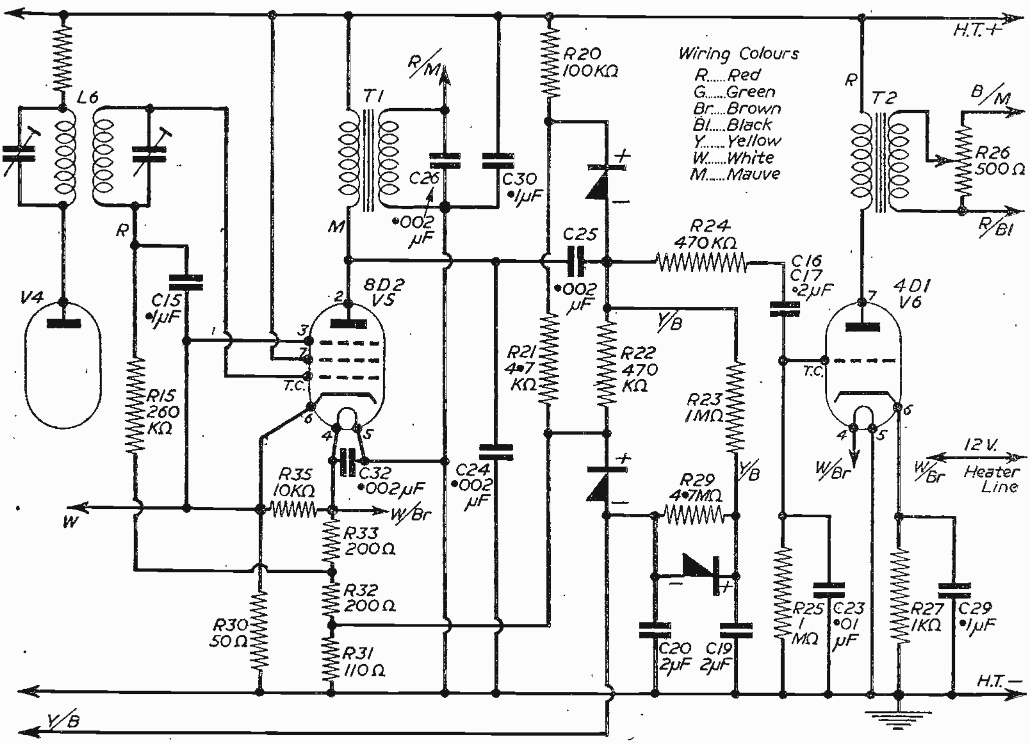


Fig. 2.—The detector and output stages of the original circuit.

R7 on the tag board was removed. A 22 k resistor was connected between the junction of R7 and C7 and H.T. positive.

When mounting new components on the tag board care was necessary to ensure that they did not foul the existing components or wiring when the hinged side of the chassis was closed.

quencies, to dispense with the switch unit altogether and get rid of some of the wiring self capacity. Trimmers could be mounted on top of the coil formers of L1 and L2 in a similar manner to the I.F. coils. A trimmer for the oscillator would have to be fixed below the chassis. The number of coil turns would have to be increased in this case.

Front Panel

W3	—	
C29	R27	
C23	R25	
C17	—	
C16	R24	
R20	R21	
W1	R22	R32
W2	R23	R32
C15	R15	R33
C14	R14	R33
C28	—	R33
R31	—	
C13	R13	
C12	R12	
C11	R11	
C10	R10	
C9	R9	
C6	R6	
C7	R7	
C5	R5	
C4	R4	
C3	R3	
R34	—	

Rear

Fig. 4.—Circuit numbers of components on tag board.

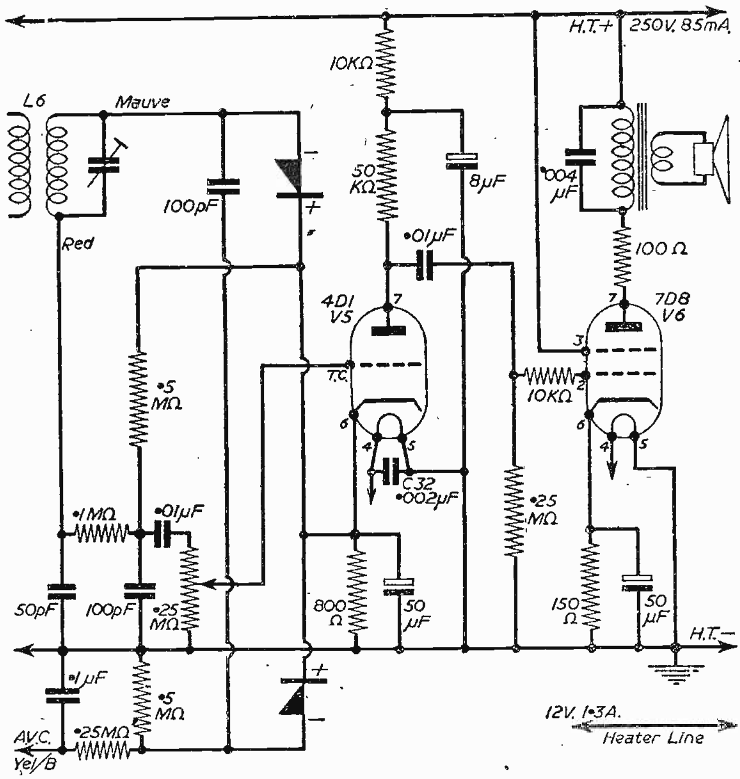


Fig. 3.—The new detector and output stages.

The set was then tested by applying the output of a signal generator at 7.0 Mc/s to the grid of V3 followed by 30-40 Mc/s signal to the aerial terminal.

It now only remained to alter the R.F. and oscillator coils to enable TV sound to be tuned in. In the writer's case Channel 2 was required. The original coils tuned slightly above 40 Mc/s and those who require Channel 1 on 41.5 Mc/s would do well to see if it is possible to tune to this frequency before making any further alterations.

The oscillator coil L3 is the most difficult to get at because it is mounted at the bottom of the channel switch assembly. However, the complete unit may be removed if a careful note is made of the connections one by one as they are disconnected.

The aerial and H.F. transformer coils L1 and L2 are altered simply by removing the cans after unsoldering the grid cap connectors for V1 and V2. Table 1 shows the number of turns for each coil used by the writer on Channel 2. Figures are given as a guide for other channels. All these figures presuppose that the channel selector switch is retained in place. It might be an advantage, particularly on the higher fre-

Table 2 gives the reference numbers of the preset tuning capacitors which are stamped on the cover plate. The oscillator main tuning will be found to be very critical and even a loud signal may be tuned through without noticing it unless the capacitor is tuned very slowly. The trimming tool must be of high quality material with no metal anywhere near the point. Even a plain ebonite rod was found to produce frequency shift so a tool was cut from ¼in. thick Perspex sheet. Having got the main tuning somewhere near the required frequency, final trimming may be carried out with a metal screwdriver on the earthed CT19A—CT24A trimmers which are attached to the inside of the cover plate. The three bearing screws which prevent bending of the plate should not be touched.

Results

The receiver appears to be very sensitive and at 25 miles from Holme Moss the sound transmission can be heard weakly without any aerial. Full volume was obtained with a 3ft. length of flex connected to the aerial terminal.

TV DX

THE RECEPTION OF EUROPEAN AND LONG DISTANCE TV STATIONS

By B. L. Morley

MANY enthusiasts consider that in the television world reception of a station at 150 miles is real TV DX and would probably be rather surprised to learn that it is possible to receive TV transmissions at over 2,000 miles—no ! not a misprint; the statement is *over two thousand miles* !

Some time before Band I was allocated to television, amateur enthusiasts were discovering that real DX (long distance reception) was possible on 56 Mc/s, which is about the centre of the Band I frequencies ; since then a great deal of investigation has been made into the phenomenon, but there is still much to be learned and there is a vast field of investigation open to the amateur.

Reception of the European stations is not impossible, indeed, at times signals from European stations have caused severe interference with our own

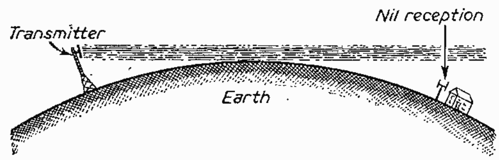


Fig. 1.—Propagation at V.H.F.

and during one rather foggy Christmas a few years ago the BBC apologised for interference which was apparently coming from a TV station in Moscow !

It is the author's opinion that with the right equipment, reception of transmissions from the Continent is well within the realms of possibility, especially at places on the South Coast, and while it would be foolish to imagine that the Continental stations could be tuned in like stations on a broadcast receiver, there is no reason why worth-while reception could not be obtained from time to time.

The enthusiast who wishes to investigate the possibilities of long distance reception requires four main items : firstly, a good aerial system, preferably rotatable so that it can be oriented in the direction of the incoming signal ; secondly, a continuously tunable receiver which can tune, preferably with a dial, over the Band to be explored ; thirdly, a receiver adapted for reception of the various types of transmissions likely to be encountered such as positive or negative modulated vision carriers ; and fourthly, some knowledge of the transmitting conditions.

All these items will be discussed in this article.

VHF Propagation

Most radio and TV enthusiasts are aware of the differences in the propagation of radio waves at frequencies in the medium-wave band and the short-wave band.

The radio waves emanate from the transmitting aerial partially along the surface of the earth and partially towards the sky. In the medium-wave band the normal reception area of the transmissions is that covered by the ground wave. However, some of the waves which travel skywards become reflected from a belt of ionised particles lying in the rarefied atmospheric regions surrounding the earth and get " bent " back down to the earth again.

The net result is that the signals are receivable at points well beyond the site of the transmitter and reception of Continental stations is possible in this country.

The layer of ionised particles (termed the E-layer) is in constant motion ; it is affected by solar radiation and intense sunspot activity. It tends to become higher at night-time than during the day, and for this reason stations can be received at considerable distances during the dark hours.

One very noticeable effect of the variation in height of the layer is in the well-known " fading " experienced on distant stations, and to overcome this problem circuitry has been designed so as to maintain a fairly constant level of output of the receiver over a quite wide range of varying inputs.

On the short waves (from about 10 to 100 metres) it was found that the radio waves were apparently unaffected by the E-layer ; they simply went through this barrier until they arrived at a somewhat similar barrier at a much greater distance from the earth's surface. This second layer has been termed the F-layer. Because of its greater height the short waves reflected from this layer came back to earth at far greater distances than those of the medium waves, and moreover, by reason of the angle at which they came back they were reflected again into the atmosphere. The process, being repetitive, enabled

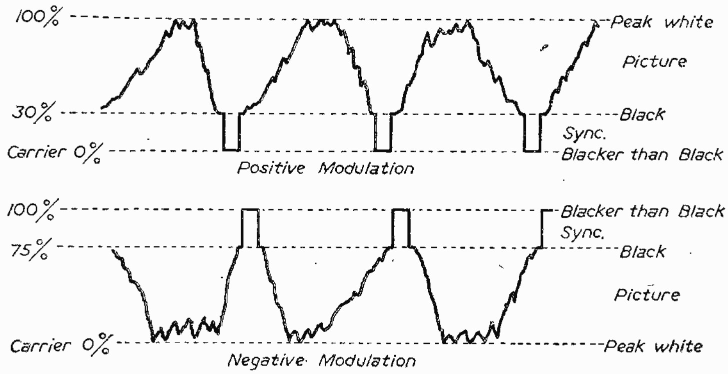


Fig. 2.—Positive and negative modulation.

signals to be sent completely round the world.

When still lower wavelengths came to be used, it was found that neither the E-layer nor the F-layer had any appreciable effect and it is generally accepted that reception is possible only when within sight of the transmitter.

As television signals are transmitted at the very low wavelengths of the order of 5 metres the accepted service area is taken as that within sight of the transmitter (we term this "line-of-sight" conditions). The waves radiate in straight lines from the aerial system and due to the curvature of the earth's surface become lost into space (Fig. 1).

Fortunately for viewers at some distance from the transmitters, a certain amount of *refraction*

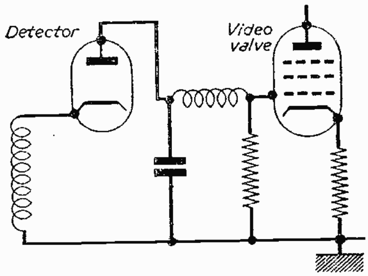


Fig. 3.—Negative grid input for grid-modulated tubes. (Positive modulated carrier.)

or bending of the waves takes place so that they tend to follow the curvature of the earth for a short distance. The refraction is due to atmospheric conditions and varies as the weather varies. This effect enables the signals to be received rather beyond actual line-of-sight conditions.

As the wavelength is shortened the refractive process becomes less; Band III signals, for example, are refracted to a lesser degree than Band I.

Generally speaking, then, at the short wavelengths (or let us give the more usual term—Very High Frequencies) used for television, no reflection takes place from the ionosphere and long distance reception is not possible. For this reason transmitting aerials are designed so as to reduce the sky-wave as much as possible and to direct the greater part of the aerial power around the immediate vicinity of the transmitter.

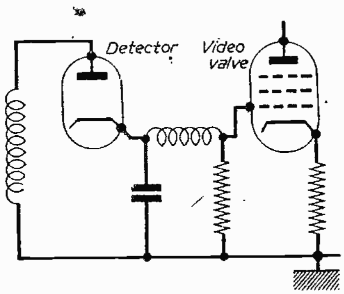


Fig. 4.—Positive grid input for cathode-modulated tubes. (Positive modulated carrier.)

The E-layer

We have seen that radio waves of medium wavelength are reflected by a layer of ionised particles termed the E-layer. The E-layer lies at about 50 miles above the earth's surface. By reason of the rarefied atmosphere, solar radiation ionises the particles, and it has been observed that the amount of ionisation is intimately associated with the activity of the sun.

There are also other visible results of the sun's activities in these upper regions; this is the phenomenon of the aurora borealis which is seen sometimes in this country. When sunspot activity is greatest, then the ionisation is intensely affected, with the result that the reflected radio waves behave in somewhat unpredictable ways.

Falling meteors also have an effect as they often leave trails of ionised particles behind them.

This sporadic ionisation of the E-layer can cause the radio waves used for television to be reflected back to the ground. In Band I reflection takes place over a distance of between 600 and 1,300 miles. Under these conditions it is possible to have an area between 100-600 miles from the transmitter where no signals are received (the skip distance), while good results are obtained at, say, 650 miles.

Tropospheric Ducts

Another phenomenon which contributes to long-range reception at V.H.F. is the production of tropospheric ducts. It appears that from time to time paths of propagation come into being between the two layers and the radio waves become trapped and travel great distances along these paths, until they encounter some atmospheric disturbance which may bring them back to the earth again.

It is probably due to this that we have the classic example of the South African "Ham" who received such good signals from Alexandra Palace that he imported a TV receiver!

"Ducting" takes place more with the Band III frequencies than with Band I, and it has been found that during certain periods the Band III transmissions are receivable at 500 miles.

Summarising the effects, it can be said that Sporadic-E DX enables Band I signals to be received at distances of 600 to 1,300 miles. Under exceptionally favourable conditions a double "hop" occurs and signals can be received as 1,200 to 2,600 miles.

Ducting is more frequent on Band III and reception conditions can take place at distances of 500 miles—even further under very favourable conditions.

Sporadic-E ionisation by meteor trails can produce long-distance reception at phenomenal distances, but this usually takes place as short bursts of reception.

Reception may last a few seconds, a few minutes, or a few hours.

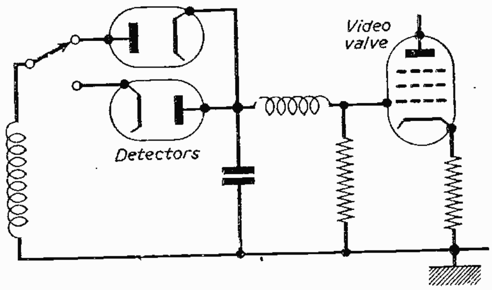


Fig. 5.—Switched grid input for positive or negative modulated carrier.

Atmospheric Variations

It has been observed that atmospheric variations have a material effect on TV DX. Generally speaking, there are two main periods of the year during which conditions are favourable; these periods are early summer (May, June, July) and, to a lesser extent, early winter (November, December, January).

Sporadic-E DX appears to follow a lunar period,

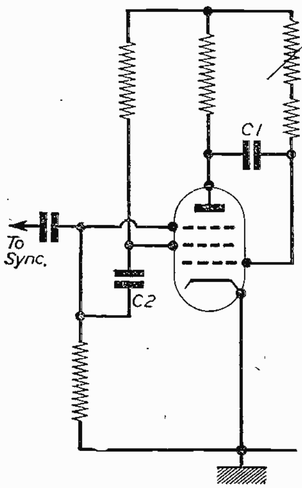


Fig. 6.—Standard Miller oscillator.

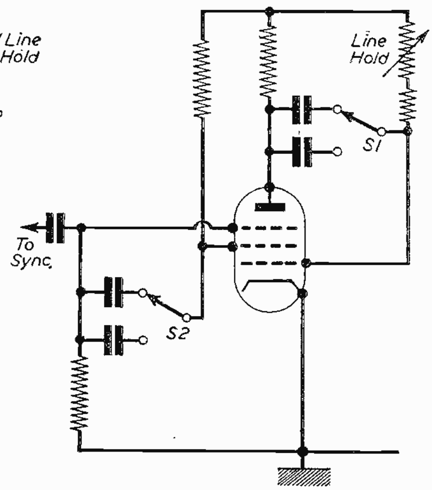


Fig. 7.—Switched oscillator.

as good conditions during one month are likely to be repeated about 27 or 28 days later.

Ducting is favoured by settled weather conditions, and long periods of settled weather with the barometer high are good periods for this class of reception.

There is a diurnal variation, conditions being better at about sunset and early morning than during the other periods of the day.

Pronounced aurora borealis displays are very frequently accompanied by Sporadic-E DX, and these periods should be watched.

A change in settled weather conditions is often favourable to TV DX. As an example, a long, dry period may be followed by a steady fall in the barometer reading, and during the falling period Sporadic-E reception is possible.

A similar condition arises when a prolonged stormy period is beginning to give way to more settled weather with a steadily rising barometer.

The lowest periods in the cycle of reception may be in September, October, and March, April. During September, however, it may be possible to obtain TV DX in "bursts" by reason of the increased meteoric activity.

During the winter period, settled foggy conditions which may prevail over a large part of Europe can bring in exceptionally good signals of really high quality. These signals are often comparable with those from the local transmitter.

For Sporadic-E DX the lower channels of Band I are the most favoured and can be received over considerable distances. In Band III ducting has to be relied on mainly, and in this band the distances obtained are not normally comparable with those obtained by Sporadic-E DX.

The bending of the waves which takes place in ducting usually takes place within a few thousand feet above the ground. In areas where settled seasons are the rule (not the British Isles!) consistent reception is often obtained by this means.

In America, where the weather generally follows a settled pattern, consistent results are obtainable. A phenominal record was achieved by the reception of the station at Sao Paulo, Brazil (PRF-3) at Halifax, Nova Scotia, and at Grand Rapids, Michigan — nearly 5,000 miles!

There is as yet (to the author's knowledge) no known verified reports of trans-Atlantic reception, but this may possibly be due to the difference in the two systems. It is thought that if experimental televisors could be constructed so as to cater for the differing conditions of transmission, the reception of transmissions at a long distance could prove an interesting and valuable field of interest for the amateur.

In Part II we will discuss these differences and suggest methods of adaptation to existing equipment to enable TV DX to be received. Before we do this, however, let us be perfectly clear on the likely conditions.

(To be continued)

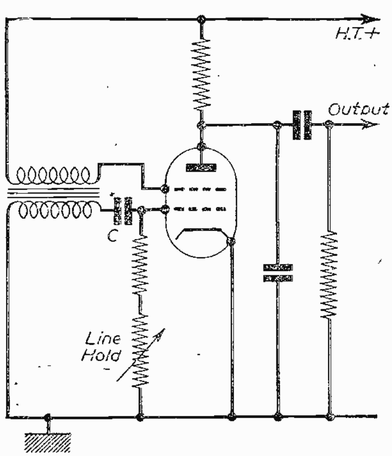


Fig. 8.—Typical blocking oscillator.

