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# Practical Television

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AND TELEVISION TIMES

AUGUST 1956

EDITOR: E.J. CAMM

NEW SERIES
A Beginner's Guide to Television

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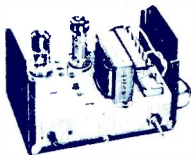

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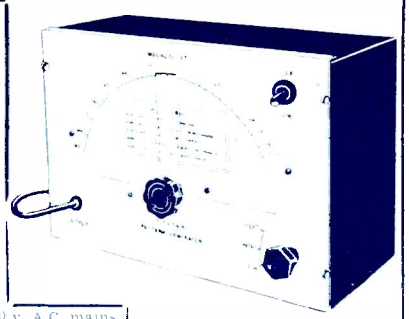

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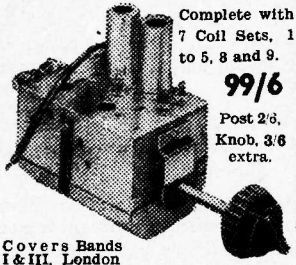

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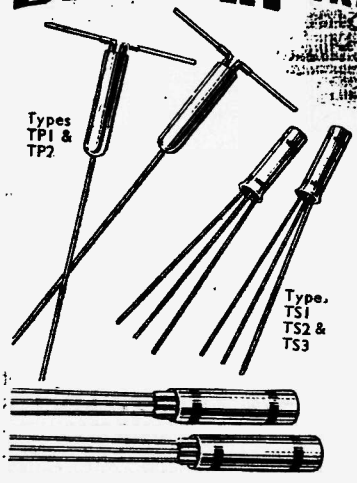


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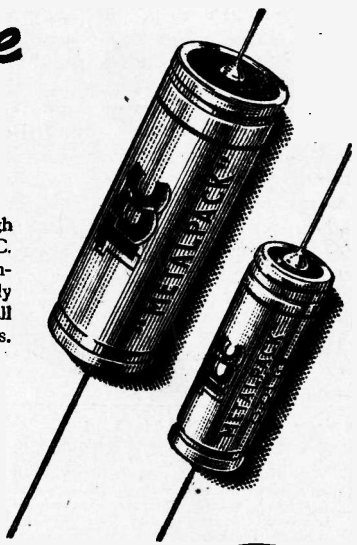

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# Practical Television

## & TELEVISION TIMES

Editor : F. J. CAMM

Editorial and Advertisement Offices : "Practical Television," George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2. 'Phone : Temple Bar 4363. Telegrams : Newnes, Rand, London.

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Vol. 7 No. 73 EVERY MONTH AUGUST, 1956


# Televiews

### COMMERCIAL TV ADVANCES

ACCORDING to Television Audience measurement the number of homes in the I.T.A. areas of London, Lancashire and the Midlands receiving commercial television is in excess of 1,500,000, and from the number of queries we receive asking for details of converters, it is apparent that the programmes are providing healthy competition for the BBC. No one, however, would suggest that the I.T.A. programmes are as yet comparable to those of the BBC in quality or in content. Every I.T.A. programme gives one the impression of an almost indecent haste to get the programme over, and bearing in mind the high cost of these advertising programmes it is understandable that the timing must be to the split second. This quite often destroys dramatic effect, and that is where the more leisurely style of the BBC scores.

It would equally be wrong to suggest that the quality of the I.T.A. transmissions have not improved during the past few months. Whether advertisers find the somewhat fleeting references to their product of value is not yet known. Some of the references indeed are so short that they could be completely obliterated during a few moments of interference caused by passing cars.

### TV IN CARS

THE Minister of Transport, no doubt viewing the shape of things to come, proposes to incorporate in amendments to the Motor Vehicles (Construction and Use) Regulations a measure making it an offence to use or to install for use in a motor vehicle a television receiver, if the screen is partly or wholly, and whether directly or in a mirror, visible to the driver while in the driving seat. Furthermore the controls, apart from a main switch in the sound volume control, must not be within reach of the driver, and the set must not be so placed or used as to cause distraction to other drivers on the road.

Objections were raised to the installation of car radio in its early days because it was thought that by listening to the radio the driver would not be concentrating upon the road. Experience has found, however, that these fears were unfounded. TV, it is admitted, is in a different category, for it would be impossible for a driver to watch a television programme and drive with safety at the same time.

### THE RADIO SHOW

WILL readers please note that this and our associated journals together with our full range of technical books and blueprints will be exhibited at our Stand No. 111 on the ground floor where we shall be pleased to welcome all readers visiting the show. The technical staff will be available to deal with readers' queries.

### DROP IN TV SALES

ACCORDING to the *Board of Trade Journal* the drop in the sale of TV receivers during the past few months cannot be attributed to the raising of the minimum deposit in February, and the drop must, therefore, be attributed to the usual seasonal decline. There can be no doubt, however, that the raising of the deposit must eventually affect sales, because that is what it was intended to do. If, however, it does not affect sales the minimum deposit should revert to its original figure to encourage sales.

### NEW VOLUME

THIS issue commences Volume 7. Indexes for Volume 6 are in course of preparation and will cost 1s. 3d. by post. Orders should be sent to the publishers, address as above.

Previous volumes have commenced in May, but due to the printers' strike in the early part of the year, March and April issues were lost, and thus Volume 6 will cover from June, 1955, to July, 1956, although still consisting of 12 issues.—F. J. C.

# A Beginner's Guide to Television

A NEW SERIES

## 5.—TRACING THE SIGNALS THROUGH THE RECEIVER

By F. J. Camm

HAVING in the four preceding articles explained the function of each part of the television receiver and the system of transmission it would now be as well to recapitulate and make a connected theme. We have seen that a TV receiver consists of the aerial, which collects both sound and vision signals at the same time and passes them to the first stage of the televisor. From this stage the two signals are separated into the two channels—sound and vision—the sound signal passing to the audio section and the vision signal to the video section.

The sound signal is amplified and passed on to the loudspeaker. The vision signal, of course separated from the sound, is passed to the video section, where it is amplified and passed on to the cathode ray tube, which consists of a large glass envelope having on the front a fluorescent screen.

The sound signals are made audible by means of the cone of the loudspeaker, and the vision signals are made visible by a stream of electrons which are projected on to the end of the screen in the form of a spot, which is made to trace out the picture elements by means of the deflector coils.