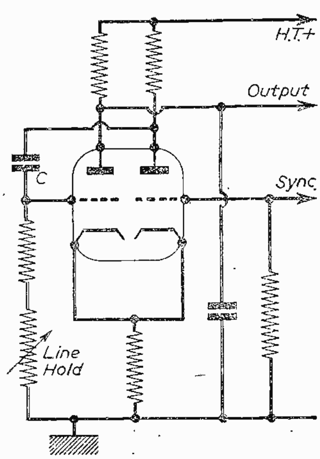
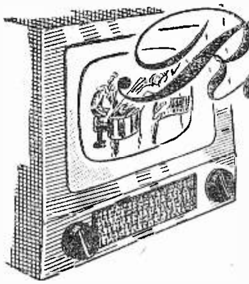


Fig. 9.—Cathode-coupled multi-vibrator.



Receiving the I.T.A.

THE FOURTH 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.

(Continued from page 176, September issue)

THE additional voltage drop across the Band III valves may be counteracted in this type of receiver by reducing the mains voltage tapping by 10 to 15 volts ; e.g., if the receiver is operating on a 245-volt supply the mains tapping can be taken down to 230 volts. Alternatively, provided the receiver is working on A.C. mains, a small mains heater transformer could be employed solely for energising the heaters of the Band III valves. In this case it would be desirable to use the 6.3-volt type Band III valves instead of the 0.3-amp type. The heater transformer should be wired to the receiver side of the mains on/off switch as shown in Fig. 11 so that this switch will control both the receiver and the converter.

If the receiver already employs a mains transformer with a heater winding the Band III valves may then simply be wired in parallel and connected across the heater winding on this transformer—there is generally a surplus power available here. In this instance it will also be necessary to use the 6.3 type valves unless, of course, the receiver's heater winding is other than 6.3 volts, in which case it would still probably be best to use the 6.3-volt valves and make use of a separate heater transformer.

High-tension for the converter may be picked up from any convenient point on the receiver H.T. rail, though it is desirable to avoid tapping it off from a decoupling resistor in the receiver as these are critically rated and may overheat, and consequently disturb the working of the associated circuit if called upon to carry additional current.

It has been found best, where possible, to obtain H.T. from the main H.T. line via a resistor-capacitor combination as shown in Fig. 12. If the H.T. voltage at this point is above 200, the value for R may be calculated by dividing the difference between the main H.T. line voltage and 200 by 0.03, a 3-watt resistor should be used. If the voltage is more or less 200 then a resistor may not be necessary.

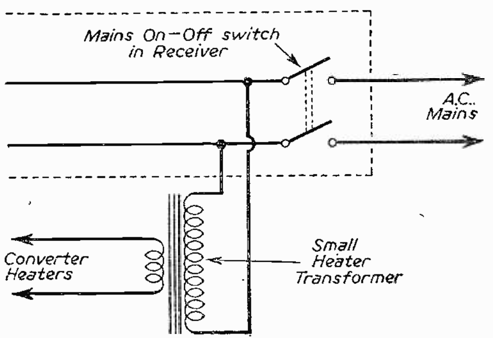


Fig. 11.—The use of an additional heater transformer.

On certain older style receivers the main H.T. current is passed through the focus coil, in which case thet converter current may alter slightly the focus setting. This may be corrected by shifting the focus unit along the neck of the picture-tube until optimum focus is achieved with the focus control in its normal position.

It is nearly always necessary to connect the converter H.T. negative lead to the chassis of the receiver, but when this is done one must remember that most of the present-day receivers have one side of the mains directly connected to chassis, and extreme care must be taken to ensure that this is the neutral side of the mains. It is well worth while to check this with a small neon tester or A.C. voltmeter.

The expense of band conversion is considerably reduced by energising the converter from the receiver power supply if this is possible, for it would appear pointless to employ a somewhat superfluous power-unit solely for the purpose of energising the converter valves.

The Double Superhet Principle

Where the receiver used with a band converter is a superhet, a double frequency-changing action will occur ; once in the converter to change Band III signals to the frequency of Band I, and again in the receiver itself where the Band I signals are converted to an intermediate frequency. This is sometimes known as the "double superhet principle" and is extensively adopted in high-frequency communication receivers used by the Forces.

So far as sound broadcasts are concerned the system works very satisfactorily, but with wide-band television reception there is always the possibility of patterning due to the production of spurious signals acceptable by the pass-band of the system as the result of heterodyning of the two oscillators. Moreover, a complex state may exist where spurious signals generated by heterodyning (beating) of the fundamentals or harmonics of the two oscillators fall either in the normal pass-band of the Band III—Band I system, or in a second channel of the system as a

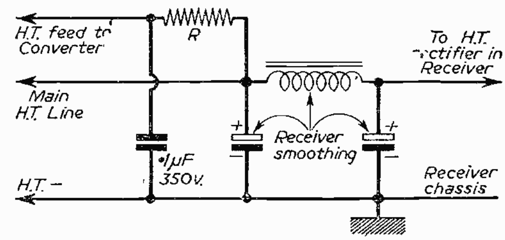


Fig. 12.—A decoupled H.T. feed for a band converter.

whole. It is also possible, of course, that the third harmonic of the Band I oscillator may fall within the Band III vision pass-band. These effects will be considerably aggravated when more than one local Band III programme is available as the result of oscillator radiation from adjacent receivers tuned to different channels in Band III.

We would add, however, that there is less likelihood of heterodyne patterns occurring in Band III as the result of conversion as is the case with channel converters in Band I.

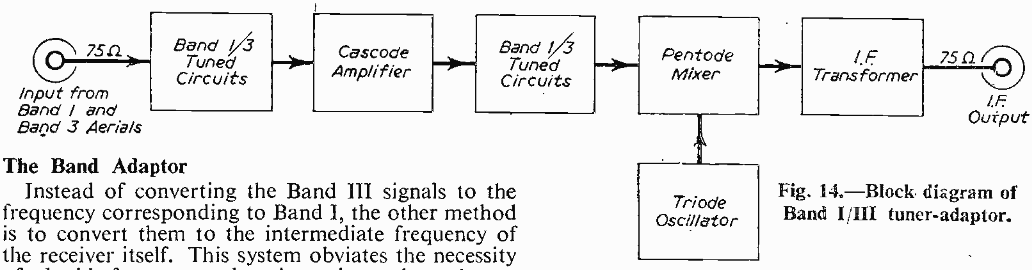


Fig. 14.—Block diagram of Band I/III tuner-adaptor.

The Band Adaptor

Instead of converting the Band III signals to the frequency corresponding to Band I, the other method is to convert them to the intermediate frequency of the receiver itself. This system obviates the necessity of double-frequency changing, since the adaptor replaces the front of the receiver entirely, being designed to tune all channels both in Band I and Band III. This method is adopted in all current two-band commercial receivers, and the later type receiver which does not incorporate such an adaptor has provisions for easy fixing of one when required.

The Pilot TV87 is typical in this respect as may be seen by studying the circuit at Fig. 13. Here is shown the Band I frequency-change valve (V1), and in shunt with this, as a buffer, a Band III I.F. input valve (V2). This valve is already fitted in the receiver and its heaters are constantly energised; it is not normally passing any current, however, as its screen grid is taken to a socket on the receiver chassis which is not connected to the H.T. line until the band adaptor is plugged in and switched to the "Band III" position.

It will be seen that the receiver H.T. line is connected to pin three on the socket and that pin two is connected to the H.T. circuits of the Band I R.F. section—this is a part of the receiver, of course—and to the oscillator circuit, via R1. Until the time when the adaptor is installed, pins two and three on the socket are shorted together and the receiver is then permitted to operate in the normal way—the alignment being such as to counteract the capacitances due to V2.

When the adaptor plug is installed in the socket, however, this link is removed and H.T. is applied to the Band I section only when the band change-over switch, which is fitted in the adaptor, is in the appropriate position. In this same position H.T. is removed from the adaptor, and the converse follows when the switch is in the Band III position.

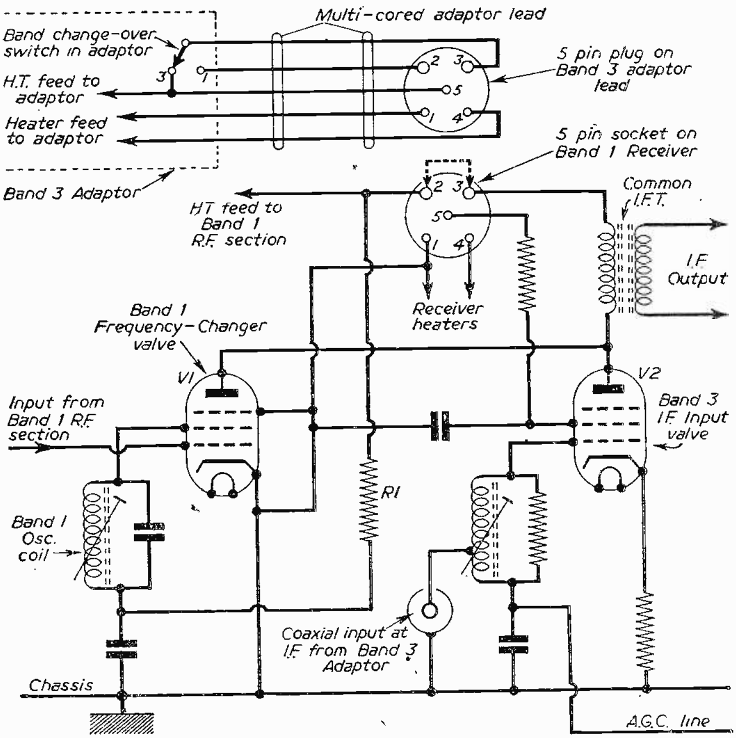


Fig. 13.—The facilities for a Band III adaptor in the Pilot TV87.

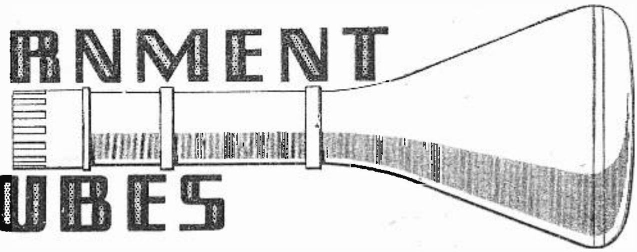
The I.F. output from the adaptor is taken by way of a coaxial link to the tuned grid circuit of V2. The common I.F. transformer conveys either the Band I signals or the Band III signals to the I.F. stages of the receiver in the usual way.

It will be observed that this method permits the normal use of the Band I tuner section and permits of the simple inclusion of an adaptor which is tuned to Band III.

Most manufactures have developed Band III tuner units, adaptors or converters which can be added to their Band I receivers with the minimum of trouble. Usually, however, the receivers which are covered by this modification are those which are no older than two to four years. This varies between manufacturers, so before contemplating the purchase or

(Continued on page 207)

Ex-Government C.R. Tubes



DETAILS OF MOST OF THE SURPLUS TUBES NOW AVAILABLE

By "Erg"

AS the supply of inexpensive ex-Government cathode-ray tubes becomes more restricted many constructors are trying to bring into use some of the lesser known types. There is some danger in this as good money can be spent on a worthless tube and such purchases must be made with discrimination.

The main classes of tubes to avoid are those of the gas focusing type, tubes with long persistence screens, and tubes intended for projection.

The war years saw the development of many classes of tubes, some of the experimental type and some which proved of little value in the field. The reader will appreciate that it is not possible to list every type likely to be encountered, nor is it possible to give base connections of each different type, though a method will be given which should enable the constructor to determine this latter point for himself.

Tubes to Avoid

Perhaps the most important of these are the gas-focused types such as the VCR84, VCR85, VCR87, NC2 and NC4. These tubes have a rather long after-glow and a very short life.

Following closely behind these tubes are those used for projection work. Those known to the author are the VCR520 and CV965. These were originally used as skiatrons; they have a dark screen subject to staining, have a 3½in. diameter screen and require about 10 Kv. for the final anode. They are interesting for experiment but of no value for television.

The final category of tubes to avoid are those with screens of long persistence. Here we come against a problem as the term "long persistence" can be loosely applied. Some tubes classified as long persistence can be used in TV and should really come under the category of medium persistence. Generally, we can say that tubes with two coatings on the screen are unsuitable. These can often be recognised by the fact that the front of the screen appears yellowy while the rear appears blue.

The effect of long persistence is accomplished in this case by the blue layer on the screen being activated by the electron beam, and by re-radiation activating in turn the screen nearest the glass front.

Such tubes were often used in P.P.I. displays.

A second method which may be employed to distinguish these tubes is to hold the tube so that it faces bright sunlight; if the tube is then taken into the dark and then shows a green glow it is almost certain to be one with a long persistence.

Screen Persistence

The persistence of the screen is a vital factor in determining the use of a tube for TV. For this work screens of a short persistence are required.

By persistence of the screen we mean the time taken for the glow to subside after the activating electron beam has been removed. With a screen of short persistence the glow decays to zero in less time than the natural persistence of vision of the eye. With medium persistence tubes the glow is retained a little longer and while such tubes can be used for television they are not ideal.

It may come as a surprise to many that the popular VCR97 is classified as a medium persistence tube. Some reveal the fact more than others, the degree of persistence depending to some extent upon the applied E.H.T.

The long persistence tube is useless for TV as the image is retained for a long period—in some cases as long as five seconds. In such cases persons walking about the scene would appear as ghost figures as the scenery would be seen through them; further, their outlines would be blurred. With long panning shots and fast action scenes such tubes are hopeless.

There is no reliable method known to the writer of changing a long persistence screen into one of short persistence.

Tubes with Similar Characteristics

Some tubes are similar in appearance and characteristics and they are listed below. It is not possible to give a fully comprehensive list for reasons stated previously, but this list should be a useful guide.

VCR87 = ACR19
VCR131 = ACR12 = NC20
VCR511 = ACR23
VCR520 = CV965
VCR97 = NC12 (approx)
VCR517 = ACR21

In the case of the NC12 we have a tube similar to the VCR97 but it will take up to 5 Kv. E.H.T. This tube is often sold as a VCR97 and will generally function quite well in normal VCR97 circuits. The VCR97 proper, however, is a Mullard tube having the number ECR-60, while the NC12 is a G.E.C. tube and has the number E-4504-B-16. (The two commercial numbers are the near equivalents.)

The VCR138 is really a VCR97 used with a smaller screen. It has the same gun structure as that tube and will operate on the same voltages. The screen diameter of 3 ins. makes it suitable for oscilloscopes, but to obtain the very best results an E.H.T. of 2.5 Kv. should be used. This means, of course, that the power of the timebase must be increased accordingly and if this E.H.T. is used then a paraphase system is the best type to employ in the timebase.

Following closely on the VCR138 is the VCR138A which has very similar characteristics but has a slightly longer screen persistence. The trace is green as is that of the VCR138 and 97.

Although the maximum anode voltages have been given as 2.5 Kv these tubes will work on as low as 1.2Kv.

The VCR139 is an excellent little tube having a similar construction to the ACR10; the two can be considered as being equivalent. The screen diameter is 2¾ ins. and the maximum anode voltage is 1.5Kv. Under service conditions it was intended to use this class of tube at 2.6Kv but the life of the tube was comparatively short and gay. It functions very well at 115Kv and will even provide a good trace at 800 v.

As this tube has a short persistence screen it is very suitable for miniature TV receivers and for oscilloscopes.

The VCR139A, which has the near equivalent of the VCR526, is similar to the VCR139 excepting that it has a medium persistence screen. It can be used in similar circumstances and is sometimes known as the NC16. The near commercial equivalent is the G.E.C. E-4205-B-7.

A tube to avoid is the VCR520=CV965 which is a projection tube having a dark screen and short life. The diameter of the screen is 3½ ins.; it requires 10Kv E.H.T. and is sometimes called the "Skiatron."

Tube Summary

Once again the writer would like to make the warning that it is not possible to give a complete classified list of all the tubes likely to be encountered; it would take up too much space and would prove rather boring. Instead a selection of the tubes most likely to be encountered is given with a brief résumé of their chief points.

The VCR84, 85, 87, NC2, NC4 are gas focused tubes with short lives—avoid them.

VCR131 is an electrostatic tube with 12in. screen and can be used for TV. Its trace is green and it is actually a pre-war commercial oscilloscope tube. Circuits for its use have been given in PRACTICAL TELEVISION.

VCR138 screen 3 ins. diameter mentioned in previous paragraph.

VCR139 and VCR139A have been mentioned in a previous paragraph.

VCR140 is a very tempting tube for the home constructor. It is a magnetic tube with a 12in. screen and can be obtained quite inexpensively. The screen trace is inclined to vary in colour according to the E.H.T. supply but can be stated as being a bluey-green. When viewed from the rear the tube appears to have a blue screen; this is because it is of the two layer type, the blue layer being the primary layer activated by the electron beam and, emitting rays in the U.V. region, it actuates the rather slower layer which is on the glass of the screen and which is, therefore, seen from the front of the tube.

The front layer is, therefore, of long persistence and while the tube may be suitable for experimental purposes it is not, in the writer's opinion, suitable for TV and the constructor should think well before he decides to use it in a proposed television receiver.

VCR140A, very similar to the previous model but has an even longer persistence. It will operate with up to 8 Kv as E.H.T.

VCR511 and VCR511A. These two are 12in. tubes with electrostatic deflection and while the persistence of the green screen has been given as medium to long they have proved quite suitable for TV. The ACR23 is a near equivalent. Articles have been given in PRACTICAL TELEVISION on the use of these tubes.

VCR516 and VCR516A. Both of these tubes are the 9in. equivalents of the VCR140 and VCR140A (q.v.). They have magnetic deflection and can be used experimentally in TV but are *not* recommended for a normal service receiver as they have screens which possess long persistence like their VCR140 counterparts.

VCR517 and VCR517A. These two tubes can be classified practically as equivalents of the VCR97 and can be used in the same circuits. They are of medium persistence, however (especially the 517A), and, in the writer's opinion, do not provide quite as good a picture as the popular VCR97. They are capable, however, of very good results.

VCR517C is a tube very similar to the VCR517 but it has a lower X plate sensitivity (more power is necessary in the line timebase to produce full width) and, what is more serious, it suffers from long persistence. It is not considered suitable for TV except for experimental purposes.

VCR520 is a projection tube and has been mentioned in a previous paragraph.

VCR521 is somewhat similar to the VCR138A, having a small 3in. screen but requiring up to 5 Kv E.H.T. Its screen is long persistence.

VCR522 is a rather small tube with a screen diameter of about 1 in. It is of the electrostatic type and requires 800 volts E.H.T. It is very similar to the G.E.C. E4103-B-4 which is used in the G.E.C. "Miniscope." It can be used for a rather small oscilloscope but the screen is rather too small for TV.

VCR530 is not suitable for TV, it has a long persistence screen. The CV254 was derived from this tube and it has electrostatic focus and is a 9in. tube.

VCR524 is very similar to the 522, but it uses post deflector acceleration.

Some C.R.T.s are known by their NC numbers, and to assist the constructor the following notes are given:—

NC1 similar to VCR522.

NC6 is a rather queer looking tube as the Y plate connections are brought out to side caps. The tube has a medium persistence of screen which is 3 ins. in diameter.

NC7 is a worth-while tube if it can be obtained. It is an electrostatic tube with a 9in. screen of short persistence and requires an E.H.T. of 6 Kv.

NC12 is the G.E.C. version of the VCR97 and has been mentioned previously.

NC14 is similar to the VCR97 but has a blue screen of medium persistence. The maximum E.H.T. is 2.5 Kv.

NC15 is rather an odd man out as it is a 4in. tube using a 12-pin base. It has a fairly long afterglow and is not considered suitable for television.

NC20 is the equivalent of the VCR131 q.v.

NC19 is very similar to the NC1 and can be used in lieu.

American Tubes

The writer has not a great deal of information on these tubes but the following notes are offered as a guide.

3FP7 has a 3in. screen and a long persistence. It is not suitable for television.

3GP1 is also a 3in. tube of medium persistence and can be used for an oscilloscope or miniature TV.

3BP1 is a very useful little tube and very suitable for oscilloscopes. The screen is green and is of medium persistence.

3EP1 is similar to the 3BP1 and can be used in an oscilloscope.

5AP1 has a 5in. screen and is of medium persistence.

5BP1 is quite a useful tube for TV and can be used in similar circumstances to the VCR97. It operates best with a higher E.H.T. than the VCR97 and although the screen is a little smaller it provides a very good picture.