### The Aerial

There are many types of aerials as we have seen, but in all of them the principle is the same. It receives the modulated signal containing both sound and vision. The length of the aerial is decided so that it can receive a certain wavelength.

Sometimes the wavelength is expressed in terms of its frequency, and they are directly related to one another. We all know that the electro-magnetic wave radiated from a transmitter is said to have a certain wavelength. If, for example, a radio programme is being received on 350 metres, this means that the distance from the top or node of one wave to the top of the next is 350 metres.

Now the product of wavelength and frequency is the speed of light, and if we know the wavelength we have only to divide this into the speed of light, which is 186,282 miles per second. In other words the speed of wireless waves is exactly that of light. Similarly, if you know the frequency, in order to obtain the wavelength we divide the frequency into 186,282. From this it will be seen that as the frequency increases the wavelength decreases, although the product of the two will always be the same, viz., 186,282. Thus we may say that a programme is being radiated on a wavelength of so many metres or we may also say that it is radiated on a frequency of so many cycles per second.

Whilst the wavelength is high the number of cycles per second will be low, but when we come to deal with the very low wavelengths on which television is broadcast definition of the accurate wavelength is difficult. The wavelength for Wenvoe, for example, is 4.63 metres. It is much easier to express this in terms of frequencies, which is 65 megacycles (1,000,000 cycles × 65), which is abbreviated to 65 Mc/s.

### Band Width

Now let us consider the question of band width, and in order to do so let us consider the transmission of sound. We know that when a high note on a piano is struck the string is vibrating at a very high rate, and a low note is due to a string vibrating comparatively slowly. In other words, the frequency of a high note is higher than that of a low note. Now when we hear a broadcast we must be able to hear all of the notes, the high, medium and low. Unfortunately it is not possible for us to hear all of the notes over the audible frequency range, and so we have to strike a compromise. In fact those between 5,000 and 8,000 cycles are transmitted.

It will be obvious from this that the wave transmitted from the aerial—that is, the electro-magnetic wave—must be 4,700 cycles wide so that all of the notes or frequencies we wish to hear are encompassed by it.

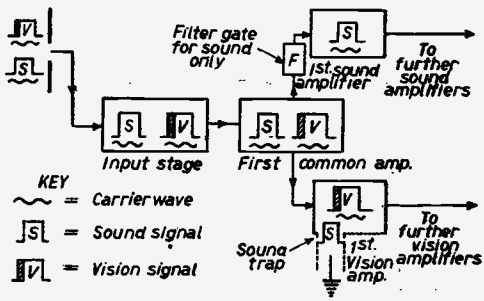



**Fig. 19.—Block diagram in which the audio and video signals are traced through a "straight" receiver.**

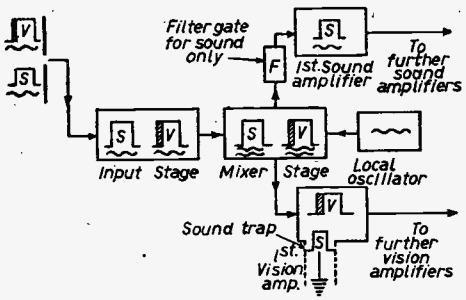



**Fig. 20.—A block diagram similar to Fig. 19, but relating to a superhet receiver. See also Fig. 21.**

It is because of this that we refer to the band width of the electro-magnetic wave (it is termed the carrier wave), and it is 4,700 cycles wide.

Now with vision a much greater range of frequency is dealt with, and it must encompass a dead black to the whitest white, and in this case a band width of 3,000,000 cycles (3 megacycles) is required. It will be clear from this that if the vision circuit will not permit this wide range of frequencies to pass through it picture quality will suffer. The designer has, however, attended to all this, and it is rare to find a receiver where the full range of frequencies is not covered. Of course, there are single and double side-band transmissions, but most of the TV channels work on a single side-band.

The input circuit of the receiver obviously has to be designed so that the band width is wide enough to include the sound channel as well as the vision. The first amplifying stage in most cases includes both signals, but from this point on the audio and video signals are separated by tuned circuits known as filters. In some cases the sound is separated at the input stage, but more often it is separated after the first amplifier. Occasionally, the signals are not separated until they reach the output of the second amplifying valve. One of the difficulties which occur in separation is that it is difficult to rid entirely the sound from the vision circuits, and filters are included in later stages to filter off any traces of sound signal.

In the case of a superhet the vision carrier frequency is "beaten" or heterodyned against a frequency generated by a local oscillator. This changes the frequency which carries the signal to one of a low figure, making it easier to handle. The sound signal is treated in a similar way.

This heterodyning or beating together occurs in the mixer valve. Unlike other valves, however, this one does not amplify. Indeed it is often the case that there is a loss.

The filter to which I have referred is, in reality, a coil or inductance and capacitates tuned to the sound channel. It acts as a vent, permitting sound only to pass through.

Similarly, in the video stage a coil and condenser comprise a trap or rejector and indeed it is termed a sound rejector or sound trap.

The sound signal proceeds through the filter and from thence its course is similar to that as in a radio receiver (see "The Beginner's Guide to Radio"). The only difference is that an interference limiter is nearly always included which filters away any interference caused by car ignition or other electrical apparatus. The carrier conveying the sound is amplified with the sound until it reaches that part of the circuit where it can take care of itself and it is here that vision and sound signals are separated; in other words, at a detector stage. At this point sound alone is amplified and passes to the loud-speaker.

**The Video Section**

We have seen that the first stage of a TV receiver is common to vision and sound in most cases, and where a straight receiver is concerned, that is, one which amplifies throughout at signal frequency, it is common practice to make the first amplifying stage common to vision and sound and after separation of the two signals has been effected by means of gate filters and traps referred to earlier the two signals are amplified in separate channels until sound reaches the speaker and the vision reaches the cathode-ray tube.

Three stages of vision amplification are commonly employed at signal frequency up to the detector stage at which, as already explained, the vision signal is separated from its carrier in a similar manner to that of the sound signal. It is passed on to the video amplifier.

Between the aerial and the detector four amplifying stages occur, for it would be almost impossible to design an amplifier to suit the wide range of frequencies encompassed by vision and sound. It is for this reason that a wide band amplifier using single-tuned couplings between stages which will provide the necessary degree of amplification is difficult to design, and to overcome the difficulty stagger tuning is used, and this is arranged so that each stage amplifies a certain proportion of the band. By tuning each stage to its particular band the total result will be a wide band amplified signal which is applied to the detector.