5BP4 has a white screen 5 ins. in diameter and of short persistence. Very few available.

5CP7 has a greenish yellow screen of long persistence and is not considered suitable for television.

5HP1, 5LP1, 5MP1 are all tubes of medium persistence having a green trace with a screen diameter of 5in. There are very few available at the present time.

ACR Tubes

Most of this class of tube has been covered under their equivalents, but two which have not been so covered which deserve mention are the ACR2 and the ACR2X. These tubes are electrostatic and are a little longer than similar tubes of the VCR class. They have 6in. screens and the deflector plates are brought out to side contacts. Both tubes can provide a really good picture and are fairly cheap to buy when they are available.

VCR97

This tube, known to almost every constructor, deserves special mention as there are one or two hidden snags. It is classified as a medium persistence tube, but, so far as general TV work is concerned, it has proved to be one of the most suitable types.

It is known also by its CV number which is CV1097, and if this is the tube number then it is certainly a VCR97.

As mentioned previously there are two makes of tubes which are sold as VCR97s, one made by Mullard and one made by G.E.C.

The Mullard tube has the following characteristics :

Heater 4 v. Heater current 1.0 A.
Va1-Va3, 2.5 Kv.
Va2, 260-450 v.
Vg, −1 up to −100.

The G.E.C. tube (the E-4504-B-16) has the following characteristics :

Heater 4 v. Heater current 1.1 A.
Va1, 2.5 Kv. Va2, 0.175 x Va3 mean.
Va3, 5Kv max. (min. 1 Kv).
Vg, −90 v.

The G.E.C. tube can therefore be used with a higher E.H.T. voltage and is capable of giving a picture with greater detail.

One important point to note with these tubes is that some models suffer from " cut-off." This is the shadow thrown on the screen by the deflector plates which thereby prevents the full width of the screen being occupied ; the picture is cut off at the edges. In some cases the picture can be pulled into shape by the use of very long, thin magnets placed on the side of the screen, but generally speaking, the tubes are only suitable for oscilloscopes and can be obtained very cheaply for this purpose.

In Part II of this article we shall deal with methods of determining the contacts when these are not known.

(To be continued)

RECEIVING THE I.T.A.

(Continued from page 204)

construction of a standard type converter it would be well worth while to find out whether a specially-designed unit is available for the receiver concerned —the manufacturers' agents can supply this information quite easily.

Various methods of Band III conversion exist, and as opposed to the Pilot scheme some manufacturers have available two band units which can be plugged in to replace the whole of the front section of the Band I receiver.

As previously intimated, the circuitry of a band adaptor is practically identical to that of the Cascode type converter, the essential difference being that with the adaptor the output is at an intermediate frequency (see Fig. 14).

The Intermediate Frequency

It has been recommended by the British Radio Equipment Manufacturers' Association (B.R.E.M.A.) and the G.P.O. that in future two-band TV receivers a standard intermediate frequency of 34.65 Mc/s be adopted for the vision channel ; the two concerns also suggest the use of an oscillator higher than the signal frequency, thereby making the sound I.F. channel correspondingly higher in frequency than the vision channel.

This choice of frequency, it is claimed, will reduce interference caused by harmonic radiation originating in the vision I.F. channel of the receiver itself to one isolated case resulting in a possible 1.85 Mc/s beat pattern in the fringe areas in Channel 12. Moreover, it is advocated that the above system will eliminate excessive interference in Band II (the F.M. band) which may otherwise occur as the result of radiation from television oscillators.

It would seem from current practice that TV designers are taking keen note of these recommendations, for the majority of two-band receivers are now employing an intermediate frequency within the range 34-35.5 Mc/s. Two-band tuner units which are now available commercially, are also arranged to feed an I.F. channel of 38.15 Mc/s sound and 34.65 Mc/s vision.

Clearly, then, such tuners are not easily installed in existing Band I receivers in place of the original R.F. amplifier and frequency-changer stages. This is, of course, because the majority of older style receivers use intermediate frequencies within the range 12-19 Mc/s, and also in a large number of receivers the oscillator frequency is lower than the signal frequency, producing a vision I.F. 3.5 Mc/s above the sound I.F.

It may be possible to alter the sound and vision I.F.s in the receiver to correspond to the output I.F.s of a tuner unit, but such a modification will almost certainly demand the use of an accurately calibrated signal generator and a video output meter and, generally speaking, a conversion of this nature falls outside the scope of the average experimenter, that is, so far as commercial receivers are concerned anyway.

One may also be tempted to alter the tuner unit's oscillator frequency so that it will produce an I.F. output to match the receiver intermediate frequencies. This may be feasible in some cases, but to disturb the tuned circuits of such a device is a risky business.

(To be continued)

Amateur Television Construction

SOME DETAILS FOR THE NEWCOMER

By M. R. Harknett

MOST radio enthusiasts interested in having their own television receiver will realise that it is an expensive business to construct one from scratch. Yet a secondhand receiver tuned to the London frequency, channel 1, can be purchased very cheaply (a 9in. screen set would cost about £10, less than the parts would cost alone).

To tune this receiver to another channel is comparatively simple, and when this has been done one has a receiver in a cabinet with a professional finish known only to commercial sets. Most home-made receivers never have the luxury of a cabinet, and whilst to the constructor the naked receiver is a beautiful piece of workmanship it is hideous to his wife and non-technical friends and it spoils the appearance of any room.

Some people will remark that a 9in. screen is too small. It is true that large screens are in vogue, but there is nothing more ludicrous than to enter a home and to see a couple viewing a 17in. screen in a room which will only allow a viewing distance of 10ft.

The only advantage of a large screen is to enable several people to see a good picture, which may suit those wishing to give over their home to public entertainment.

If one sits at a distance from the screen where the picture ceases to appear to be made up of horizontal lines (about 6ft. in the case of a 9in. screen), then one will have the same angle subtended at the eye by any size of screen, which is the only criterion.

The prospective purchaser of the secondhand set would be well advised to ensure that a raster is obtainable as this checks all of the expensive side of the receiver: picture tube, timebase coils, transformers and E.H.T. circuits, whether the latter be derived from line flyback or a mains transformer source. It is not quite so important that the radio-frequency circuits are working properly, since they can be repaired cheaply, but these circuits can be checked by connecting the receiver to any aerial and, with the gain full up, watch and listen for car noises.

Superhet Preferred

It is preferable to purchase a superhet for reasons which are explained later, but it is not easy to distinguish a superhet from a straight set merely by examining the chassis. A valve identifiable as a frequency changer is almost a certain indication of a superhet, but in some superhets a separate local oscillator is used, thus making identification difficult. The only certain method of identification is to refer to the service sheet which should be obtained in any case before attempting to retune. Service sheets can be hired for a very moderate sum in most towns.

Before attempting to retune the receiver, the difference between the present channel 1 and the other channels should be appreciated.

The vision transmission on channel 1 is an ordinary amplitude-modulated signal as is the sound. The vision for the other channels is transmitted on the vestigial sideband system. This means that only one complete sideband is transmitted, the other sideband being cut off just above the carrier (Fig. 1).

Conversion

The actual conversion will now be discussed, starting with superhets.

To retune most superhets only three tuned circuits have to be altered: aerial, mixer grid and local oscillator.

In general the best method of retuning these circuits is to remove turns from the tuning coil. Another method which can sometimes be used is to remove the dust-iron tuning slug and replace it with a copper or brass slug. This method saves an awkward job in the case of waxed-in and closely-coupled coils. The disadvantages of this method are: (1) the effect on the tuning is not readily calculable; (2) it will only provide a sufficient change of inductance if the dust-iron slug was well in the coil originally; (3) it is often found that at least one of the coils is already tuned by a copper slug or cylinder.

The number of turns on the coil has to be proportioned down inversely as the frequency, the frequencies considered being the sound frequencies of the two channels. It is important that the winding length of the coils be kept the same. The theory connected with this modification is simple:

$$L = \frac{Kn^2a\mu}{l}$$

Where L = Inductance of coil.
K = A constant.
n = Number of turns.
a = Cross-sectional area of coil.
μ = Permeability of core.
l = Winding length.

If a, μ, l are kept constant, then $L = Kn^2$ ....(1)

$$\text{also } f = \frac{P}{\sqrt{LC}}$$

Where f = Tuned frequency.
P = A constant.
C = Tuning capacity.

Then since C is kept constant

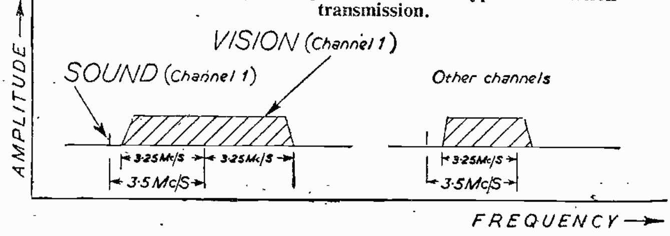
$$f = \frac{P^1}{\sqrt{L}} \quad \ldots\ldots\ldots (2)$$

Substituting (1) in (2) we get

$$n = \frac{K^1}{f}$$

Which result confirms the above-stated inverse proportionality, e.g., if there were 12 turns on a

Fig. 1.—Frequency spectra of the two types of television transmission.



particular coil in a receiver tuned to channel 1, and the new channel was channel 3, i.e., the frequency is to be changed from 41.5 Mc/s to 53.25 Mc/s, then the new number of turns will be

$$12\times\frac{41.5}{53.25}$$

=9.5 to the nearest half-turn, which means that 2.5 turns have to be removed, it being borne in mind that the remaining turns must be spaced farther apart in order to maintain the original overall winding length of the coil.

Oscillator Coil

In the case of an oscillator coil, the frequencies considered in the calculation should really be the two respective sound frequencies minus the intermediate frequencies. However, since the intermediate frequency is usually low the error due to not making this correction is small and can be corrected by the trimmer. For an oscillator coil which is centre tapped, turns should be removed from each end of the coil; in the example given, 1 turn should be taken off one end and 1.5 turns from the other end of the coil. If for mechanical reasons it is only possible to work to the nearest whole turn, the difference can be made up during the trimming by adjusting the slug or trimming condenser as the case may be.

When all the R.F. tuned circuits have been modified, the set can be connected to the appropriate aerial and switched on. If one is in a strong signal area both sound and vision should be received after slight adjustment of the oscillator trimmer. The vision signal will probably at first only appear as dark patches flitting across the screen.

In the case of weak signal areas, a modulated signal generator will be very useful. This should be set to the sound carrier frequency and the local oscillator tuned for maximum audio response. Once the actual transmission can be received, the R.F. circuits can be trimmed for a good compromise between sound and vision signal strength. When any circuit is being tuned, care should be taken to ensure that a false maximum is not obtained. For example, when the inductance is on the low side a false maximum can be

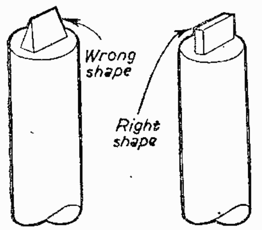


Fig. 2.—Showing how a suitable trimmer may be filed from a broken knitting needle.

obtained when the slug is fully in the coil, since screwing the slug in any direction will cause a decrease in the output and will therefore give the impression that the optimum has been obtained. This is, of course, not the case and the addition of the appropriate capacity will enable the optimum tuning point to be reached.

When the optimum tuning position for the local oscillator has been found, the core can be locked in position since it will not require further adjustment. If the trimming adjustment is of the screwed dust-iron type it can be fixed in position by wax.

Great care must be exercised when adjusting this type of slug, since the thread on the slug and the thread in the former is very delicate and therefore easily stripped. The slug must be screwed in with as little pushing action as possible. A non-magnetic trimming tool must be used in order that the tool will have no effect on the inductance of the circuit. A suitable trimmer can be made from a broken knitting needle filed as in Fig. 2.

If the above drill has been carried out correctly it should now be possible to lock the picture with the aid of the appropriate controls.

For the final adjustments it is best to use test card C when this is transmitted by the BBC, and adjust the trimmers for the best frequency response. The vision I.F. trimmers may have to be adjusted for a good response as the vision I.F. strip may have been tuned to receive the upper sideband of the channel 1 transmission.

Bandwidth

It is not usually possible to obtain a frequency response better than 2.5 Mc/s, as shown by the boxes on the test card, due to trouble in the form of sound on vision and vision on sound. Sound on vision in a mild form will cause black bars to appear on the screen, the pattern of which can be correlated to the audio signal. In a bad case of sound on vision the whole picture will break up. In most receivers there are sound and vision rejectors which, of course, have to be adjusted for minimum interaction between the two channels. These circuits and their location will be explained in the service sheet.

Vision on sound is equally annoying, and gives rise to a 50 c/s hum in the loudspeaker. This hum will change with the picture and is worse when the picture is half plain black and half plain white as in the case of the black cross test signal.

One should not waste too much time trying to obtain a very high frequency response; even if only the 2 Mc/s bars can be resolved this will give quite a good picture. Unnecessary adjustment might eventually lead to stripped threads. When a satisfactory picture has been obtained, lock or wax all the slugs into position. This will not only prevent the slugs from moving with vibration, but it will also discourage tampering.

T.R.F. Circuits

We now come to the retuning of T.R.F. receivers.

Almost all straight receivers were designed to take advantage of the double sideband transmission of channel 1, the vision R.F. circuits being tuned to receive the upper sideband only (Fig. 3a). This made it easier to separate sound from the vision. The receiver response required for channel 3 is shown in Fig. 3b. It is seen that the frequency differences between the centres of the two passbands will be different for the two types of transmission, being in fact (assuming 3 Mc/s bandwidth) 5 Mc/s for channel 1, and 2 Mc/s for all the other channels.

Two things become immediately apparent from these considerations:

(1) The frequency spacing between the vision and sound R.F. amplifier responses will have to be reduced.

(2) It is very difficult to obtain a high-frequency response with low interaction between sound and vision channels.

It is much more difficult in the case of a straight set to avoid interaction between sound and vision channels, and usually one has to be contented with a modest vision frequency response. This is because, assuming the same Q for the coils of both types of receiver, the skirts of the response curves will be less steep in a straight set than in a superhet where the separation is carried out at a much lower frequency, i.e., I.F. For the same reason, the sound and vision rejection circuits will have a much greater selectivity in the case of a superhet.

It is recommended that to retune a straight receiver all the coils should be altered in the same manner as the R.F. coils in the superhet. Unfortunately there are many more coils to alter in this case, but it is the simplest method in the long run. One big disadvantage of this method, however, is that it is a permanent measure and the receiver is not easily reconvertible.

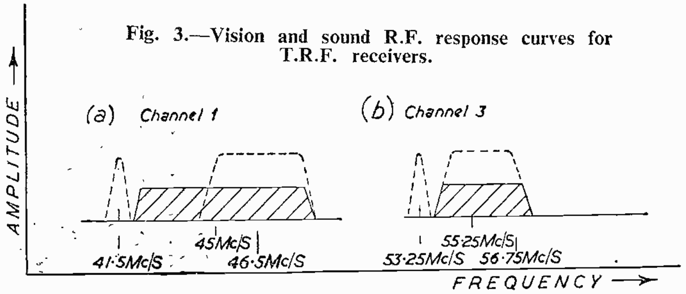


Fig. 3.—Vision and sound R.F. response curves for T.R.F. receivers.

It is not recommended that the receiver be converted into a superhet with I.F. frequencies corresponding to the channel 1 frequencies. To do this a very low local oscillator frequency would have to be used, the harmonics of which would most likely fall within the passband of the sound and vision R.F. amplifiers.

A local oscillator on the high side cannot easily be used since it would invert the sound and vision channels, thus causing the sound I.F. to be higher than the vision I.F. Two oscillators on the high side could be used, but the drift would be intolerable unless special precautions were taken.

There is nothing to be gained from the selectivity point of view by converting to a superhet in this fashion since the I.F. would be so high.

When modifying coupled pairs of coils, the spacing between coils need not be altered as this is not critical.

When all the coils have been altered, the receiver can then be connected to an aerial and switched on. In a T.R.F. receiver there is usually a common sound and vision stage which should first be trimmed for maximum audio output; the sound channel can now be peaked up.

Once the sound is received it should be possible to see signs of a picture. The vision strip should then be tuned for a reasonable-looking picture which can be locked by the appropriate controls. The common R.F. stage should then be trimmed for a good compromise between sound and vision amplitudes. One cannot peak up the circuits too much in a straight set since, as all the tuned circuits in a particular channel are tuned to the same frequency, the channel is liable to oscillate.

The final tuning should be carried out, using test card C as before.

LIGHTNING

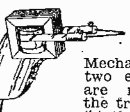
THE following interesting statement has been received from Messrs. Belling and Lee, well-known aerial manufacturers. In view of the importance of the subject, we think readers will be interested in the statements.

Notices in some sections of the daily Press suggest that there is a measure of risk of television aerials being struck by lightning. One paper headed a notice in bold type "Television aerials attract lightning." In fact, nobody would dispute that one is in far greater danger of an accident in going out to post a letter. If there were any significant danger to property, the insurance companies would not be slow in adding a shilling or two to the normal householder's comprehensive premium. Each "Belling-Lee" aerial carries a three-year insurance against damage by lightning and this is passed on to the ultimate user. During the past 16 years well over a million and a half TV aerials and "Skyrods" have been sold by "Belling-Lee" and erected, but claims for damage by lightning brought to our notice barely reach a dozen, and in no case was damage done to the fabric of the house but only to the receiver. In the same period many thousands of buildings without television aerials have been struck and damaged.

When lightning conductors are fitted to a high building the conductors are generally of very heavy copper strip about 1½in. wide and ⅛in. thick. Cost of labour and material would be many times that of a television receiver and its aerial. Such buildings are not immune, and if the lightning charge is heavy the copper will melt, but generally the copper is heavy enough to carry the charge. In the case of a television aerial, if the aerial is struck the feeder (lead-in) generally disappears. It is instantaneously melted and the charge follows the path of the metallic vapour.

The rising column of smoke, or even air, issuing from a chimney is more conductive than the normal air surrounding the roof. The influence of that smoke or air is greater than any aerial and if a static or lightning charge chooses to go to earth in the vicinity it will follow down that conductive air column and probably shatter the chimney (which is generally a carbon-coated tube), and perhaps destroy the fireplace on the way. In any case, the damage would be much more serious than if a television aerial were struck.

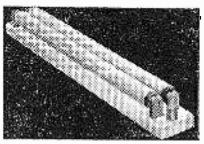
MAKE A SOLDER GUN



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

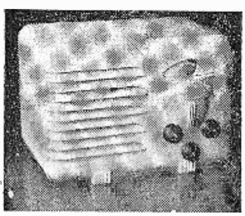
IMPORTANT NOTE

We would like to hear from readers who have constructed our Superior 15 Televisor who would be prepared to undertake servicing and fitting of Band III converters to these sets for constructors in their area who are unable to do these jobs.



THE TWIN 20

This is a complete fluorescent lighting fitting. It has built-in ballast and starters — stove enamelled white and ready to work. It is an ideal unit for the kitchen, over the work-bench, and in similar location. It uses two 20-watt lamps. Price, complete less tubes, 29/6, or with two tubes, 39/6. Post and insurance 2/6. Extra 20-watt tubes, 7/6 each.



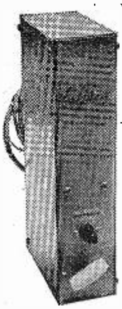
MAINS-MINI

Uses high-efficiency coils—covers long and medium wavebands and fits into the neat white or brown bakelite cabinet—limited quantity only. All the parts, including cabinet, valves, in fact, everything, £3/19/6, plus 2/- post. Constructional data free with the parts, or available separately 1/6.

MULLARD AMPLIFIER "510"

A Quality Amplifier designed by Mullard. Power output exceeds 10 watts. Frequency response almost flat from 10 to 20,000 C.P.S. For use with the Acos "Hi G" and other good pick-ups. Made up and ready to work is £12/10/- or 85/- deposit, plus 10/- carr. and insurance. Available in kit form. Send for Mullard Shopping List.

ADDITA—BAND III CONVERTER



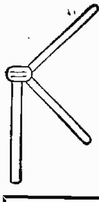
Our conveter has given very satisfactory results from the experimental Beulah Hill station, and we have had many satisfying reports regarding its performance.