We have, of course, considered the vision signal as a simple band wave with a frequency extending from 0 to 3 Mc/s, but, in fact, it is a very complex affair. The main point is, however, that the video signal contains all the picture detail as well as the synchronising pulses which keeps the standing spot in the receiving tube in step with that of the camera.

These pulses are extracted from the video signal and fed to the timebases where triggering takes place.

We have already noted that this process takes place in the detector stage, which thus performs the double function of separating the video from its carrier and the sync pulses from the picture.

The timebase must trigger the oscillators and the pulses must be free from "picture intelligence," for if the pulses contain the latter any change in scene from light to dark would give rise to a spurious pulse and the timebase oscillators would not function correctly. With the result that the picture would be broken up.

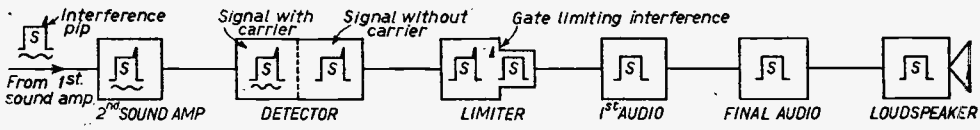



**Fig. 21.—Block diagram of the path of the sound channel from the final stage of Fig. 20.**

**The Video Valve**

The purpose of the video valve is to amplify the entire frequency range from 0 to 3 Mc/s. To obtain the maximum gain from the stage it is possible to make the anode load resistor 20 per cent. higher than that called for in the design and also to increase the value of the coupling condenser. This, however, is always accompanied by an adverse effect on the quality of the picture, but in the fringe areas the extra gain is probably worth some sacrifice of picture quality.

**The Television Camera**

Although many different types of television camera are used today they differ in the matter of design and lens arrangement, and their differences are mechanical and optical rather than fundamental. Each of them is based upon the principles first laid down by Campbell Swinton more than 40 years ago. The Emitron camera and the Super-Emitron with their later improvements are chiefly in use in great Britain, whilst America uses the Iconoscope and the Orthiconoscope or Orthicon, and the Image Orthicon which perhaps is more used in America than any other type.

Before we can understand the television camera it is necessary to have a knowledge of certain fundamentals. We have seen earlier that in both sound and vision systems the received signal is made up of one or more periodic wave forms. They are waves of air pressure in the case of sound, and variations of strain in the ether in the case of vision. In both it is necessary to transmit amplitude (strength or intensity), frequency (pitch or colour), phase (the relationship in time between one component wave form and another), and spatial distribution. The latter is of great importance in television, but only of slight importance in sound. In television reproduction it would be purposeless to indicate the strength of a light impulse or even its colour unless it is related to the exact point where it fits into the picture as a whole. At any one instant the output from one photocell can only convey one single item of information, so to speak, and it will produce exactly the same current whether it is looking at a chequerboard of black and white or at a scene which is uniformly grey. The problem admits of two solutions. The system may consist of a number of separate channels each confined to one small section of the picture. That, however, is impracticable. The system, therefore, must confine itself to one section at any time covering the whole scene in an orderly sequence known as scanning, and then repeating the whole operation at a rate sufficiently fast to deceive the eye into thinking that it is viewing a continuously present picture instead of only a spot.

A vital point is the number of sections into which the picture must be broken up for good reproduction, or what we now term definition. In the Baird 30-line system the number was approximately 1,000, which we now know to be totally inadequate. The optimum number of sections, which in turn determines the number of lines, is still a matter of conjecture, but it certainly cannot be less than 50,000, and it can be said that any increase above 1,000,000 is not justified by any improvement in definition which is perceptible to the human eye.

In the standard BBC system the picture is broken up into approximately 200,000 elements, and it is the duty of the television camera to scan the picture at every instant to produce an output current which is proportional to the intensity of the light falling upon the camera at that instant. The picture being televised is scanned in zig-zag lines from left to right. The start of each line is below that of its predecessor by a distance equal to twice its own thickness or depth. When 202½ lines have been covered, the scanning spot returns to the top of the picture and scans the lines which have been missed out during the first half of the process, making 405 lines in all. The whole process is then repeated 25 times every second, which is fast enough to take full advantage of the well-known persistence of vision effect in the eye. As a parallel, it will be recalled that in film production a similar device is used; although only 24 frames pass through the projector every second, each frame is actually viewed twice, giving the same smoothness as if the frame frequency were 48. The equivalent television frequency is increased to 50 to take advantage of the controlled grid supply in this country.

With sequential scanning, one difficulty which immediately arises is that of getting adequate sensitivity, bearing in mind that each individual section is only viewed for roughly one two-hundred-thousandth part of the duration of each picture, which in any case only lasts for one twenty-fifth of a second itself. Camera-minded readers will appreciate the problem of exposure times in the order of 0.0000002 second! It is this problem of combining a sensitivity high enough to overcome the inevitable background noises with the demand for a high rate of scanning, and therefore a short duration of coverage on each individual section, that has determined the characteristics of the television camera as we know it today.

*(To be continued.)*

## ODDS AND ENDS

**Smaller TV Sets**

U.S. television set manufacturers are putting on a big competitive drive to sell smaller sets at the present time. This is part of the industry's general programme of selling its customers who already have large sets in the house a second receiver.

Radio Corp. of U.S.A. has on the market a set with an 8½-inch screen that sells for $125. Admiral Corporation has begun production of a 10-inch set which is priced at from $90 to $120, according to model. General Electric has just brought out a 9-inch set that is priced at under $100.

**TV Receivers in Cars**

IN the additions and amendments to the Motor Vehicles (Construction and Use) Regulations it is proposed to include a paragraph concerning the installation of television receivers in cars. This will make it compulsory that the receiver be fitted in such a position that the screen cannot be seen wholly or partly by the driver, and that the only controls permitted within reach of the driver are a main switch and a sound control.

**Danish TV**

DENMARK'S third television station, which cost £130,000, was opened in May at Aarhus. The State Radio began its television broadcasts in 1953 and there are now over 25,000 viewers, with 60 per cent. of the country covered by transmissions.