It is a very neat-looking unit and fits to the side or the back of the televisor. It is designed to convert any T.V. superhet or T.R.F. and no internal modifications of any kind are required. Simply plug in the aerials, connect to the mains, and you have Band I or Band III at the flick of a switch. Price £7/10/- and 2/6 post and insurance.

BUILD IT YOURSELF

You can save at least £2 on the above if you build the converter yourself. Price of all components, including stove enamelled case and even-transfers for the front, is £4/5/-, plus 2/6 post, or £5/5/- if mains components also required. Data is included free with the parts or available separately price 2/6.

BAND 3 AERIAL KIT



An interesting aerial, "The Folded V," was described in the July number of this magazine. We tried this and found it to be most efficient, both for interference reducing and increasing reception strength. It is simple to make. We, therefore, offer this aerial as a constructor's kit. The kit comprises alloy elements and connectors, neat plastic centre piece with polythene insulators and saddle for mounting on existing mast, or in loft, window frame, drainpipe, etc., etc. etc., etc. 8/6, post 1/6.

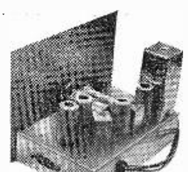
W.W. Band III Kit

One of the most successful circuits for Band III conversion was published in the "Wireless World." The results we have received in our Eastbourne laboratory have been more than satisfactory and we consequently offer a complete kit of parts including the specified EF80 valves, wound coils, drilled chassis, in fact, everything including a copy of the circuit diagram. Price only 42/6, post 2/6 extra. Mains components if required 25/- extra. Data available separately, price 1/-.

READY-BUILT BAND III CONVERTER 59/6

This is a 2-valve unit for conversion at aerial frequencies. It is largely based upon the "Wireless World" circuit described above. It's frequency can be set anywhere within the 186-196 mc/s band. It is pre-aligned so no instruments are required for adjustment, simply "fine" tune. Price 59/6, post and insurance 2/6.

THE CLEVELAND F.M. TUNER



This tuner is based upon the very successful circuit published by Data Publications. We have made up models at all branches and will gladly demonstrate. Stability is extremely good and making and aligning most simple. With only a simple indoor aerial this tuner works very well at Eastbourne (over 60 miles from London) and we await reports from even greater distances. Cost of all parts including valves, prepared metal chassis, wound coils and stove enamelled scale, slow-motion drive, pointer, tuning knob, in fact everything needed is £6/12/6. Data is included free with the parts or is available separately, price 2/-. Extra parts for fringe area model, 20/-.

RECORD PLAYER £4-10-0

3-speed Gramophone Motor

Latest rim drive 3-speed motor with metal turn-table and rubber mat. Small mod. makes speed easily variable for special effects and dance work.

Hi-Fi Pick-Up

Using famous Cosmocord Hi-G turn over crystal. Separate sapphire for each speed. Neat bakelite case with pressure adjustment.

Special Snip Offer This Month

The two units for £4.10.0 or 30/- deposit and four payments of 18/-, post and insurance 5/-.

⅞-INCH ALUMINIUM TUBING

Ideal for making T.V. aerials, etc., 1/6 per foot, 6 feet lengths 8/4.

CAR STARTER/CHARGER KIT

All parts to build 6- and 12-volt charger which can be connected to a "flat" battery and will enable the car to be started instantly. Kit comprising the following:—

Mains transformer	19/6
6-amp. rectifier	32/6
Regulator Stud Switch ...	3/6
Resistance Wire	2/-
Resistance Former	2/6
Mains on/off Switch ...	1/-
0-5amp. Moving Coil Meter	9/6
Constructional Data ...	1/6

or if bought all together price is 69/6, plus 2/- post and packing.

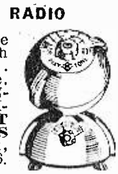
INFRAY LAMP WARMER

Means real comfort in bed as it emits Infra Red Rays which warm and keep you healthy. ● Economical. ● Costs only 1d. per hour (elec'y at 1d. per unit). ● Absolutely safe, no health or fire risk. ● Ideal for many other uses —over pet's basket, rearing pup, chicks, over desk, work-bench, etc. ● All complete and ready to work.

Price 36/-
Post & Packing 2/-.

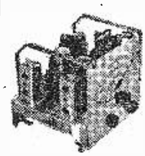
Major 4 Lamp Model £6-10-0

NOVELTY RADIO



Complete tunable M/W Radio with room for 3in. speaker in base. **NEW AND UNUSED, COMPLETE EXCEPT FOR VALVES AND SPEAKER,** 29/6, postage 2/6.

5-VALVE SUPERHET
YOURS FOR ONLY 40/- DOWN



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. New and unused. Cash price £5.19.6, or 40/- deposit and 9 monthly payments of 10/- (carr. and ins. 7/6).

FREE

To encourage customers to use our post service, we are giving a set of 2, 4 and 6 B.A. folding spanners free with all post orders of 10/- and over this month.

ELECTRONIC PRECISION EQUIPMENT, LTD.

Post orders should be addressed to E.P.E. LTD., Dept. 5, 123 Terminus Road, Eastbourne.

Post enquiries to Eastbourne with stamped envelope, please.

42-46, Windmill Hill, Ruislip, Middx. Phone: RUISLIP 5780 Half day, Wednesday.	**152-3, Fleet Street, E.C.4.** Phone: FLEet 2833 Half day, Saturday.	**29, Stroud Green Rd., Finsbury Park, N.4.** Phone: ARChway 1049 Half day, Thursday.	**249, Kilburn High Road, Kilburn.** MAIda Vale 4921.

I.T.A.–Lichfield Station

ADVANCE DETAILS OF THE PROPOSED MIDLAND AREA TRANSMITTER

THE map below shows approximately the areas in which the reception of the I.T.A.'s station at Lichfield will be possible, when the station comes into operation. This is expected to be in January or February, 1956.

Provided that the correct type of receiving aerial recommended for the various localities is used and the appropriate conversion of receivers to obtain the alternative programmes is made, reception conditions in the zones are expected to be as follows :

Site Height	... 500*ft. a.s.l.*
Mean Aerial Height ...	... 900*ft. a.s.l.*
Channel	... 8
Frequencies { *Vision* ...	...189.75*Mc/s*
Frequencies { *Sound* ...	...186.25*Mc/s*
E.R.P.	200 *kW approx.*
Population Served :	
Primary Service Area ...	4.83 *mill. approx.*
Secondary Service Area	1.24 *mill. approx.*

Inner Unshaded Zone (Primary Service Area)

Most viewers in this area, unless situated in specially unfavourable positions, for example, immediately behind high ground, or screened by high buildings, will receive a satisfactory service.

Shaded Zone (Secondary Service Area)

Within this zone a substantial proportion of viewers will receive a satisfactory service, but there will be some local areas in which reception conditions will be poor.

Outside the Shaded Zone

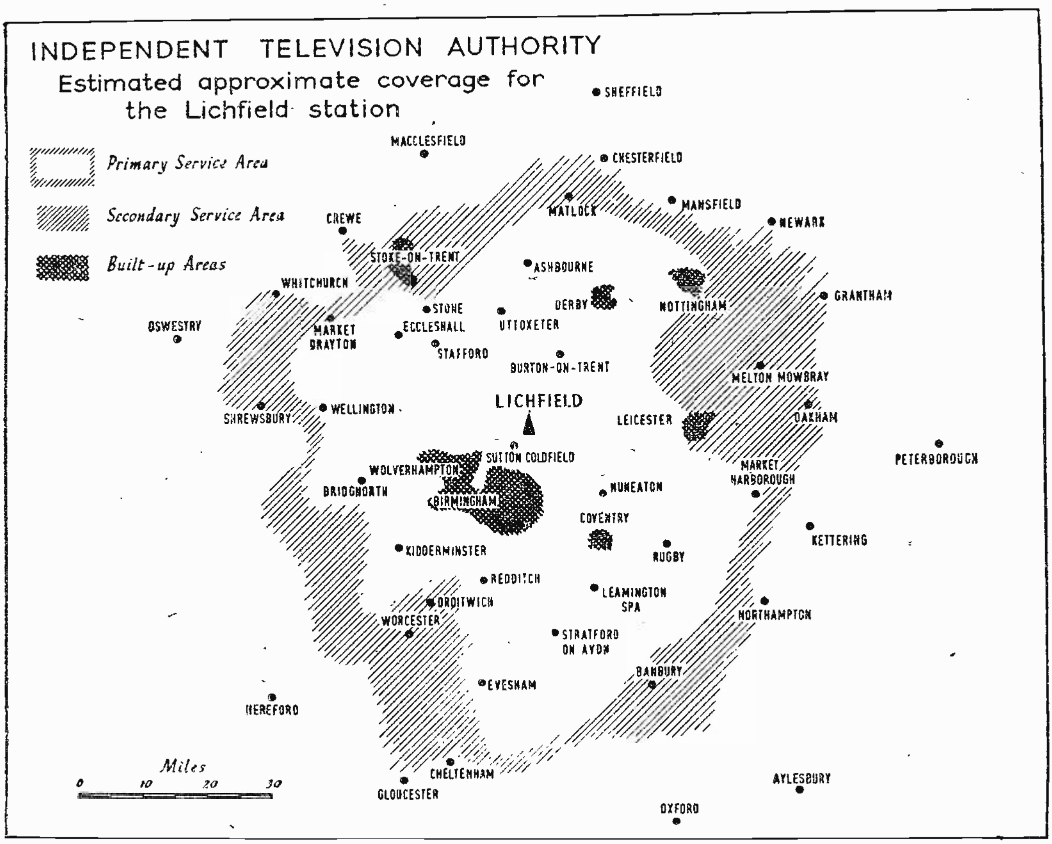
Some favourably situated viewers will be able to obtain a reasonable service.

Primary Service Area

The map shows that the estimated Primary Service Area extends from the transmitter out to some 30 miles to the west (near Wellington) ; for about 35 miles to the north (near Matlock) ; for about 35 miles to the east (near Market Harborough) ; and for over 50 miles to the south (in the Vale of Evesham).

Extent of Secondary Service Area

The estimated Secondary Service Area brings into range places some 50 miles distant from the transmitter in the west (between Shrewsbury and Oswestry);



some 45 miles distant in the north (near Bakewell and Chesterfield) and in the east (near Grantham and Oakham), and nearly 60 miles in the south (near Gloucester and Cheltenham).

Population Coverage

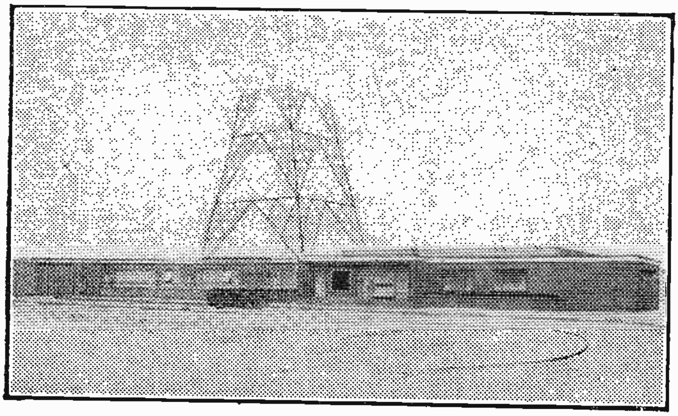
The population in the area which the station will serve is estimated as:

Primary Service Area	4.83 m.
Secondary Service Area	1.24 m.
Total	6.07 m.

Signals will be transmitted from a high-gain aerial which will be carried on a 450ft. self-supporting tower. As the site is 500ft. above sea level the total height of the mast above sea level will, therefore, be 950ft.

Work Begun on Site

Work began on levelling the site and excavating the foundations for the building and the mast in the middle of July. The authority's architects are Messrs. E. R. Collister and Associates, and the work of preparing the site and erecting the station buildings is in the hands of Messrs. James Crosby and Son. As previously announced the transmitting equipment is being built by Messrs. Pye, Ltd., and the mast and aerial system by Messrs. Marconi's Wireless Telegraph Co., Ltd.



An artist's impression of the proposed new station.

Low Power Test Transmissions

Messrs. Belling and Lee, aerial manufacturers, who are at the moment putting out test transmissions on low power at the authority's' station at Croydon, have been invited by the authority to make similar transmissions from the site at Lichfield and have agreed to do so. It is hoped that these will begin in October. No intimation has been received at the time of writing as to the Call Sign or power which will be used.

High Power Transmitter Planned

The transmitter will start on high power with an effective radiated power of 144 kW. or more. This may be increased later to 200 kW. or even more.

Programme Companies

As previously announced, Associated Broadcasting Co., Ltd., will supply the programmes to be transmitted from the Lichfield station Monday to Friday.

Ekco Battery-mains Portable

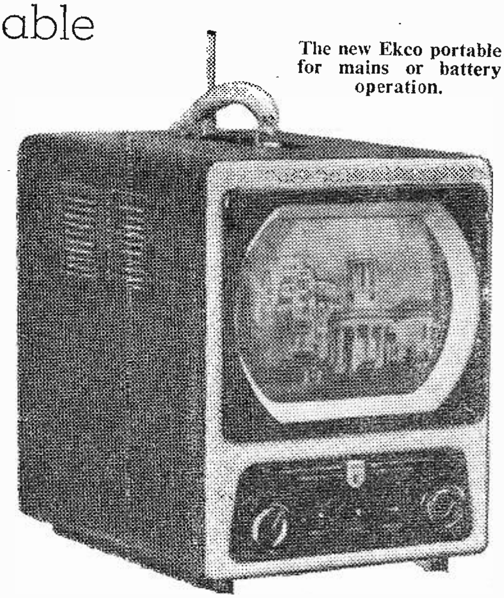
BRITAIN'S first mains/battery portable television set has been developed by E. K. Cole Ltd. and was shown for the first time at the National Radio Show.

This 9in. tube portable receiver, which weighs 30lb. and measures 10½in. wide x 13in. high x 15in. deep, incorporates its own self-contained telescopic aerial and provides switch selection of BBC and commercial TV programmes as well as V.H.F. radio. It works from a 12-volt car battery—consuming, on TV reception, the same amount of current as that used by one large car headlamp—or from A.C. mains, 230 volts. On V.H.F. radio reception the current consumption is lower.

Working from an average size car battery, this portable receiver (Model TMB272) will operate continuously for 10 hours before the former requires recharging. It will run for 15-20 hours on normal intermittent use.

The lightness of weight of the receiver has been achieved by using an aluminium cabinet, which is covered in an attractive plastic fabric. A carrying handle enables the receiver to be moved with ease.

The five-section telescopic aerial is mounted on the rear of the receiver and Band I, II and III transmissions are received by simply manually extending the length of the aerial (4ft. 6in. fully extended). A non-directional aerial is used, thus eliminating the need for the receiver to face the direction of the transmitter. The price will be in the region of £60.



The new Ekco portable for mains or battery operation.

of 11.2 turns per volt (approx.). We shall, therefore, require $11.2 \times 6.3 = 72$ turns (approx.) for the 6-volt tap with an additional 28 turns for the 9-volt tap. The latter can be given two extra turns to cater for losses (Fig. 20).

Twenty-two s.w.g. enamelled wire should be used and the turns wound with adjacent turns touching in the usual manner. A single layer of oiled silk can be laid between each layer.

Those who would prefer not to build the transformer can use a separate heater transformer giving 6.3 volts with a centre tap. The centre tap will be at 3.15 volts and so can be used to couple in series with the existing winding. This is shown in Fig. 16. Care must be taken to ensure that the coupled windings of such an arrangement are in phase and thus the total voltages additive.

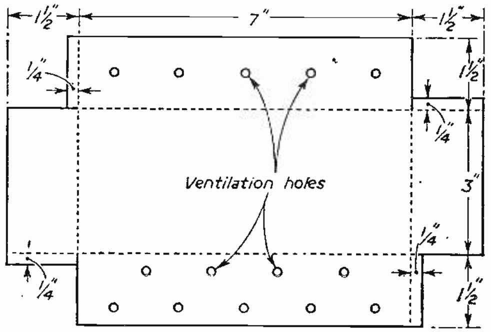


Fig. 15.—Chassis details for the power unit for the fringe model.

Yet another arrangement is a heater transformer with a 4-volt output having a 3-ohm 1-watt resistor connected in series with one of the leads, as shown in Fig. 21. Again the phase relationship must be watched.

OUR FREE GIFT BLUEPRINT!

Constructional Details of the P.T. Converter

OUR Free Gift Blueprint shows that the chassis or tin is divided into three compartments by means of two screens and that, apart from the screened output transformer, the coaxial sockets and, of course, the screened valves, the components are housed within the chassis, which also has a tight fitting bottom, or the original tin "lid." A standard tobacco tin may be used. The screens are shown in Fig. 24.

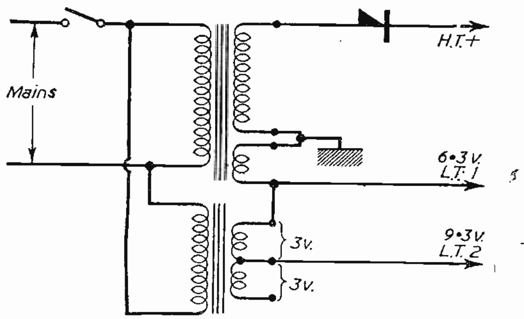


Fig. 16.—Circuit of power supply for obtaining a 9.3 volt heater supply.

In order that viewers with older style sets may have band-changing facilities similar to their neighbours with two-band receivers, a band switch is incorporated in this design. This protrudes through the top of one corner of the chassis and is terminated on a spindle-coupler.

As shown on page 219, it is intended for the lid to be drilled and screwed to the inside of the receiver cabinet. The lid should actually be stood-off from the woodwork by using ¼in. rubber grommets. This is to aid ventilation as it is desirable to drill a pattern of small holes in the lid, particularly in the region of compartment B (the centre compartment).

The chassis is thus mounted simply by pushing on to the lid. When so secured, a length of ¼in. insulated spindle may be measured and fixed on the band switch coupler so that it protrudes by about ½in. through a hole drilled in the opposite side of the receiver cabinet.

It will also be seen that a number of small holes are drilled near the oscillator coil on the top of compartment B, and also around the edge of the chassis, both in compartment A and compartment B. These, together with the ventilation holes in the lid of the chassis, permit a flow of air through the inside of the converter. The smaller components do not operate at high temperature, but the valves get fairly hot and transmit heat through their holders and wiring to the inside of the converter.

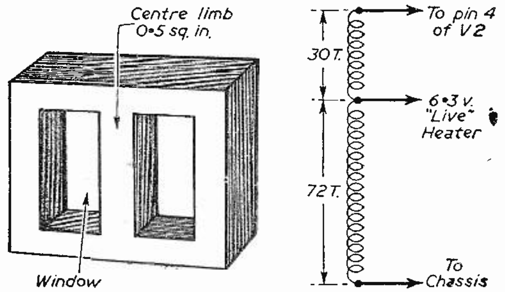


Fig. 20.—Transformer data.

Compartment C (housing the band-change switch) does not require ventilating and it is not desirable to drill holes in this section of the chassis, for here it is essential to maintain optimum screening as a means of avoiding Band 1 signal pick-up. As an additional precaution in this respect, the wires connecting the band-change switch to the two adjacent coaxial sockets should also be screened—thin coaxial feeder is quite suitable here.

The Circuit

This is given, with wiring diagram, on the free blueprint included in this issue. It is reasonably conventional and follows the pattern of a double-triode (V1) cascode stage and a triode-pentode (V2) frequency changer.

The Band III signal is induced from across the small coupling coil into the grid coil L2 and on to the grid of the first triode in V1. This valve section is neutralised with the aid of C2 and C3. These components are fairly critical in value, but not critical enough to warrant an adjustable element.

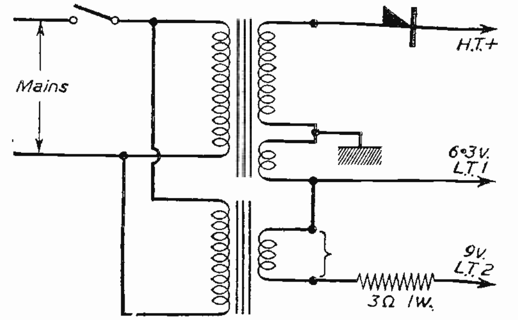
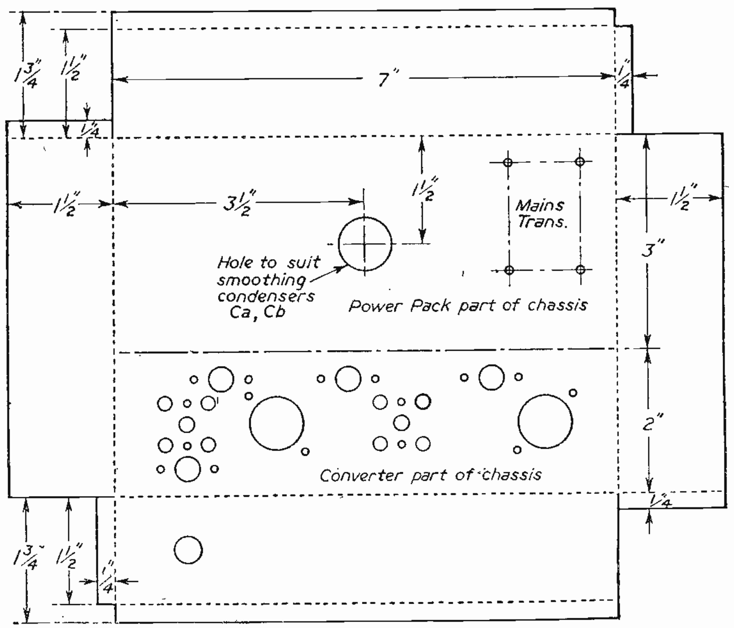
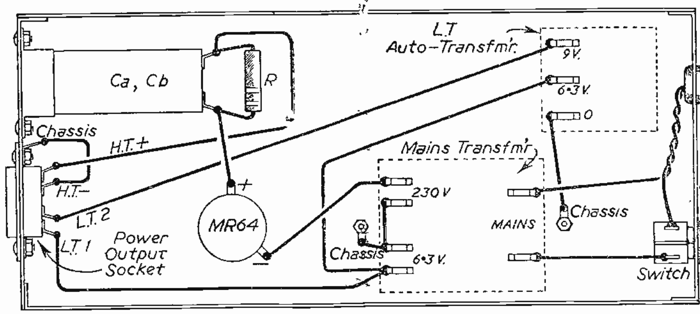


Fig. 21.—Another arrangement for obtaining a suitable heater supply.

The second triode section in V1 is virtually an earthed grid amplifier, the grid being earthed to R.F. through C6. L3 is the cascode coil which is somewhat critically proportioned and arranged to resonate with its associated stray capacitances in the region of 200 Mc/s. This coil has the effect of improving the gain of the cascode stage by tuning out the output capacitances of the first triode and the input capacitances of the second. It is air-cored and can be adjusted for optimum results by altering the spacing between its turns. Its position is in the valve-holder corner of compartment A, where it is shown soldered directly on the tags of the valve-holder of V1. The remaining components situated in compartment A are shown on the blueprint.

The anode coil (L5) of the cascode stage is housed in compartment B. Three holes are drilled in the adjacent screen to carry the coil wire from L5 to the





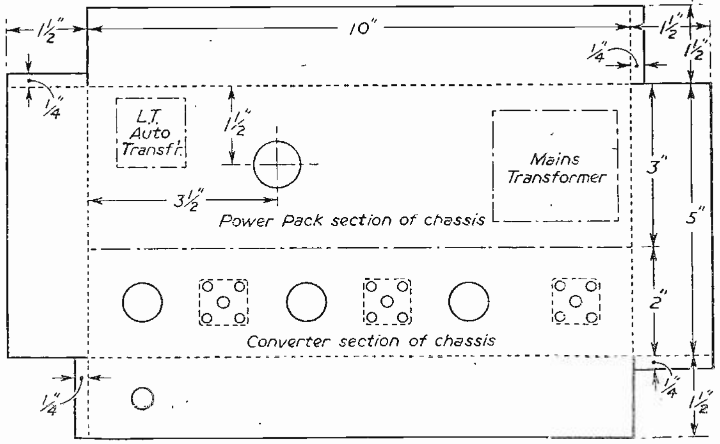


Fig. 17 (left).—Details of chassis for a combined service area model and power supply. Fig. 18 (right).—Chassis details for a combined fringe model and power supply, and Fig. 19 (above).—Wiring diagram of fringe model power supply.

anode of the second triode in V1, the heater supply from V1 to V2 and an earth (chassis connection) to R4. These holes should accommodate small rubber grommets, and the one used to pass the start of L5 should be as large as possible, in order to minimise shunt capacitance, and positioned on the screen so that the very shortest possible wire may be used to connect L5 to the anode.

The triode section of V2 operates as a Colpitts oscillator, L6 being the oscillator coil, C7 the coupling capacitor and C8 the tuning capacitor. The pentode section of V2 operates as a mixer. The signal from the cascode stage is coupled in through C14 and the oscillator voltage through C15. It may be found easier to fit the small heater choke L4 also in compartment B, the other components which should, however, be housed in this compartment are shown on the circuit diagram.

Compartment C should be really signal tight, for it is in this section that some Band I signal may gain admittance and cause patterning on the Band III picture. This section houses mainly the band-change switch and the signal output and Band I coaxial sockets. The connections from the screened output transformer (L7/8) are brought down into this section, and two holes are drilled in the adjacent screen, one to pass the transformer connection to the pentode anode of V2 and the other to carry the H.T. lead to the top of winding L7.

General Notes

The stability of this converter is solely that of the oscillator. The previous remarks given concerning ventilation of compartment B should be strictly adhered to, and the tuning capacitor C8 should possess a negative temperature coefficient. These precautions have been found to render it unnecessary

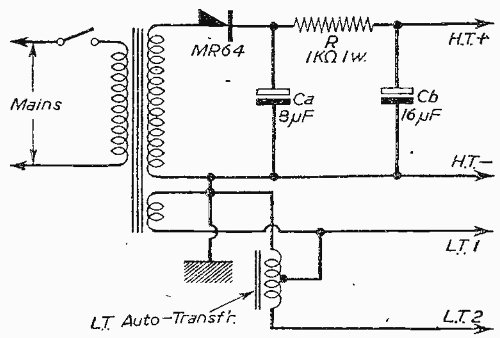


Fig. 22.—Power supply for the fringe model.

to install a manual tuning control as a means of correcting oscillator drift. Tests have proved that the converter's frequency stability is quite satisfactory for normal use and that frequency drift is remarkably small once the unit has acquired its normal operating temperature.

On no account, however, must the applied H.T. exceed 200 volts—it is best, if possible, and if adequate Band III signal is available, to work the unit on about

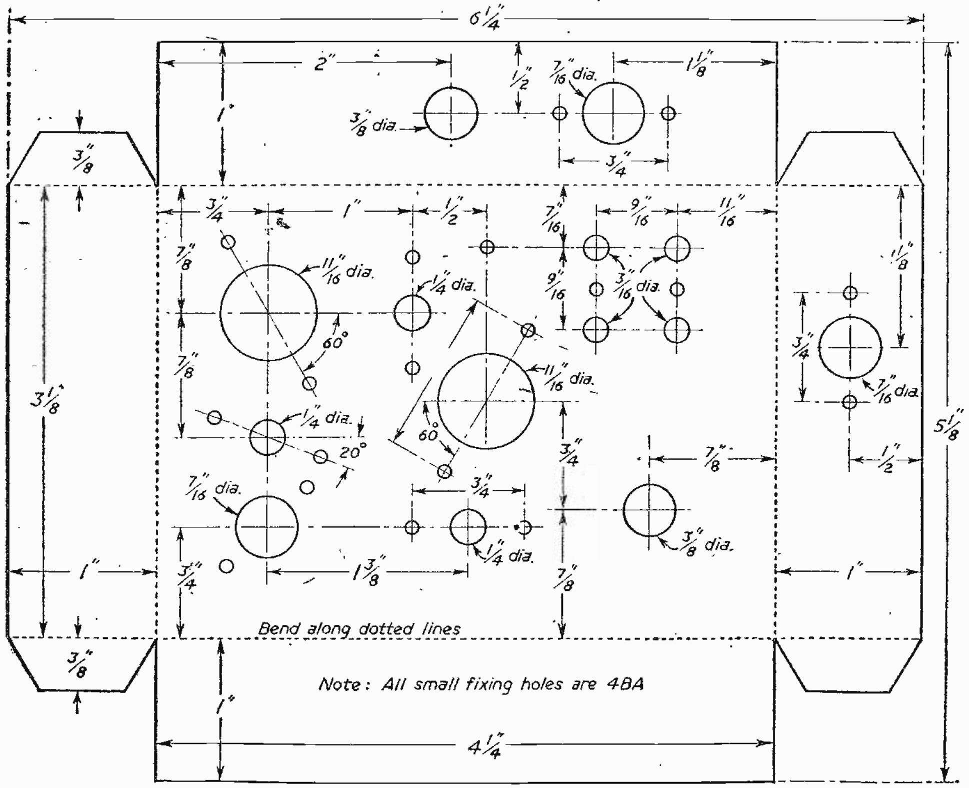
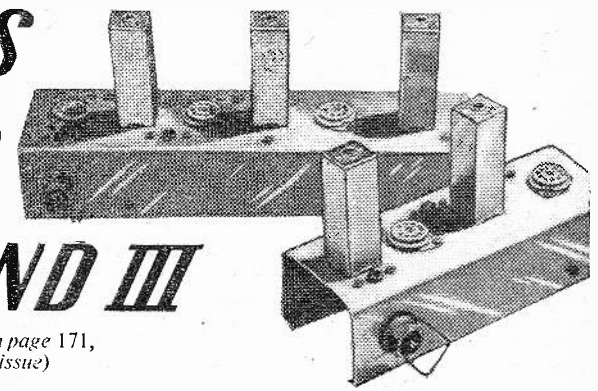


Fig. 23.—Details of the chassis and drilling data. If the screens are to be soldered in place tin-plate should be used.

CONVERTERS FOR BAND III



Constructional Details for the P.T. Converter, the Subject of our Free Gift Blueprint, Appear on the Centre Pages

(Continued from page 171, September issue)

The Power Pack for Simple Unit

THIS power pack employs half-wave rectification and uses a standard type of pre-amplifier transformer giving 230 volts at 30 mA and 6.3 volts at 1-2 A. A metal rectifier, type MR64, 260 volts, is used (Fig. 12).

It is not strictly necessary to make a separate power pack as the main chassis can be enlarged to accommodate the power unit and a diagram for this is given in Fig. 17, with a detailed drawing for separate power pack at Fig. 14.

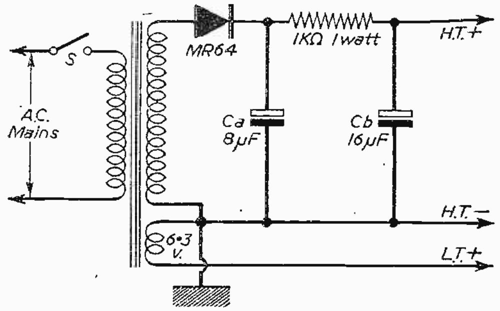


Fig. 12.—Circuit of the simple power pack.

Fig. 13 shows the wiring, from which it will be seen that the mains lead is led directly to the switch and the outputs are connected to a three-pin socket of the 5-amp. type. The plug from the converter fits into this socket.

The rectifier is mounted in a vertical position and the smoothing resistor is wired directly across the electrolytic condenser.

The Power Pack for Fringe Model

This power pack is essentially the same as that for the previous model but in order to provide a 9-volt supply for V2 a simple auto-transformer is included. Fig. 22 shows the circuit.

A chassis should be made, as given in Fig. 15. As with the previous model a single chassis can be made if desired and details are given in Fig. 18.

Fig. 19 shows the layout and wiring of the power pack.

The Auto-transformer

This is quite easy to make and many constructors will have the necessary core available from an old transformer in the spares box. The core should have a cross-sectional area of 0.5 sq. in., minimum, with a window area of about ½in. by 1¼in.

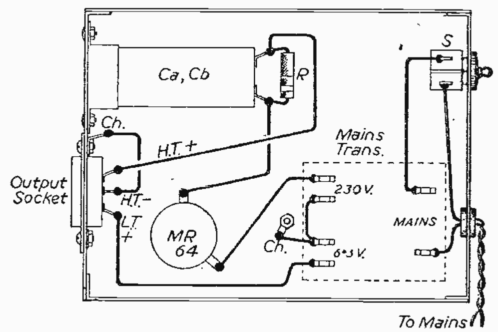


Fig. 13.—Wiring diagram of the circuit in Fig. 12.

The number of turns required can be calculated from the simple formula

$$N = \frac{5.6}{A}$$

where N is the number of turns required and A is the cross-sectional area of the centre limb in sq. in.

With a centre limb of 0.5 sq. in. we have a figure

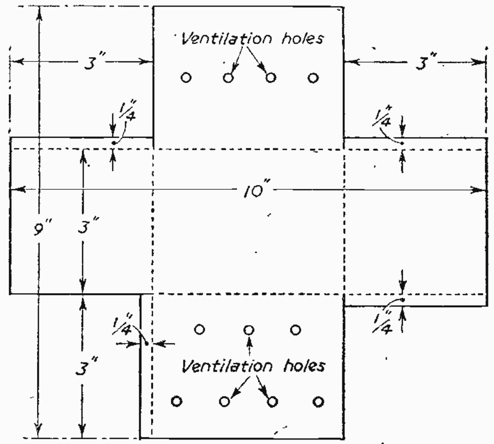


Fig. 14.—Details of a chassis for the Fig. 12 arrangement.

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THE "P.T." BAND III CONVERTER

PRICE 1/-

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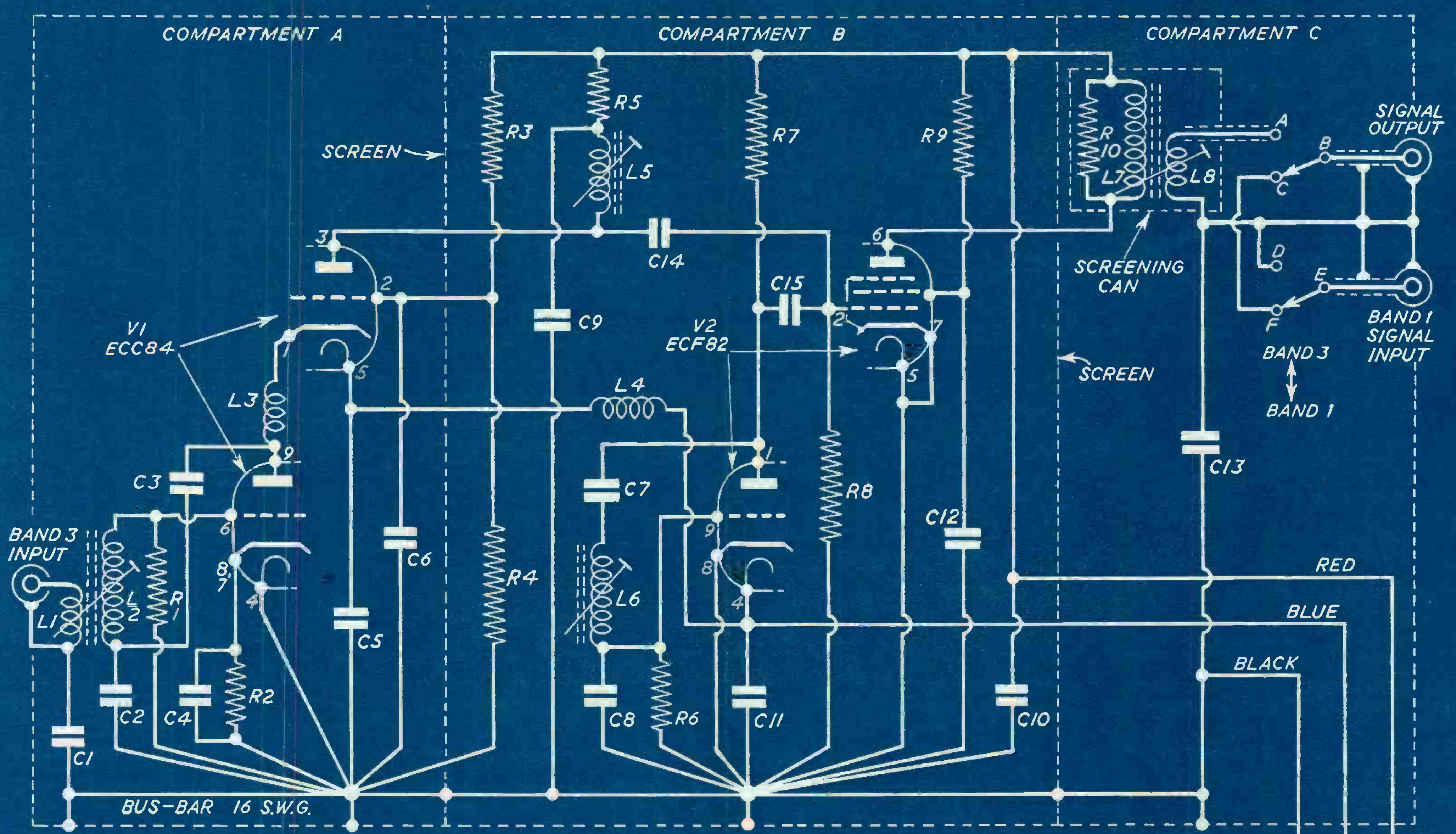

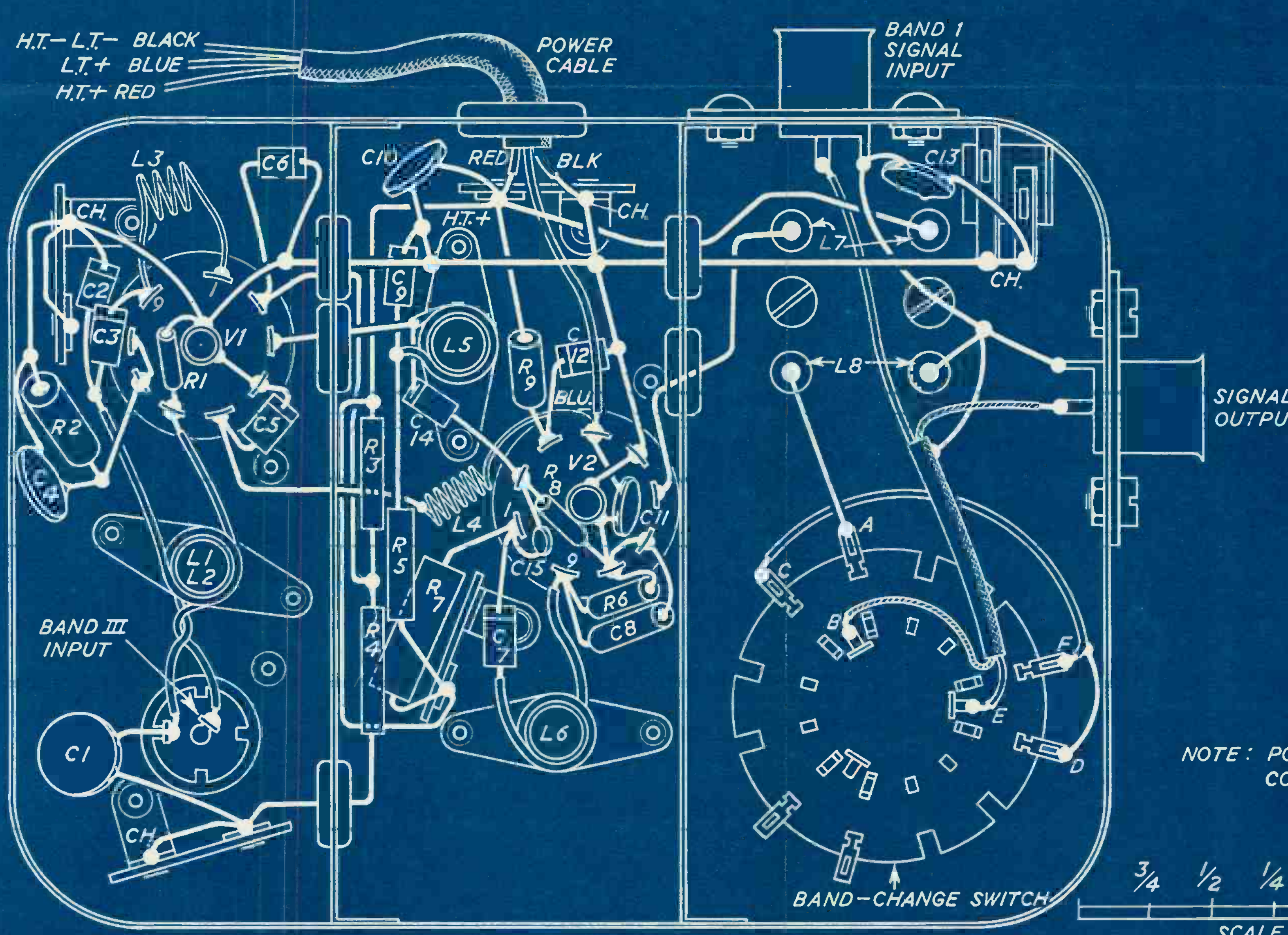

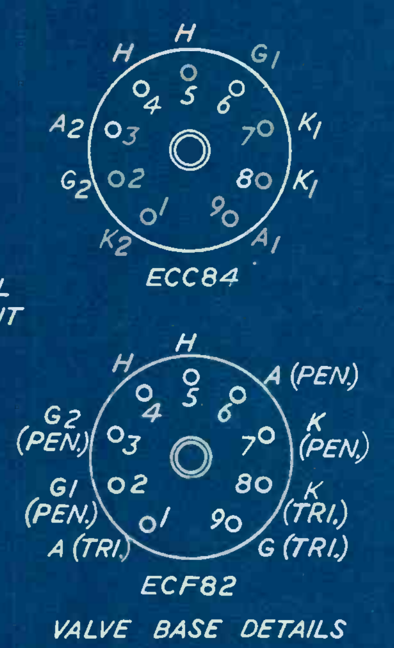

LIST OF PARTS

C1 470pF CERAMIC
C2 5pF 5% CERAMIC
C3, C15 2·2pF 5% CERAMIC
C4, C5, C6, C9, C10, C11, C12 ARE 1000pF 20% CERAMIC
C7 25pF 5% CERAMIC
C8 10pF NEG. TEMP. (N.750)
C13 470pF
C14 10pF 5% CERAMIC