# RINGING CHOKE EHT

## AN INEXPENSIVE EHT SUPPLY FOR THE EXPERIMENTER By "Erg"

ONE of the problems which faces the experimenter is that of a suitable supply of EHT. Where a small 6in. C.R.T. of the ex-Govt. type, such as the VCR97, is used, then the usual EHT source is from a 50-cycle mains supply with its attendant problems of too good a regulation, and the expensiveness of good quality EHT mains transformers.

Although the VCR97 and kindred tubes take a fair EHT current (comparatively!) other methods of supplying the necessary high voltages are available. A common method is by means of an R.F. circuit where an oscillator functions at very high frequencies, and the other is by the ringing choke.

The R.F. oscillator type of EHT supply is quite efficient for normal use, but is a rather difficult type of circuit for the novice to get going efficiently; moreover, where electrostatic tubes are employed with their necessary bleeder networks feeding the different tube elements, then quite often it is difficult to get the necessary current from the circuit.

The regulation of the R.F. supply is rather poor; it is too poor for many requirements.

### EHT Regulation

When dealing with supply of EHT voltages the question of the regulation of the supply must come into the picture.

Without becoming too technical we can say that by regulation we mean the ability of the supply to maintain its normal voltage under varying conditions of load.

In a well-regulated supply the actual voltage remains constant over a fair range of current. In a poorly regulated supply the voltage falls rapidly with increase of current.

The variation of voltage with supply of current has some advantages and some disadvantages.

The main disadvantage of a poorly regulated supply is that peak whites tend to defocus. This is the case with most television receivers which employ the line flyback for supply of EHT. Such a source has poor regulation and it will be noticed that the white parts of the picture do not focus correctly; they come out of focus and cause two defects. First, the defocusing causes the lines to thicken with resultant distortion of the picture, and second the thickening process makes the lines appear to interlace incorrectly.

Close examination of the screen of practically any commercial television receiver which employs such methods of EHT provision will reveal these defects.

Another defect is that ignition interference which drives the tube beyond peak whites causes such defocusing that the interference which would normally appear as small white spots, is turned into large blobs spreading over several lines.

The employment of interference suppression circuits materially assists in cutting down this effect and it is not now such a nuisance as in the earlier days of television.

A major advantage of poor regulation is that as the voltage drops considerably as the load is increased, it becomes rather safer to handle such an EHT source. Where accidental contact is made with the hands, for instance, then the applied voltage drops immediately and beyond the initial "kick" no damage is done. A well-regulated 50-cycle supply,

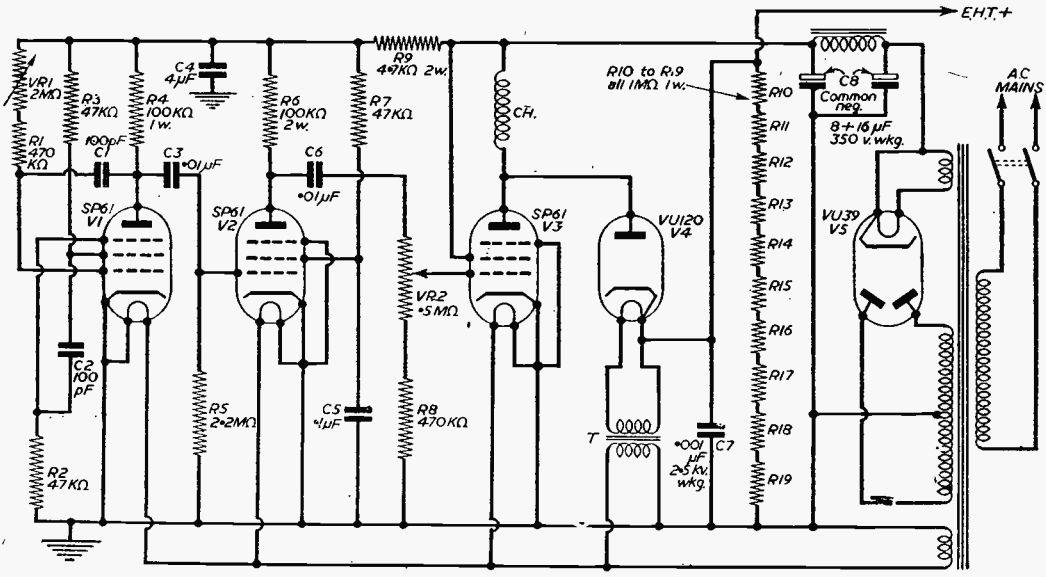



Fig. 4.—Complete circuit as referred to on page 9.

however, tends to retain the original applied voltage, and great care must be exercised when handling such supplies.

An EHT supply obtained from an R.F. oscillator can supply very high voltages, and this method is employed on most projection systems. For moderate EHT, such as the experimenters' VCR97 type of tube, the "ringing choke" method of supply will be found to effect a good compromise between a well-

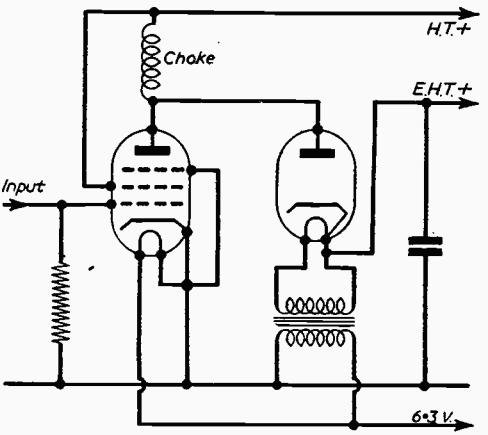



**Fig. 1.—Ringing choke output circuit.**

regulated, but expensive, mains supply and the not-so-well regulated R.F. supply.

The voltage obtained from this system can be classified as being of the "safe" type yet the regulation is quite good for normal purposes.

### The Ringing Choke

It is well known that any rapid change of current through an inductance will cause a heavy voltage change across the inductance. The more rapid the current change, the greater is the voltage change. We have an example of this in the output of the line amplifier. On the flyback, voltages are generated in the anode circuit of the valve and can be as high as 2,000 volts—sometimes even more.

The sudden drop of current from a very high figure to zero causes the primary of the output transformer to "ring" and to produce these high voltages.

In the televisor arrangements are made for the output transformer to have some extra windings so that the voltage produced is stepped up still further and it is then rectified and used for EHT.

The same principle applies in the case of a ringing choke EHT. An amplifying valve is fed with an impulse type of waveform which produces shock excitation of the inductance in its anode circuit. The value of the inductance is chosen so that it tends to oscillate or "ring" at the frequency of the input. The resultant voltages can then be rectified and employed in the usual manner (Fig. 1).