R1 47KΩ 1/8 WATT
R2 100Ω 1/2 WATT (MIN.)
R3, R4 100KΩ 1/2 WATT (MIN.)
R5 1KΩ 1/2 WATT (MIN.)
R6 10KΩ 1/4 WATT (MIN.)
R7 6·8KΩ 1 WATT
R8 100KΩ 1/8 WATT
R9 33KΩ 1/2 WATT (MIN.)
R10 5KΩ 1/4 WATT (SITUATED INSIDE L7, L8 SCREEN)

3 ALADDIN BAKELITE COIL FORMERS, TYPE PPF5961 WITH GRADE 'F' CORE (PURPLE) TYPE PP5940
1 COIL AND SCREENING CAN FOR COIL L7, L8.......HAYNES RADIO
2 B9A VALVEHOLDERS AND SCREENING CANS.....McMURDO
3 INSULATED COAXIAL SOCKETS BELLING-LEE L603/S
1 TWO-POLE DOUBLE-THROW ROTARY BAND-CHANGE SWITCH

1 SPINDLE COUPLER, 6 GROMMETS
1 INSULATED BAND-CHANGE SWITCH SPINDLE EXTENSION
5 TWO-WAY TAG STRIPS
1 CONTROL KNOB FOR BAND SWITCH
V1 MULLARD ECC84 (OR PCC84 OR EQUIVALENT FOR 0·3 AMP. HEATER)
V2 MULLARD ECF82 (OR PCF82 OR EQUIVALENT FOR 0·3 AMP. HEATER)
1 CHASSIS.......SEE TEXT

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180 volts H.T. It does, in fact, work, although at reduced sensitivity, on 150 volts H.T. An excessive H.T. causes the unit to over-heat considerably and as a consequence provokes excessive frequency drift.

For the same reason, care must be taken when mounting the unit in the cabinet ; it must be mounted clear of the " hot " side of the cabinet, and as close as possible to the cabinet back, which should also be given additional ventilation holes.

It must be borne in mind, however, that when dealing with very high frequencies even a short length of wire will possess an inductance and distributed capacitances which may be liable to disturb severely the operation of the circuit. All coil connection wires must, therefore, be kept as short as possible, and this can be arranged in practice only by carefully working out the precise positions of the valve-holders in relation to the coils before cutting the chassis.

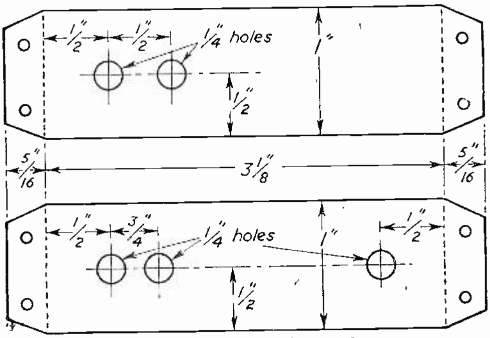


Fig. 24.—Details of the internal screens.

Leads to the decoupling capacitors and resistors which are " hot " to R.F. must also be as short as possible, and decoupling must be returned to a common earthing point for each section. This can be catered for by running a 16 s.w.g. bus-bar throughout the compartments, which may be supported by the earthed tag on the two-way tag strips. It should be earthed as frequently as possible along its length to avoid undesirable resonances.

Non-inductive ceramic capacitors only must be used for all positions in this converter. Paper type capacitors are useless at high frequency.

The Coils

The four coils L1/2, L5 and L6 are wound in Aladdin Tee-base bakelite formers of 6 m.m. diameter and use high Q dust cores. Coils L7 and L8 are wound on a totally screened Haynes coil former. The two coils L3 and L4 are air-cored and of 3/16in. diameter, both are wound with 20 s.w.g. tinned copper wire and are supported in the circuit wiring.

L1—1 turn of p.v.c. covered wire wound between the turns of L2.

L2—2 turns of 18 s.w.g. tinned copper wire, the turns spaced approximately the diameter of the wire.

L3—4 turns, as described above.

L4—12 turns, as described above.

L5—2 turns of 18 s.w.g. tinned copper wire, the turns spaced approximately the diameter of the wire.

L6—4.5 turns of 18 s.w.g. tinned copper wire, the turns spaced approximately the diameter of the wire.

L7—10 turns of 26 s.w.g. d.c.c. wire, close wound.

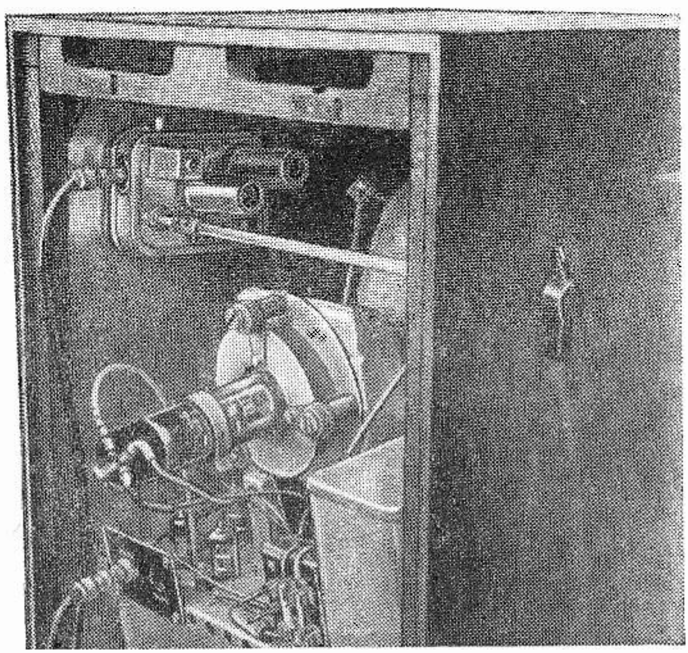
L8—2 turns of 26 s.w.g. d.c.c. wire, close wound and separated by approximately 1/16in. from the earthy side of L7.

The coils are best first wound on a rod of $\frac{1}{4}$in. diameter and then removed from the rod and carefully pushed on the formers after the formers are in position on the chassis. In order to obtain maximum adjustment by means of the dust cores, the coils should be situated so that their windings start approximately $\frac{1}{8}$in. from the base of the formers.

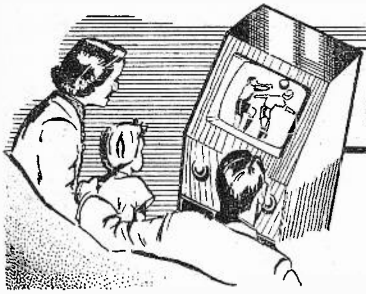
It will be found that the coils are quite secure on their formers after they have been wired to the valve-holder tags and into the circuit, and for this reason it is unnecessary to cement the turns in position. If it is decided to make L1 stable by this means, however, a good quality low-loss cement, such as Distrene, must be employed, and only the smallest possible amount used as it tends not only to dissolve the formers, but also causes them to become soft at a slight rise in temperature.

It is essential that L7/8 be perfectly screened in order that Band I pick-up may be kept at a minimum. Practically any make of good quality non-inductive ceramic capacitor is suitable and care must be taken to ensure that C8 has a negative temperature coefficient.

Miniature $\frac{1}{2}$-watt resistors can now be obtained from most dealers. It should be noted that R5 and R7 operate fairly warm and it is desirable to use the largest type possible for these positions ; this applies particularly to R7. *(To be continued)*



The unit mounted inside a Cossor receiver.



UNDERNEATH THE DIPOLE

TELEVISION PICK-UPS AND REFLECTIONS

By Iconos

SERIALS

THE difference between a series and a serial is that each instalment of a series is a complete story in itself, whereas the serial requires one's attention for every consecutive episode. This applies equally to "chapter plays" in periodicals, on sound radio or on TV. There is much to be said for the series type of production, of which *Dixon of Dock Green* is a good example. The popularity of Jack Warner, who looks far more like a London policeman than a real policeman does, and the first-class production work of Douglas Moodie have put this feature into the top class. It must be difficult, however, for the script-writer to ring so many variations week by week on the theme of the avuncular copper whose philosophies solve so many problems. However, Sherlock Holmes and Sexton Blake each had their lengthy eras of crime detection into which they aired their own particular views of contemporary life without repeating themselves too often. I hope that Jack "Blue Lamp" Warner will continue to do so for a very long time.

PRUNING THE PROGRAMMES

WHETHER the ITA material has been good or bad it has always been well pruned in the cutting rooms and the scissors have been used ruthlessly to cut out pauses, slow business or dialogue which fails to register. Excepting with the High Definition system, film editors carry out this delicate operation before and after special previews to selected audiences who view the results in conditions comparable with home viewing. In some of the production organisations ingenious electronic devices have been devised to simulate reproduction on the average home set. At Highbury Studios, where the High Definition electronic recording process is now in continuous use, the major part of the editing is carried out during actual shooting by switching over from camera to camera. But shooting is still carried out in a way which permits further trimming by editors if required. The programmes will certainly be slick; it is the "commercials," the advertising plugs in between them, that worry me a little. It is not the advertising matter which repels, but, in many cases, the very low standard of ideas and presentation as compared with the entertainment part of the programmes. However, I have heard that there has been some ruthless scrapping and cutting in this side of the business, so perhaps the most repellent commercial three-minute plugs are already discarded into the cutting room waste bins. Let us hope so, at any rate.

THE SPONSORS

THE Sponsor, who pays a lot of money for programme time and its associated "commercial," has little or no say-so about the make-up of the programme itself. That, at any rate, seems to be the official theory. His principal interest will probably lie in what is on the BBC TV programme at the exact moment his own bought - and - paid - for transmission is sent out by the ITA. For instance, if his programme happens to commence about half an hour after the start of a BBC play such as *The Vale of Shadows*, then he is in luck. Few of my colleagues survived the first twenty minutes of this tedious version of the French dramatist Jean Anouilh's *Eurydice*; I stayed the course a little longer, but had to give up the struggle at about 55 minutes. If commercial TV had been operating the ITA would have surely reached about 95 per cent. of the viewers who had their sets switched on. The moral of this story is that every TV sponsor is in favour of the BBC transmitting as many ex-Third Programme plays as possible. *The Vale of Shadows* had a good cast and a good producer, Rudolph Cartier, who, however, seems to have a penchant for selecting plays which have limited appeal.

PROVINCIAL TECHNIQUE

SOME good programmes are now coming from BBC provincial studios, particularly Bristol and Manchester. The producers and technicians, however, are well behind their London colleagues in the mechanics of presentation. Lighting is often faulty, cameras seem to move about aimlessly and, worse still, the settings are much too busy and full of distracting furnishings, fittings and stage properties. Sooner or later the provincial art directors will learn that simplicity is the principal requirement; settings should not intrude in any way. Otherwise, the producer will have difficulty in placing his artistes in positions which avoid chandeliers, aspidistras or toby jugs appearing to grow out of the top of the actors' heads. In film studios the shooting of short individual shots permits special care to be taken of this contingency in authentic "busy" settings by the simple expedient of cheating to one side or removing altogether the offending article in the background shot by shot. This cheating cannot be done during the progress of a long, live TV play. Simplicity in set design is the only answer. And such simplicity which at the same time conveys the full atmosphere of the required scene demands art direction of great skill and experience. The art director must have the same flair and eye as the artist or cartoonist who is able to convey ideas or personalities with the fewest possible strokes of the pen.

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We invite you to visit us and see it in operation for yourselves. Suitable for all types of T/V sets, T.R.F. or Superhet and all channels, 42 Mc/s to 68 Mc/s. Blueprint and circuit details will be sent on application by return of post, 1/6 post free. Supply voltages required 200-250 v., 20 mA H.T. 6.3 v. 1 a. L.T.

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

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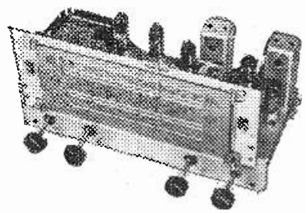

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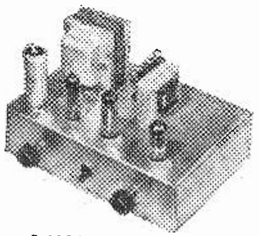

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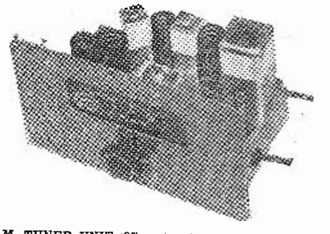

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INTERFERENCE SUPPRESSION AT TELEVISION FREQUENCIES

CURING NOISE PRODUCTION AT THE SOURCE

By F. Sutcliffe

WITH more people than ever before now in a position to enjoy the benefits of television, the ever-growing production of interference-making machines and equipment must be recognised as creating an acute problem. For there can be but few regular viewers who have not, at some time or other, felt like emulating the irate viewer on the BBC " Are you suppressed ? " film, and hurling a brick through the screen of their receiver as those infuriating white lines proceed to tear the picture to pieces. Unfortunately, the apparatus which only too often spells ruination for good TV reception is, in itself, just as important—if not more so—as an uninterrupted TV programme. One would hardly expect factories containing electrical machinery to operate during non-transmission hours only, for instance, and even the neighbouring housewife may well be excused for not checking on the programme times before using her electric sewing machine or hair-dryer. What, then, are the alternatives ? Having ascertained that with the present system of transmission certain articles by their very action must always be looked upon as interference generators, it would appear that two distinct methods of attack are open to us, i.e., suppression at the source of the trouble or suppression at the receiving end.

Studying the latter of these two possibilities first, it will be apparent that the measure of success achieved must depend upon the type of interference in question. As will be shown later in this article, over 99 per cent. of all TV interference is fed into the receiver via the aerial and feeder cable, and *not* via the mains supply lead. It is, unfortunately, not at present feasible to incorporate in the aerial feeder a device which will stop interference signals and pass TV signals *on the same frequency*. Therefore, this method of approach is only of use where the interference is on a different frequency to the TV transmission and is getting into the receiver via second channel, adjacent channel or I.F. break-through methods. In these cases a frequency filter or wavetrap fitted at the input to the receiver usually suffices to clear the trouble. The type of filter used will vary with individual cases, such factors as the difference between the TV frequency and the interfering frequency, the relative field strength of the two transmissions, etc.; determining the complexity of the unit. In simple cases an ordinary parallel rejector circuit with one inductor and one capacitor will suffice whilst for more severe cases a multi-stage unit must be used.

Much thought has been given in recent years by manufacturers' associations, in conjunction with the G.P.O. and other interested bodies, to choosing oscillator frequencies and I.F.s which, together with their harmonics and image channel frequencies, will fall clear of other transmissions, such as police, ambulance and taxi networks, etc., and which will also fall clear of those frequencies recommended to manufacturers of diathermy and R.F. heating equipment. Conferences have been held on an international scale (e.g., Atlantic City 1947) from time to time in an effort to " Clear the air " on a world-wide basis, and although these steps are contributing a great deal towards the eventual goal of interference-free reception, a great amount of work remains to be done.

Quite apart from troubles of this nature, however, there remain the twin bugbears of ignition and commutation type interferences, which usually cover an extremely large band of frequencies, the TV Channels included, and it is fairly safe to say that these two types of interference are responsible for 95 per cent. of all cases of ruined television reception.

Although many extremely efficient and ingenious suppression circuits have been developed for incorporation into television receivers, it is generally agreed that the final result is only a compromise. Despite improvements such as " Black Spotter " circuits, and the increasing use of time delay networks, the present-day suppression circuit is still, on the average, built around the peak limiter principle. This being so, the interference can never be eliminated, but only reduced, usually to the value of peak white on picture. In the writer's opinion this important point forms the over-riding factor in the question of suppression at the source versus suppression at the receiver. Although much can be done at the receiving end to minimise interference troubles, the only way to eliminate completely ignition and commutation interference is by suppressing them at the source. The remainder of this article will, therefore, be devoted to a consideration of how this may be achieved. Before examining practical suppression methods, it is important to remember that the extent to which any interference is experienced is not so much a matter of the amount of interference present, as the *ratio* of the television signal amplitude to the interference amplitude. In this connection it is found that a level of interference which may completely ruin reception in one area may pass almost unnoticed in another. Here also lies the explanation of the " suppressed " machine which gives trouble when

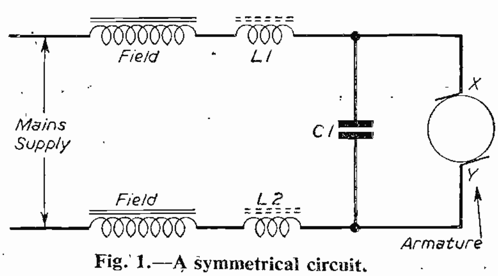

Fig. 1.—A symmetrical circuit.

moved to a new district. It is therefore essential to good TV reception that in all cases TV receivers be supplied with signals from an aerial which is of a type suitable for the district. The better the aerial installation the easier it is to eliminate interference, and the possibilities of directional arrays accepting a minimum of interference and/or a maximum of signal should be borne in mind.

Reverting now to the consideration of practical suppression techniques, it is necessary to examine the way in which the interference is first created and then transmitted. When the current flowing in an electrical circuit is suddenly caused to change, as is happening continuously in a commutator type motor, the potential of some parts of the circuit changes rapidly, causing pulses of energy to be both radiated and fed back into the leads supplying the circuit. The first important point now arises, i.e., the ratio in which the directly-radiated and the mains-borne interferences are propagated, and how this ratio compares with that at medium- and long-wave broadcast frequencies. It is a well-known fact that as the length of a radiating element becomes more and more comparable with the wavelength of the signal in question, the easier and more efficiently will energy radiate from it. Hence half-wave and quarter-wave aerials are much more efficient than, say, aerials which are 1/100th or 1/1,000th of a wavelength in length. Thus, the few feet or yards of wiring between an interfering device and the shielded mains cable act as a much more efficient radiator at TV frequencies than at medium- and long-wave broadcast frequencies. Indeed, if the flex lead of, say, a hair-dryer happened to be 9ft. or so in length, it may actually resonate at the TV frequency and, acting as a half-wave dipole aerial, radiate the interference most efficiently. An additional factor which must be taken into consideration is that the attenuation coefficient of the mains wiring and cable is considerably greater at 50 Mc/s than at 1 Mc/s. Briefly this may be explained by imagining the flex lead or mains wiring as a transmission line with distributed series inductance and parallel capacitance. As the frequency of the wave form travelling along the line increases the series path impedance becomes increasingly high, whilst that of the parallel path falls, resulting in reduced propagation. For this reason propagation for more than a few yards along the mains cabling is seldom encountered at TV frequencies. Hence, except in rare circumstances, attempts to clear a given source of TV interference by use of a plug-point suppressor usually prove abortive, the damage having been done before the interference reaches the plug point. As the frequency goes still higher this effect is enhanced until at, say, 200 Mc/s all suppressors must be placed actually within the interfering device, and a suppressor placed 1ft. down the flex lead from a motor to prevent interference on Band I may prove to be non-efficacious on Band III.

From the foregoing it will be obvious that the only way to achieve really good suppression is to prevent the interference pulses from travelling down the mains lead, i.e., to literally suppress at source and fix the suppression items on, or preferably inside, the interfering device.

It should be noted at this point that although one of the two supply wires is "Earthy" to the low mains frequencies, this is not so at the much higher interference frequencies, and both conductors must be treated alike.

Although there are many types of suppressors that may be fitted, they all consist essentially of a low-pass filter, allowing the low mains frequencies to reach the machine but not allowing the high interference frequencies to travel back along the mains supply. In making up the filters two types of components are used, i.e., inductors and capacitors, and the method of selecting appropriate values and circuits will now be studied. Taking a closer look at the voltage which is propagated along the supply wires prior to radiation, this may be made up of two separate component parts, viz.:

(a) a symmetrical part or one which is propagated between the supply wires; and

(b) an asymmetrical component, or one which is propagated between either conductor and earth.

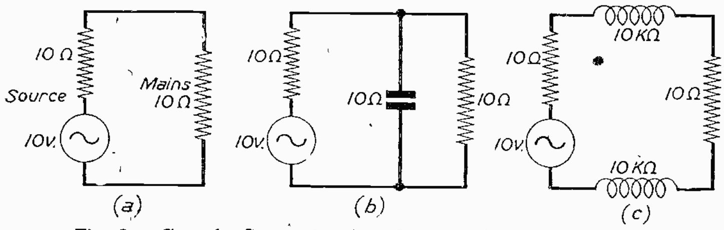

Fig. 2.—Case 1—Source low impedance, mains low impedance.

The Symmetrical Component

The basis of design here is to create a potential divider network consisting of, say, two inductors and one capacitor, by means of which we can offer to the interfering voltages two alternate paths, one high impedance (back along the mains) and the other low impedance (effectively "short circuiting" the interference at its source, i.e., the brushes).

This system is illustrated in Fig. 1 where L1L2 are high-frequency chokes offering a very big impedance to the passage of the interference pulses generated at the brushes X and Y. C1 offers a low impedance parallel path to the interference which is, therefore,

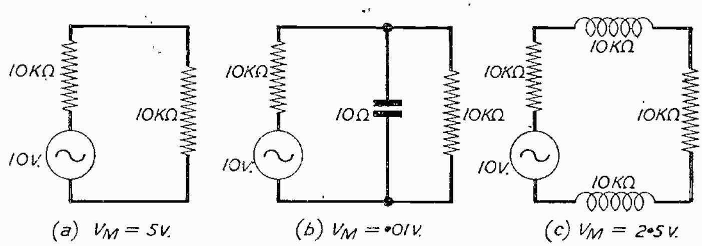

Fig. 3.—Case 2—Here the source is high impedance and the mains low impedance.

(*Continued on page 227*)

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1T4	7/6	6SJ7GT	8/6	TZ40	35/-	VP2	8/6	QP21	8/-
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confined to the local circuit X-C1-Y-X, and propagation along the mains lead is prevented provided the distance between source and suppressors is very small.

Unfortunately, however, although the foregoing reasoning holds true as a general principle, it fails to take into account the relative impedances of the interfering device, or source, and the mains. As will be seen from the accompanying series of sketches (Figs. 2-5) these impedances determine which side of the chokes the capacitor should be fitted, if at all. For ease of calculation a hypothetical interference voltage of 10 v. has been chosen and for high and low impedances values of 10,000 ohms and 10 ohms have been assumed.

Case. 1.—Source Low Impedance—Mains Low Impedance.

The first case is shown in Fig. 2, where
(a) Unsuppressed—Voltage out to mains (Vm) = 5 v.
(b) Capacitor suppression Vm = 3⅓ v.
(c) Inductor suppression Vm≏ .005 v.

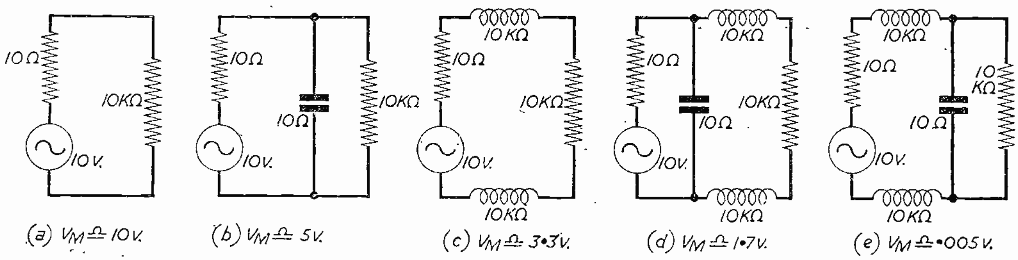


Fig. 4.—Case 3.—Here the source is low impedance and the mains high impedance.

It should be borne in mind that in Figs. 2-5 the object is to make Vm as small as possible, so circuits should be chosen accordingly. In practice it may be difficult to ascertain the relative impedances of the source and the mains, and the different circuits may sometimes have to be tried for comparison.

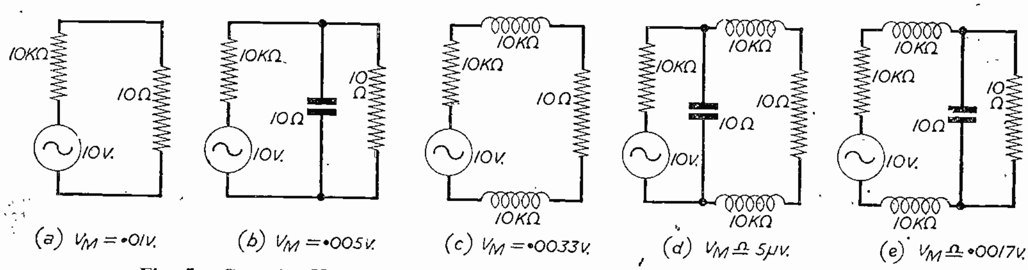


Fig. 5.—Case 4.—Here the source is high impedance and the mains low impedance.

To come now to the actual values of the components to be used it is essential that the capacitors and inductors should in practice as well as in theory act as such. For instance, a 0.1 μF paper capacitor has so much self-inductance that at TV frequencies the reactance would be quite formidable, and the low-impedance by-pass across the motor would disappear if such a component were to be used in this position. Similarly, if normal R.F. chokes, such as those found in medium-wave broadcast sets were used, their self-capacitance would form a low-impedance path across them at TV frequencies thus destroying the "barrier" to the interference. It is important, therefore, that the inductance of the capacitors and the capacitance of the inductors be kept within very small limits. In practice a small amount may actually be an advantage, for then the self-inductance of the capacitor may be utilised to create a series resonant (Acceptor) circuit across the motor and the parallel capacitance of the inductors may be used to form a parallel or rejector circuit, thus increasing the efficiency of the filter many times. This is an excellent scheme if we are interested in one TV channel only, but in order to make the inductors effective over all the existing channels they are usually made to resonate around the highest channel frequency. This means that they are then still inductive and therefore efficient on the other channels, as a parallel resonant circuit is inductive *below* the resonant frequency but not above. The "Q" of the inductors may be increased by winding them on ferromagnetic cores, and a typical item may consist of 18 turns of 26 s.w.g. enamelled wire on a ¼in. former, though the gauge of wire will, of course, depend upon the current taken by the machine to be suppressed. For the capacitors small layered mica and ceramic items are used. For instance a small flat type 470 pF mica unit with ⅛in. leads will give a series resonance at about 50 Mc/s. No definite values can be laid down for these components, but for Band I, capacitors of between 100 and 500 pF and inductors of approximately 5 μH should be tried.

The Asymmetric Component

Reverting now to the asymmetrical portion of the interference, i.e., that part transmitted out along one wire and back to its source via the earth and distributed capacitances, it will be seen that similar reasoning to the symmetric case can be applied. Series chokes and parallel capacitors will again limit the interference, the capacitors this time being wired from brush to earth. Figs. 6 and 7 illustrate the paths for the asymmetric interference before and after suppression respectively.

It can now be seen that if a circuit is wired up along the general lines of Fig. 8 it will be effective in suppressing both symmetric and asymmetric interference and this arrangement is to be strongly recommended wherever complex (i.e., containing both components) interference is encountered.

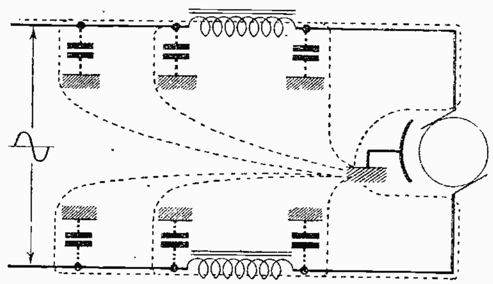


Fig. 6.—The path of asymmetric interference before suppression.

The three capacitors may be separate or in the form of a specially made multi-unit containing, say, one 470 pF and two 100 pF capacitors. It should be noted that should the relative impedances make it necessary, the capacitor connections may have to be made to points C and D instead of points A and B.

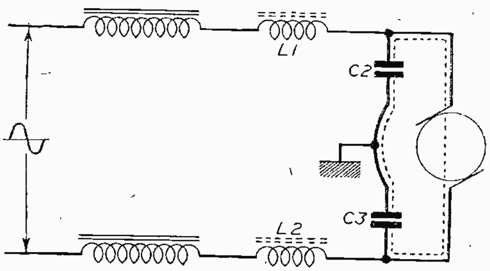


Fig. 7.—The path after suppression.

In all cases where suppression is carried out care must be taken to keep the length of component leads down to an absolute minimum ; also for obvious safety reasons the components should never be hung inside a machine carelessly or wrapped with yards and yards of insulation tape. Where room permits, small paxolin panels may be made up and housed inside the machine with the components neatly tagged on and soldered. Where space is strictly limited the items are soldered direct to the brush holders and may be covered with sections of insulated sleeving or, better still, rubber sleeves. Where no space exists at all then recourse must be made to fitting the suppression items in the mains lead at the point of entry into the machine. It is then essential that a robust case be used to house the suppressors of course, though the smaller and more compact the better, especially for portable appliances such as hair-dryers and shavers, etc.

With regard to ignition interference, i.e., the type experienced from cars, the solution is usually much easier, a 5,000-ohm resistor in the distributor lead sufficing in most cases. For better suppression still a 15,000-ohm resistor is placed in series with each plug in addition. In each case the resistor acts in such a manner as to damp out, or to present a barrier to, the H.F. oscillations caused by the spark at the " points." Special resistors are obtainable for the purpose, which may be screwed or clamped in a few seconds.

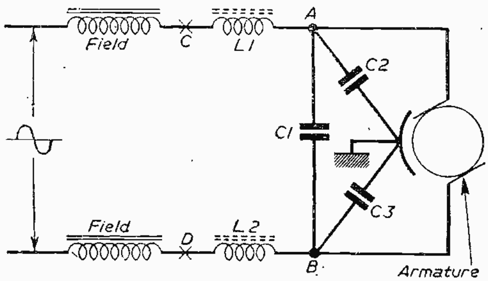


Fig. 8.—This arrangement will suppress both symmetric and asymmetric interference.

Whilst on the subject of motor cars an interference generator which receives little publicity is the windscreen-wiper, which should be treated as outlined above as for small motors. In closing, any reader who may be called upon to carry out suppression work is advised to study BSS613, which forms an invaluable guide for this type of work.

Australian TV Buy Marconi

TELEVISION will come to a fifth continent next year, when Australia's first television stations are due for completion. Two Government-controlled stations, together with studio centres, are to be built at Sydney and Melbourne, and are expected to inaugurate the planned national television service before the end of 1956.

Most of the equipment for the Sydney and Melbourne transmitting stations, including the transmitters themselves and the aerials, is to be provided by Marconi's Wireless Telegraph Company, Ltd., under the terms of a recently-signed contract worth more than £250,000. Each of the stations will have an installation consisting of two main transmitters, 18 kW. vision and 4 kW. sound, with two smaller transmitters as standbys.

Radio and TV Servicing

THE publication of a new booklet, " Radio and Television Servicing," by the Central Youth Employment Executive coincided with the opening of the National Radio Show, at Earls Court.

The booklet, which is fully illustrated, describes the training, qualities required, opportunities of employment and avenues of promotion.

Service engineers, the booklet states, are employed in shops which sell and repair receivers, in organisations which repair them for the shops, by the manufacturers of receivers and other radio and electronic equipment and by the organisations which relay radio and television by wire into homes and places of work. Details of opportunities in Airways Corporations and other firms engaged in air transport are also descrbed.

TELENEWS

Television Licences

THE following statement shows the approximate number of television licences in force at the end of July, 1955. The grand total of sound and television licences was 14,067,394.

Region	*Number*
London Postal	1,150,207
Home Counties	518,897
Midland	856,594
North Eastern	692,813
North Western	689,142
South Western	272,056
Wales and Border Counties ...	259,036
Total England and Wales ...	4,438,745
Scotland	260,741
Northern Ireland	26,097
Grand Total	4,725,583

From Ireland

BBC Television is planning its first broadcasts from Ireland before the end of the year, subject to conditions being favourable. Plans are in hand first for one or two programmes from Belfast in mid-November. On November 25th the BBC hopes to extend still further its television coverage of sport by the first television programme from Eire on the occasion of the Irish and British Amateur Boxing Association's match at the Dublin Sports Stadium.

Coverage of Party Conferences

THE BBC Television Service will present three reports from the Conservative Party Conference at Bournemouth on the evenings of October 6th, 7th and 8th. The team will be headed by E. R. Thompson, the Parliamentary Correspondent.

The BBC has made a similar offer to the Labour Party for its Margate Conference. The Labour Party has agreed to coverage of the second day's open session on October 11th on an experimental basis.

BBC Manchester Studio

THE BBC has contracted J. and J. Parish, Ltd., of Burton Road, Withington, Manchester, 20, for building work in connection with television studio accommodation. The work covers the conversion of an existing building in Dickenson Road, previously used by the Manchester Film Corporation, and the erection of a new two-storey block on the same site to provide TV studio premises which will include a production unit, a small film unit and telecine facilities.

With An Interval?

IT is learned that the average family in the United States spends five hours 24 minutes each day looking at TV, and two hours 26 minutes listening to the radio.

75 Different Types

IT is reported that in 1954 Western Germany produced 130,000 television receivers of 75 different types.

It is anticipated that production this year will increase to about 350,000. The Television Service in Western Germany is available to 60 per cent. of the population and is comprised of six studios and 22 transmitters.

TV in Africa

A MINIATURE television network is being installed to help maintain security on Dr. J. T. Williamson's diamond mine at Mwadui, Tanganyika.

Concealed TV cameras will enable the security staff to watch the workers and their handling of the diamonds on a central screen.

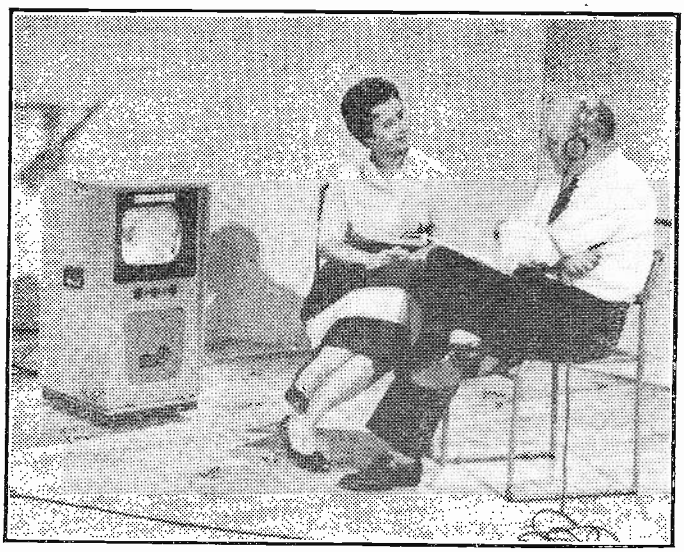
Australian Order for Marconi's

THE Australian national television service is expected to be inaugurated towards the end of next year upon the completion of the first two Government-controlled stations and studio centres, at Sydney and Melbourne.

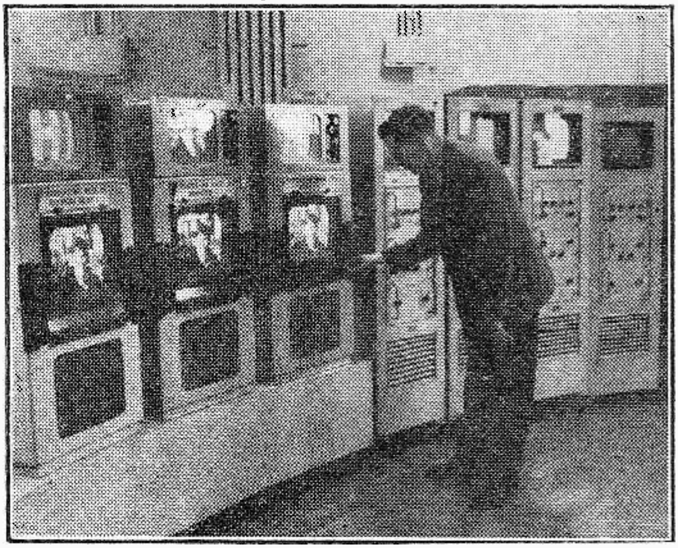
Most of the equipment for the Sydney and Melbourne transmitting stations is to be provided by Marconi's Wireless Telegraph Company Ltd., under the terms of a recently-signed contract worth more than £250,000 which was obtained through their Australian associates, Amalgamated Wireless Australasia) Ltd.

Granada's Manchester Studio

MARCONI'S are to supply a large amount of television studio equipment to Granada TV Network Ltd., the Monday to



The Associated Broadcasting Company have conducted a series of camera tests to discover which of the 18 finalists is to receive a contract as compere of the family programme "Week End," which will be seen every Saturday morning. The picture shows Barbara Lott, one of the entrants in a "Mock" interview with Bill Allenby, a BBC Commentator. The Monitor Screen showing the interview in progress can be seen.



A technician studies various monitor screens in the main control room for transmitting faults. (See " Television Control Centre ".)

Friday programme contractors for the Manchester area. The equipment is to be installed in a studio in the Granada Television Centre, now being built in Manchester. Plans for the Centre were designed by Mr. Ralph Tubbs, who was responsible for the Dome of Discovery at the Festival of Britain, and Mr. R. Hammans, until recently Head of the Television Unit in the BBC Planning and Installation Department.

Belgium-Germany Link

THE Belgian Broadcasting Organisation has completed a television link between Liége in Belgium and Roetgen in Germany, enabling a direct exchange of programmes between the two countries to be effected.

Until recently, a long-distance route via the Netherlands has been used. A good picture quality has been reported.

Floating Transmitter

SOUTH African television engineers and businessmen are planning a floating TV station to transmit signals to South Africa's four largest ports.

It will be operated in international waters about three miles from shore and will transmit programmes to Capetown, Durban, East London and Port Elizabeth.

Commercial TV for Midlands

IT is probable that the I.T.A's Midlands transmitter at Lichfield, Staffs, will be in operation by January or February next year with a radiated power of 144 kW.

Television Control Centre

INSTALLATION is not yet complete of cables and equipment used for the linking of ITA studios. This link-up is controlled by the G.P.O. Television Control Centre in Howland Street, London, which was first originated when the BBC decided to extend its Television Service to the provinces. The function of the centre is to operate and control the complex network of Post Office cable and radio links used to distribute the television programmes. A constant check is kept on the signals passing over the circuits and tests are made at regular daily intervals to ensure a satisfactory service.

Steady Output

THORN ELECTRICAL INDUSTRIES, makers of Ferguson receivers, state that half a million TV sets have been produced at their Enfield factory since the end of the war. Present production rate is one new set every 30 seconds.