When considering the use of ringing choke systems there are several important points which must not be overlooked.

First, to produce the best results the current must change very rapidly: for this reason excitation by means of a flyback pulse produces very good results.

Second, the inductance in the output circuit must be highly insulated or breakdown is liable between windings of adjacent turns.

Third, it is important that the pulse producing the high voltages at the anode is in the correct phase so that positive voltages are produced and not negative ones which would be liable to damage the valve. Therefore the input to the valve must be such that the flyback is in the negative direction at the grid, and therefore positive at the anode.

### The Choke

The value of the choke should be in the region of 0.2 Henries. This need not cause any difficulty, as it is quite easy to make a choke approximately this value, at home.

The choke is wound on a piece of dowel rod $\frac{5}{8}$in. diameter and about $1\frac{3}{4}$in. long. Cheeks can be fitted at the ends so as to retain the windings, the cheeks being made of stiff cardboard or plywood (Fig. 2).

The wire to be used is 38 s.w.g. enamelled wire and about $\frac{1}{4}$lb. will be required.

Each layer of windings should be separated by a layer of waxed paper, and that from an old paper condenser can be used.

The wire is wound on in as even layers as possible with a layer of waxed paper between each layer of wire. A total of 7,000 turns are necessary.

When completed the choke can be bolted to the chassis by running a bolt down through the centre of the dowelling. This makes a neater job than trying to use a wood screw from underneath the chassis.

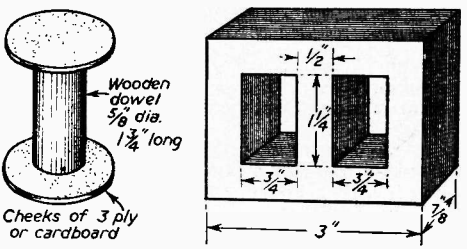



**Fig. 2. (Left).—The choke former. Fig. 3 (Right).—Transformer core.**

### Heater Transformer

Having overcome the problem of the choke the next problem is that of the heater supply for the rectifier valve. If desired an EY51 can be used as a rectifier the heater being fed either from a transformer with highly insulated wiring, or from a separate winding on the choke. 18 turns of wire should be sufficient, but this winding must be well insulated from the remainder of the choke and, if waxed paper is used for insulation, then the choke must not be allowed to become heated.

A cheaper, though more laborious, method is to make a heater transformer and to use an ex-Govt. valve such as the VU120.

The transformer need not be at all difficult in construction and anybody could make a simple one of the type about to be described, as it is purely a heater to heater transformer and requires very few turns of wire.

The transformer requires an area of about $\frac{1}{2}$ sq. in. for the centre limb on to which is to be wound the windings. The window area should be about $\frac{3}{4}$in. by $1\frac{1}{4}$in. to accommodate the windings. (Fig. 3).

An old loudspeaker transformer can often be used for this job, or a transformer from an ex-Govt. unit with approximately the above dimensions.

If an old transformer is used the stampings should be unbolted then taken apart very carefully noting the "lay" of them so that they can be re-assembled in the same manner. Having removed the stampings, then the existing wire should be removed.

For the primary fresh wire is wound on and 22 s.w.g. enamelled wire should be used. Sixty-five turns are necessary and the wire should be wound so that each adjacent turn touches; this will mean that more than one layer is necessary and each layer should be insulated from the previous one with a layer of oiled silk, empire cloth, or good quality insulating tape.

Having wound on the primary, several layers of a good insulator should be wound on as the secondary will be at about 2-3 Kv. above the primary.

The best material is undoubtedly oiled silk but P.V.C. sheeting, several layers of empire tape, or similar high insulation material can be used. Waxed cardboard can often be employed. It is not wise to use P.V.C. sheeting alone as, if any heat is generated, the P.V.C. softens and this may be the cause of a flash-over.

The secondary uses the same type of wire as the primary but only 27 turns are required as the heater of the VU120 requires only 2 volt. (Note: If a 4-volt rectifier is to be used then double the number of turns given above).

Having wound the transformer the stampings are replaced and bolted together firmly. If the stampings are loose then they will vibrate to the mains hum.

**The Complete EHT Supply**

Having settled the problems of the choke and the heater supply we can now consider the complete circuit.

In Fig. 4 we show a complete unit which will provide an EHT of between 2 and 3 Kv. The whole unit is very inexpensive as it is made mostly from ex-Govt. materials.

The EHT is obtained from the rectifier valve V4, which is a VU120. The heater is fed from a transformer which is made as described previously. The output is smoothed by the condenser C7 which, due to the high frequency of the supply, can be of low value; this solves the problem of smoothing condensers for mains-supplied EHT, which are in rather short supply. A value of 0.001 $\mu$F can be used, 2.5 Kv. working minimum.

The output is fed into the bleeder network which is composed of ten 1 megohm 1 watt resistors. These resistors should be mounted on a well-insulated paxolin panel in staggered formation to prevent flashover.

V3 is the amplifier which supplies the EHT. The valve type is not at all critical and one of the inexpensive SP61 valves (VR65) which can be obtained very cheaply can be used in this position.

The input to the valve, and hence the output of EHT is controlled by the potentiometer VR2.

The supply for the input to this valve can be obtained from an existing timebase *provided that the supply is positive going*. The output from the normal Miller oscillator as is used in many home constructors' televisors is negative going, and such a signal must be reversed in phase before being applied.

In the circuit given in Fig. 4, we have provided for a suitable input source for the amplifier valve. This is obtained from V1 and V2. V1 is a standard form of Miller oscillator and uses an SP61 valve, while V2 is the paraphase amplifier. The two valves form a "see-saw" arrangement often found in electrostatic timebases, and could, with slight modifications, be used for this purpose. However at this point we are only concerned in getting a sawtooth voltage at line frequency and in correct phase, to the input of V3, and this circuit will provide that voltage.

The complete circuit has its own power supply with a valve rectifier V5, and here once again the use of an ex-Govt. valve provides for economy. The type of valve will depend upon the outputs of the mains transformer. In the prototype the mains transformer had 6.3 volt supplies for the valves with a 5 volt tapped 4 volt for the rectifier, and a 4-volt rectifier, a VU39, was used as it was to hand.