Guatemala TV Begins

CONSTRUCTION of Guatemala's first television transmitter is well under way on top of the 11,000 ft. Agua volcano.

In the first eighteen months of the station's operation, 10,000 receivers are expected to be bought.

Charity Appeals

THE BBC, on the recommendation of its Appeals Advisory Committee, has decided to broadcast appeals for charity at regular intervals in the Television Service. From the first quarter of 1956, there will be a short appeal on one Sunday in each quarter.

Organisations applying to the BBC for charity appeals will be considered equally for opportunities in the TV service as well as in *The Week's Good Cause* on Sound.

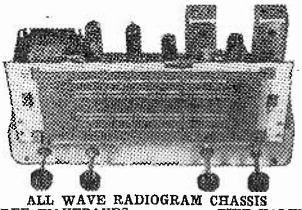
B.I.R.E. Nominations

REAR-ADMIRAL SIR PHILIP CLARKE, K.B.E., C.B., D.S.O., has been nominated for re-election as president of the British Institution of Radio Engineers for 1955-56.

G. A. Marriott, B.A. (Cantab), L. H. Paddle, J. L. Thompson and Professor E. E. Zeplar, Ph.D. have been nominated for re-election as vice-presidents.

Radio Debut in Britain

ALTHOUGH George Burns and Gracie Allen, whose films are being shown weekly by BBC television, are one of America's leading radio and TV teams, it was with the BBC that they made their radio debut some twenty years ago.



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THREE WAVEBANDS — **FIVE VALVES**

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

12 months Guarantee, with 10in. P.M. Speaker, A.C. 200/250 v. W/c Switch, Short-Medium-Long-Gram. A.V.C. and Negative feedback. 4.2 watts. Chassis 13½ x 5½ x 2½in. Glass Dial—10in. x 4½in. horizontal or vertical available. 2 Pilot Lamps, Four Knobs, Walnut or Ivory. Aligned and calibrated Chassis isolated from mains. PRICE **£10/15/0.** Without 10in. Speaker, **£9/15/0.** Carr. & Ins., 4/6.

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

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

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

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

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COMMERCIAL T.V. CONVERTER, BAND III. Ready made with power pack, attractive case, just plug in. Band I to III switching no alteration to your set. **£9/10/-.**

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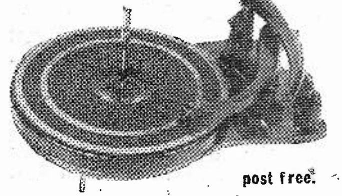

post free.

Brand new Plessey 3-speed Autochanger Mixer Unit for 7, 10 and 12in. Records. Twin Hi-Fi Xtal Head with Duopoint sapphire stylus. Plays 4,000 records. Sprung mounting. Baseboard required, 15½in. x 12½in. Height 5½in. Depth 2in. Superb Quality. FAMOUS MAKE.—3 speed Single Record unit with Acos 37 Turnover Head, each Sapphire Stylus plays 2,000 records. Starting Switch Automatically places Pick-up on records, 7in., 10in. or 12in. Auto Stop. Baseplate 12in. x 8½in. Height 2½in. Depth 1½in. Price £7/15/6, post free.

T.V. PRE-AMP.—Channel 1. Midget chassis 6in. x 3in. x 1½in. Complete with coax. lead, plug and EF42 or 6F13 valve. Brand new (boxed). Listed £3/15/-. Special clearance, 21/-.

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

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

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

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

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

EXT. SPKR. TYPE 3/-

80 ohm CABLE COAX

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

STANDARD ¼in. Coax. **7d.** yd.

COAX PLUGS ... 1/- **DOUBLE SOCKET** ... 1/-
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BALANCED TWIN FEEDER, yd. 6d. 80 or 300 ohms.
DITTO SCREENED per yd. 9d. 80 ohms only.

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

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

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

B.S.R. MONARCH 3-SPEED MIXER CHANGERS. ACOS GP37 XTAL HEADS.—Baseboard, 14in. x 12in. Height 5½in. Brand New in Maker's Boxes, **£9/19/6,** post free.

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

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

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Suitable all T.V. makes.

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

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

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

TOP SHROUDED, DROP THROUGH
260-0-260 v 70 ma, 6.3 v 2 a, 5 v 2 a ... 16/9
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250-0-250 v 100 ma, 6.3 v 4 a, 5 v 3 a 23/9
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FULLY SHROUDED UPRIGHT
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300-0-300 v 100 ma, 6.3 v 4 a, 5 v 3 a 26/9
350-0-350 v 100 ma, 6.3 v 4 a, 5 v 3 a 23/9
350-0-350 v 150 ma, 6.3 v 4 a, 0-4-5 v 3 a 31/6
425-0-425 v 200 ma, 6.3 v 4 a, C.T. 6.3 v 4 a, C.T., 5 v 3 a 49/9

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

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

OUTPUT TRANSFORMERS
Standard Pentode 5,000 to 3 ohms 4/9
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E.H.T. TRANSFORMERS 200-230-250 v 2,500 v 5 ma, 2-0-2 v 1.1 a, 2-0-2 v 1.1 a for VCR97, VCR517 ... ... 37/6

SMOOTHING CHOKES
250 ma 5 h 100 ohms 11/9
100 ma 10 h 200 ohms Potted ... 8/9
80 ma 10 h 350 ohms 5/6
60 ma 10 h 400 ohms 4/11

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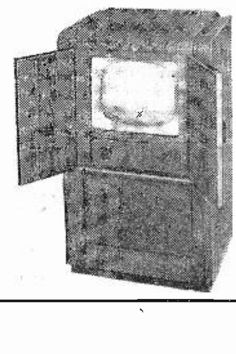
RM4 250 v 250 ma, **11/9** ; G.E.C. 300 v 250 ma, **12/9** ; 120 v 40 ma, **3/9** ; 6/12 v 1 a F.W., **4/11** ; 240 v 50 ma, **5/9** ; 6/12 v 2 a F.W., **8/9** ; 250 v 80 ma, **7/9.**

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

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

TV. CONSOLE CABINETS
Handsome, well constructed with beautiful figured walnut veneer finish. Size 40in. high, 24½in. wide, 20in. deep. For 15in. or 17in. Tube.
Limited number at only **9 GNS.**
Carr. 30/- (10/- returnable on case).



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CO-AXIAL CABLE ¼in.
75 ohms 14/36 ... ...**7d.** yd
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100 ma 10 h 250 ohms Tropicalised... 3/11
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Primaries 230/250 v 50 c/s, 48 v 1 a, **9/9** ; 400 v C.T. 150 ma 4 v 6 a, 6.3 v 6 a, 6.3 v 0.6 a, 4 v 6 a, 4 v 3 a, 5 v 3 a, 4 v 3 a, 5 v 2 a, **22/9** ; 300-0-300 v 120 ma 4 v 1 a. **17/6.**

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CORRESPONDENCE

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

SERVICING TV RECEIVERS

SIR,—I feel I must write to thank you for an excellent journal. The features contained in each month's issue are both interesting and useful.

In particular, I much appreciated the article in the series "Servicing TV Receivers" in the June issue. This dealt with the G.E.C. BT7092 receiver, of which I have a model, and through your article I have been able to clear up a fault that had been troubling me for some time. In addition, it is a handy reference to have for one's set at any time.—D. K. MALLING (Winchester).

BBC QUALITY

SIR,—Why is it that the standard of sound quality is often comparatively low in BBC telerecordings? When the BBC have achieved the task of reproducing tape-recorded vision, which is now almost indiscernible from the original, there seems to be no excuse for the large degree of background noise and absence of high frequencies that is prevalent.—D. R. BOYD (Enfield).

FIVE-CHANNEL TUNER

SIR,—Referring to the article, "A Five-channel Tuner," by B. L. Morley, which appeared in PRACTICAL TELEVISION for July, 1955, it is apparent that there are different versions of this tuner unit, and readers should perhaps be made aware of this fact.

The actual unmodified version to hand differs from the original article as follows:

1. The series heater wiring is connected to tags Nos. B and F (using the same nomenclature as in the article).
2. Tag A is a separate osc. H.T. supply.
3. Tags Nos. D and H are earth connections.
4. The 33-ohm cathode resistor to V1 is non-existent. In its place is a 180-ohm resistor shunted by 680 pF to chassis.
5. R1 is 4.7 KΩ instead of 10 KΩ.
6. R4 is 8.2 KΩ instead of 15 KΩ.
7. R6 (10 K) is paralleled by another 10 K to chassis (the reason for this is not apparent—unless this was a mistake on the assembly line).

Other connections remain as indicated in the original article.—V. M. FISKE (London, W.1).

TEST CARD C

SIR,—Your correspondent, Mr. I. Richards, of Tooting, need not necessarily blame his set, which may be quite capable of good reproduction on normal transmissions, though showing a poor test-card; it depends which one he was receiving. Many a set will display distortion on that transmitted after 12 noon.

Isn't it about time some attention was drawn to the antics of these so-called test cards which disappear and return (e.g., at 11 a.m. on one Saturday) without a word of explanation?

Also, may we have some information regarding the card which (notwithstanding an earlier announcement to the effect that "this is the last time [a quarter of an hour of] Test Card C will appear") continues to take the air after 12 noon with quite different but unspecified parameters. What are they? Or should one say, "What are they supposed to be?"—L. D. STUART (Hornchurch).

HMV 2808

SIR,—I wish to apologise and point out that an error appears in the "Problems Solved" columns (September issue).

In reply to E. C. Philbrow, New Malden (upon an HMV 2808 query), my advice to convert his receiver to London is in order, but the following paragraph suggests that the output of a Band III converter be aligned to give a "Midland" output in order to help prevent London breakthrough.

This is, of course, a silly suggestion, as the receiver when modified will only be tuned to Channel 1, and thus the Band III unit will require to be tuned to give this frequency output.—L. L. J. (Gravesend).

BAND III CONVERSION

SIR,—I note with interest that the August issue of PRACTICAL TELEVISION contains a design for a Band III converter designed around the Birmingham channel.

May I offer the following comment on converters for this channel for the benefit of any of your readers who may be considering conversion in anticipation of the I.T.A. Midlands transmitter; viz.

It may not be necessary to have two aerials nor modify their existing aerial. (I note that on page 104 of your August issue you show a switching circuit for change of bands and display two aerials.)

A resonant half-wave aerial has also resonant characteristics at its harmonically related frequencies. In this respect the higher channels with frequencies which fall into or near the third harmonic can be received with a high degreee of efficiency on an aerial cut for the lower channel. The third harmonic function operates well because the aerial is still current fed at both frequencies.

It so happens that the Birmingham Channel 4 is harmonically related to Channel 8 in this manner.

I admit that it is not an exact third harmonic relationship in theory, but allowing for practical rod lengths it is more than likely that a Channel 4 aerial will operate on a channel where orientation and signal strength are favourable.—H. W. CRITCHLEY (Scarboro').

BETTER PROGRAMMES ALL ROUND

SIR,—I note that the BBC has announced its plans for better programmes and longer viewing hours this autumn as an effort to off-set the new challenge of the ITA. Also more outside broadcasts and bigger variety shows have been promised us.

What I want to know is, why have we not had this vast improvement before? Why does it need a rival to take the BBC out of its rut and sit up? If these improvements have been possible in the past, why have they not been made? It seems that as far as the public is concerned, we are better off before the ITA begins. They have already served their purpose as a formidable rival to be reckoned with by the BBC. Yes, it seems that, whichever way we look at it, we are in for some better programmes all round whether the BBC or the ITA give them to us.—G. D. WALLIS (Catford).

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

SWITCHED TUNING

I have purchased a London model and wish to convert it to Wenvoe. Could you kindly let me know the address of a firm that sells 5 channel switched tuners or 13 channel switched tuner, the latter being preferable ?—F. Brooks (Glamorgan).

The availability of a 13 channel switched tuner unit depends upon the type of receiver and the model number.

Any receiver can be converted to another channel by the fitting of a unit for that purpose. Messrs. Spencer-West, Quay Works, Gt. Yarmouth, regularly advertise such units in our pages. These are not 5 channel, however.

Anything more ambitious requires some modification to the receiver which, of course, depends upon that receiver and we cannot always give the necessary modification instructions.

ULTRA W7216

I have an " Ultra " W7216 television receiver which has the following fault :

With the width control fully advanced, the picture is 1½in.-2in. short on the right-hand side of the screen (facing set), and is " pulled out " on the left-hand side of screen. The height of the picture is normal. The picture quality is perfect.

I have tried rotating C.R.T. and moving the deflector coils, but neither of these operations has any effect on width of picture.—W. Steadman (Nr. Barnsley).

This seems to be an efficiency diode fault, and V1 PZ30 (this is the one in the corner) should be tested. One half of this valve acts as an efficiency diode, contributing a large percentage of the total line scan.

Do not change over the PZ30's. This may result in at least one of them being damaged. If the PZ30 is in order, check C25 16μF electrolytic condenser (wired cathode of V1 (B) to H.T. line). These notes presume the line amplifier input control is properly adjusted (located just inside chassis adjacent to second PZ30 pre-set control).

PYE FV4CDL

The set was working perfectly on Children's Hour, but on switching on for the evening programme the sound was O.K. but the screen is blank from the bottom of the picture to halfway up ; the upper half of the screen is divided into three narrow pictures. I suspected frame timebase trouble. I have no test apparatus so I had V16 (B) ECL80 frame scan oscillator and V19 PL82 frame scan output valves tested, and was told the ECL80 was U.S. (low on emission). I bought a new one, which made no difference. Thinking it must be the PL82, I bought one of these to find a slight improvement. On rotating the vertical hold control in a clockwise direction viewed from the rear of the set, on reaching the end of its travel the picture jumps to full size, but will not lock, rolling slowly downwards about one frame per second with fly-back lines prominent. I tried adjusting the vertical linearity pot. R88, and vertical amplitude R87, with no success.

I would be much obliged if you could pin-point the fault. I did think of replacing R85 560K. resistor, but having no method of checking the resistance in location I decided to seek your aid.—Frank Ikin (Bolton).

The resistor 560K. may be at fault and should be replaced to make sure. However, we have found in a great many instances that the T14 blocking oscillator transformer has been responsible for this fault. This is a small transformer, mounted on the top of the chassis, and this may have to be replaced.

KB. HV40

I would be very grateful if you can tell me the value of the on/off brightness control on the Kolster Brandes HV40 and whether this should be a single- or double-pole switch. There appears to be a .5 megohm in at the moment which is faulty, causing picture to go on and off intermittently.—F. G. Goodland (Pontypool).

A double-pole switch should be fitted as a " live " chassis is employed. The value of the control is as suggested, .5 MΩ.

DEFIANT TR949/T

At first there was a picture but after a short period it began to jump sideways in bands of 3in. At the same time there was a crackling noise from the scanning coils. With no picture the frame scan would fill the tube, then collapse from top to centre. When the noise started in the coils the raster would fade leaving four balls of sparks, 2in. to 3in. from the left of the tube, with sparks trailing of to the right. Then the raster came in to about 3in. wide, the line whistle stopped and the E.H.T. dropped to 4,000 volts. (When a picture was on the focus would alter.)—J. Connell (Radcliffe).

There is little that can be done apart from replacing the scanning coils. These may be ordered from any C.W.S. radio/television dept.

EKCO TU142

I have a 12in. Ekco TU142 A.C./D.C. TV running on A.C. and was wondering if you could solve my problem. I am getting a coarse harsh picture with contrast and brilliance fully advanced. This condition would improve after set was switched on about half an hour to a good picture some nights. Other times it would be bad all night. When the picture improved the controls were retarded to normal. I have had a

(Continued on page 239)

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service engineer to it and first he re-activated the tube which gave a brilliant picture ; this lasted for a week then it went back as before. On servicing it a second time he raised the volts by .2 and got a perfect picture. He says if it goes again it is the tube.

Would it be possible to maintain this condition by a separate heater transformer, as I think it is returning back to the poor picture of my first trouble.

Could you please tell me if you think it is the tube, and if you think it would be necessary to insert a ballast resistor to take the place of tube heater. How could I work out the size of this resistor and what would be the volts required on the transformer as the heater of CRM122 is 7.3 volts, please ? I have a service chart for TU169 which I believe is the same circuit.—F. Manning (Droylsden).

An isolating transformer with a 25 per cent. boost tapping available should be fitted. The full 9 volts should not be applied in the first instance if a good picture can be obtained with less. The extra voltage will come in useful later. Although there is a limit to the boosting a heater will take the value of the resistor is quite easily obtained by dividing the heater voltage (7.3) by the heater current (.3) this gives some 25 ohms 3 watt. The transformer is available from most dealers or may be ordered from one of the advertisers in PRACTICAL TELEVISION.

PHILCO 1551

I have a problem with a Philco 1551 TV receiver in which I think you can help. This receiver has just been fitted with a new C.R.T., Mullard 31-74, and I am experiencing trouble with the interference limiter which is only effective on sound.

The picture has the appearance of having maximum interference suppression which cannot be altered although the sound can. I have tried a new EB91. I have checked C21, R24, R25, R26, C36, C37 ; R83-C70 in V5 cathode. V5 has been renewed. Germanium diode, W1, was renewed before the tube was condemned—the old tube did prove faulty (soft) and I noticed that the interference limiter had no effect on that, either. All the valves have been substituted, all voltages appear within tolerance.

The contrast control cuts out immediately it is touched yet the continuity is all right.

The sound is good but there is room for improvement in the picture gain, even taking the noise limiter into consideration I have every facility for service including circuit diagrams.—Fredk. J. Hay (Stockton-on-Tees).

We have had this trouble several times with the very similar Ferguson 983-988T, etc., and in every case the cause has been traced to the H.T. negative to chassis, 100μF condenser. This shorts out the bias which should be applied to the video amplifier control grid. If this is not the cause in this receiver, it would appear that the vision strip is oscillating and thus overloading the video amplifier.

INVICTA T120

I have an Invicta Model T.120 television set and wonder whether I can get a diagram of the circuit and servicing sheet.

Can you help me, please ? The articles in your journal do not appear to have included this model.—A. W. Vigor (Exeter).

In many respects this receiver is similar to the Pye V4, although there are many divergencies. The line timebase is similar, but the frame timebase different inasmuch that a blocking oscillator is employed in the Invicta, whereas the Pye employs a multivibrator circuit. Most of the notes in the August issue, "Servicing TV Receivers" will apply to this receiver, but not the chassis layout diagrams.

Several firms advertise service sheets in PRACTICAL TELEVISION and these may be tried.

FERRANTI T1325

I have a Ferranti 12in. TV set. Would you kindly tell me what make of tube I could use besides a Ferranti.—T. Warr (Birmingham).

The tube fitted is a Ferranti T12/72V which has an 8 volt .3 amp. heater, an international octal base, external conductive coating, and a final anode voltage of 7-GRV.

As the receiver is of the A.C./D.C. type with series heaters the most important factor is the current rating of the tube heater. A large number of tubes have a .3 amp. heater, but few combine this with an International Octal base and external coating. The G.E.C. 6706A would appear to be the nearest and could be fitted with minor modifications.

HMV 1824

I have a HMV 14in. table model television receiver. A fortnight ago it began to switch itself off. A flash would go across the centre of the screen from side to side, accompanied by a crackle and screen would go blank except for receding centre spot. If switch, which is also brightness contol was worked about a bit, then spot disappeared and set would be apparently normal again, and perhaps would not repeat the switching off for a night or two. Eventually it carried out the performance of switching itself off, and would not come on again. Being only a very inexperienced amateur I thought it was the switch which was at fault, so I obtained a new one. I wired it up and for a while it worked all right, but now every time I switch on it blows the fuses in the set and a flash emerges from the small transformer No. 4141ON which is nearest front of the set, and is connected through a valve LN152 and a condenser to the vertical hold and picture height controls at front of set. Incidentally before the switching itself off fault developed a ½in. gap at top and bottom of picture had developed, which remained at this whilst picture was on.—G. Moss (Nr. Stowe).

From a simple (and hopeful) point of view it may well be that the wiring at the double pole switch is at fault, and of course this should be checked first if this has not already been done.

If the flash comes definitely from the frame oscillator transformer the LN152 valve should be checked for internal shorts and, if this is clear, the transformer itself may have a short between the two windings. These alternatives may account for the loss of height when the set was working.

QUERIES COUPON

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

PRACTICAL TELEVISION OCTOBER, 1955.

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