The 6.3-volt supply should be at about 2A and the H.T. should be about 350 volt at about 60 mA minimum.

**Adjustment**

The circuit should be switched on and after allowing time for warming up VR2 should be adjusted for minimum position (slider towards "earthy" end of potentiometer) and VR1 should be adjusted so that the well-known whistle is heard. The whistle can be adjusted so that it is just beyond normal hearing limits, if found objectionable.

Once set, VR1 should not be disturbed.

A milliammeter should be inserted in the cathode of V3, and VR2 is then adjusted until a maximum current of 15mA is obtained. The voltage obtained can be obtained by checking the current through the bleeder chain by insertion of a milliammeter in the earthy end. The current reading obtained multiplied by the total resistance of the chain will give the EHT voltage.

Once the circuit has been set up it is important to screen the entire unit to avoid interference. A simple perforated zinc or other metal screen should be used to enclose the whole unit.

**PRACTICAL WIRELESS AUGUST ISSUE NOW ON SALE PRICE 1/3**

*The current issue of our companion paper, "Practical Wireless," has, as its main feature this month full constructional details of a small portable receiver, utilising a normal diode as detector with two transistors as L.F. amplifiers. This makes a compact receiver which requires only a 9-volt battery as the power source. The receiver will be found very useful as a bedside or outdoor model. Another constructional feature deals with the modification of a standard alarm clock movement for the switching of the mains supply to control either a radio or any other mains apparatus.*

*Details of a simplified mains-operated add on F.M. tuner also appear, and there is a constructional feature dealing with an Inexpensive Testmeter. Further details are given on the 3½in. oscilloscope, and amongst the remaining features in this issue will be found servicing data for the Philco Model A3606; Replacing Test Meter Movements; Simple Adjustable Voltage Supplies; Transmitting Topics; Finding Transformer Connections; Building a Constant Voltage Transformer; Using Test Instruments and the usual features—Letters from Readers, Programme Pointers, etc.*

# Servicing TELEVISION RECEIVERS

## No. 21. THE EKCO TS46, TSC48 AND TSC91

By L. Lawry-Johns

THE TS46 is a 9in. table model, the TSC91 the console version, and the TSC48 is a larger 12in. indirectly viewed (raised mirror in lid) with broadcast radio facilities. These notes are based mainly upon the TS46 as this is the more popular model.

Points of interest are the R.F. EHT unit mounted on the left side of the chassis, the method of wiring the circuit fuses and the fact that the C.R.T. is grid modulated.

The R.F. EHT unit contains a P61 oscillator and U22 EHT rectifier in addition to the transformer and EHT smoothing capacitors, etc. The P61 is a frequent cause of fuse failure *and* internal shorts in the UU8 rectifier valve. The current drawn by the P61 often becomes excessive causing the UU8 to become overloaded and the fuses to blow, provided that these are correctly rated at 500 mA. These fuses are not included in the mains supply leads, but complete the chassis return to each half of the H.T. secondary winding of the mains transformer. Fig. 1 shows the actual circuit. Therefore, in the event of frequent fuse failure, replace the UU8 rectifier, which is subject to internal shorts, and if the condition persists remove the cover from the left-hand screening box and replace the P61.

The disadvantage of providing fuses in the H.T. line only is that faults occurring in the heater circuit or mains transformer will not cause these fuses to blow and disconnect the receiver from the mains. As an instance of what is meant, one of these receivers was received with the complaint that smoke was issuing from the chassis, no sound or vision signals, and an objectionable smell! No H.T. shorts were detected and the mains transformer was suspected of having shorted turns. However, when the set was operated it was noticed that the rear R.F. sound and vision valves were not being heated, although the 4 volt valves, PEN45, PEN46, etc., were.

The fault was eventually located in the R.F. strip where a heater lead to a 6F13 valve was found fouled under the edge of one of the separate screening cases. A new length of lead, properly routed, cured the rather ominous symptoms. The point remaining that under some circumstances a fault of this nature, where no mains fuses are included in the circuit, could have resulted in more serious damage.

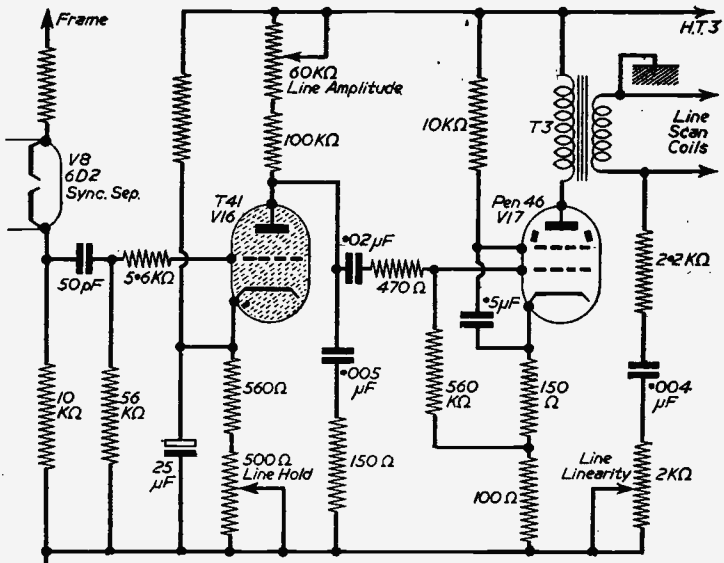



Fig. 3.—Diagram showing the Line Timebase Circuit.

### Failing H.T.

A small picture, extreme setting of the focus control and variation in the setting of the line and frame hold controls indicate low H.T., probably due to one of the 500 mA fuses failing. If the replacement fuse fails, follow the previous notes in reference to the UU8 and P61 valves. Do not be tempted to increase the fuse rating.

A frequent cause of complaint is that of intermittent variation of picture size. This sometimes gives the impression that the picture is "breathing," the variation being regular rather than intermittent. In nearly all cases

this effect is due to the U22 valve, and a replacement will clear the fault. Intermittent flashing on the picture is often again due to the U22. In this case the envelope of the valve becomes charged and glows blue. This type of valve is prone to this fault. The replacement U24 is not so affected, but the valve base must be changed to international octal if a substitution is to be made.

In the 9in. models a Mazda CRM92 is employed, although a few chassis were fitted with Cintel tubes which involved some circuit alteration and different type scanning and focus assemblies.

The TSC48 uses a 12in. Mazda CRM121 and on this model the EHT is slightly increased, necessitating the voltage rating of the EHT smoothing capacitors C71 and C72 to be increased from 6 kV to 7 kV.

The tube circuit is shown in Fig. 2, and this covers all late models. The brilliance circuit of early models differed somewhat and V4 was supplied from the H.T. line via a 4.7 kΩ resistor rather than via the brilliance circuit as shown. The focus coil is in series with the H.T. line, with the focus control in series with a fixed resistor shunted across it. The fixed resistor (R79) is of 390 Ω and is mounted beneath the tube neck on top of the chassis. It is normal for this to appear rather burned or discoloured. Quite often the focus control developes a fault whereby the track (wire-wound) becomes open circuited. Depending upon the actual position of the break the control may be completely inoperative or may be operative over only part of its travel. This control is referred to as R80 and is a 2 kΩ wire-wound potentiometer. Note that as the track and wiper arm are at H.T. potential, it is possible to obtain some types of control where one, normally the centre, tag is joined to the metal case. Obviously, this type must not be used for replacement purposes.

As can be seen from the diagram, the control grid

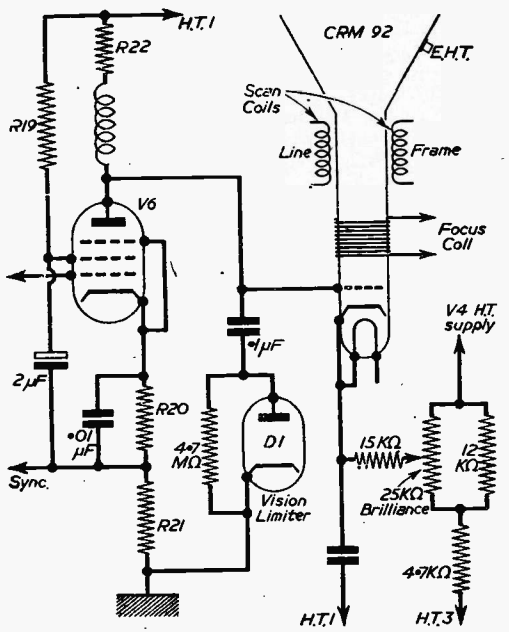



**Fig. 2.—Video amplifier output, C.R.T. and brilliance circuit.**

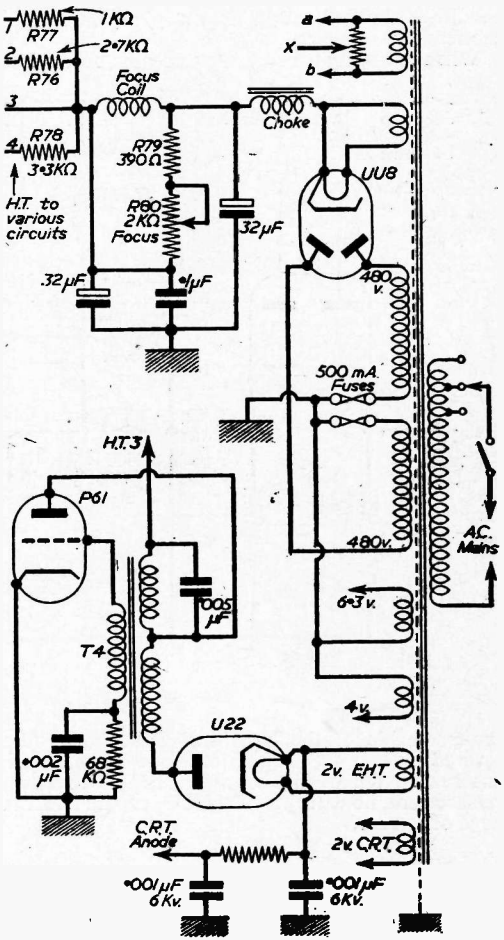



**Fig. 1.—Diagram showing Mains supply H.T. wiring and E.H.T. circuit. Heater winding a-b supply sound valves V13 and V14 which are susceptible to hum.**

of the tube is fed from the anode of the video amplifier. If a fault develops in V6, therefore, the anode voltage could rise to that of the H.T. line. The displayed condition would be that of no picture with excessive brilliance. Therefore excessive brilliance should direct attention to V6 and its associated circuit. If no fault is found in the video amplifier stage, as indicated by a correct anode voltage, attention should be directed to the brilliance circuit which controls the H.T. potential applied to the tube cathode. A fault in V4 stage could cause this voltage to fall as the H.T. applied to this valve is derived via the brilliance circuit.

### R.F. Stages

These are very straightforward and are of the tuned radio frequency type (T.R.F.). The only troubles likely to be encountered are actual valve failure and lack of H.T. to any particular stage caused by a shorted decoupling capacitor. This often causes the H.T. feed resistor, associated with this capacitor, to burn out. In the event of an open-circuited resistor being discovered, the associated decoupling capacitor

should be checked and, if necessary, replaced before the resistor is replaced.

When removing the separate screening covers from the underside of the individual R.F. stages (each secured by two 4 BA nuts from above the chassis) ensure that the wiring is undisturbed so that upon replacement, no wiring is likely to be caught under the edge of screens.

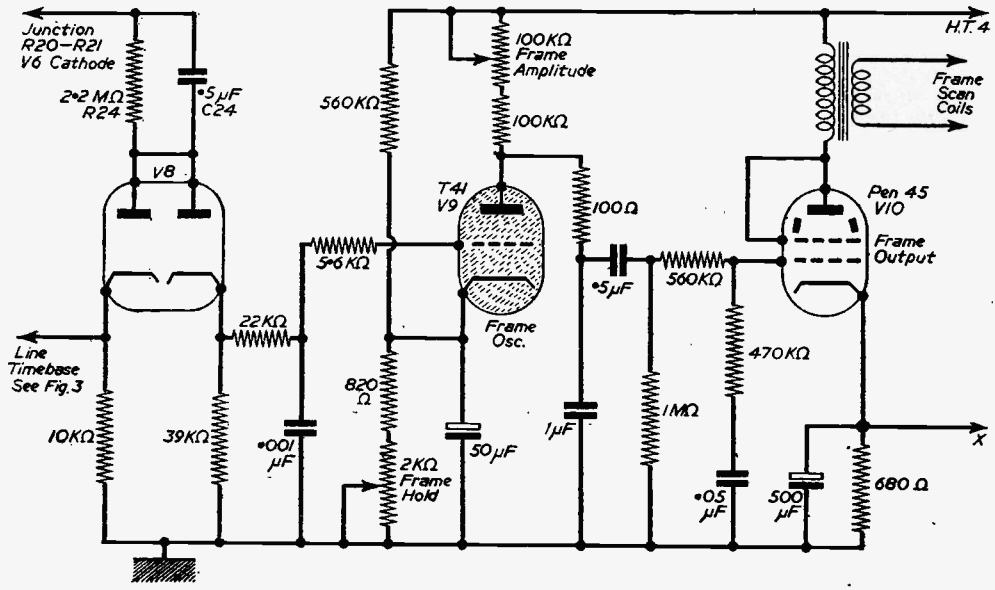



Fig. 4.—Frame Timebase and Sync Separator circuit.

## Timebases

The line timebase consists of a T41 gas-filled thyratron oscillator and a PEN46 output beam tetrode. The circuit is very simple and does not require much explanation.

Most of the troubles which occur, such as unstable line hold, picture ragged in a horizontal direction, intermittent picture slip and sometimes poor width, may be cured by replacing V16 T41.

Insufficient width can be a trifle deceptive, however, since a failing PEN46 or low H.T. voltage (check fuses and UU8) applied to the anode and/or screen of this valve could equally be responsible. Extremely poor linearity and width should direct attention to the capacitors C60 (.02 μF) and C61 (.5 μF). A complete upset of the line timebase working which does not respond to valve replacement should direct attention to C58 (25 μF) which is the T41 cathode by-pass electrolytic.

The line hold control is R65 and the width is R66. The linearity, mainly on the left side of the picture, is controlled by R75 in series with R74 and C62. Any left side distortion which is not corrected by the control should direct attention to the 2.2 kΩ resistor (R74), which may be open-circuited.

The frame timebase is extremely similar in operation, a T41 (V9) is the oscillator and a PEN45 (V10) is the frame output.

Normally, the PEN45 output stage is comparatively trouble free, picture jumping, intermittent frame hold, multiple images, etc., usually responding to a change of T41. The frame hold R31 (2 kΩ) varies the cathode potential of this valve, whilst the frame

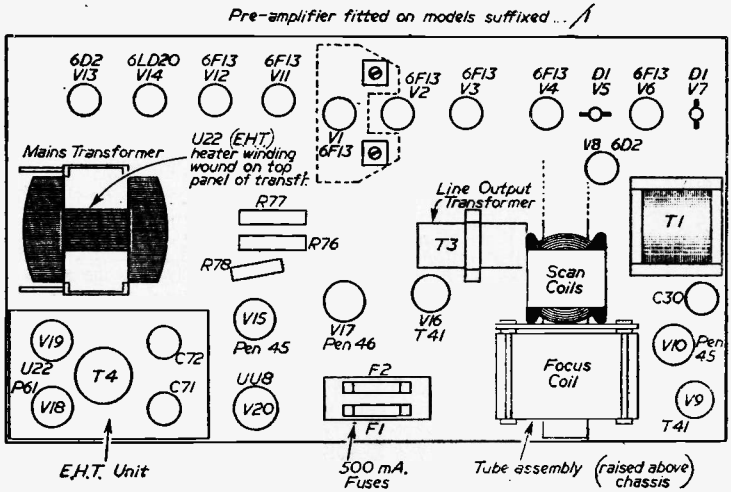



Fig. 5.—Top view of the chassis.

amplitude or height varies the H.T. applied to the anode. Poor vertical linearity may be caused by a defective PEN45 (low emission) or a leaky .5 $\mu$F coupling capacitor C28. Although the PEN45 could be responsible for loss of height, the T41 could equally be responsible. If both are in order check the 100 k$\Omega$ T41 load resistor and the electrolytic cathode capacitors.

On odd occasions R34 (100 $\Omega$) or C27 (1 $\mu$F) have been found responsible for complete loss of frame hold. These are the "charge" components which determine the repetition frequency.

**Sync Separation**

The sync pulses are derived from the cathode circuit of the V6 video amplifier. These are applied to the anodes of a double diode V8 (6D2) which are strapped. The line sync pulses are taken from one cathode and the frame from the other. The biasing of the valve removes the picture content (video signals) whilst the value of the components ensures that the frame and line pulses are adequately separated. See note on early models regarding poor sync.

**The Video Amplifier**

V6 is a 6F13 loaded "top and bottom," that is, it has an anode load resistor R22 (3.3 k$\Omega$) in series with a correction choke from which the positive going picture signals are applied to the C.R.T. control grid, whilst the cathode is also loaded by two 4.7 k$\Omega$ resistors in parallel R21 (effective resistance 2,350 $\Omega$) in addition to the normal cathode bias resistor of 47 $\Omega$, R20. The sync pulses are derived (negative going) from the junction of the two. The screen of the valve is fed from the H.T. line by R19, 4.7 k$\Omega$, and decoupled to the junction of R20 and R21 by a 2 $\mu$F electrolytic capacitor.

**The Sound Stages**

V11 and V12 are two 6F13 R.F. amplifiers transformer coupled and tuned to 41.5 Mc/s. Detection is by one of the diodes of the 6LD20 V14 which functions as the detector (diode) and A.F. amplifier (triode). The other diode section is unused and is wired to chassis. V13 is a 6D2 double diode which functions as the noise limiter and V15 is the PEN45 sound output valve. Two high value resistors are used in the 6D2 circuit, both 4.7 M$\Omega$, and sound distortion should direct attention to these resistors. If the distortion is not cured by substituting these resistors, check the insulation of the .1 $\mu$F capacitor which couples the A.F. signals to the control grid of V15. Low sound which does not respond to valve replacement may be caused by one of the several electrolytic capacitors associated with V14 or V15, becoming open circuited. The H.T. supply to these valves is derived from R76.

**Early Models**

Some considerable modification has been carried out from time to time and the extent of these is too lengthy to be included in this article. However, if the picture is inclined to lose sync, i.e., roll or slip on change of programme or picture content, R21 may be found to be 820 $\Omega$, R24 1 M$\Omega$ and C24 .1 $\mu$F. Changing R21 to 2,350 $\Omega$, R24 to 2.2 M$\Omega$ and C24 to .5 $\mu$F should enable more reliable hold to be maintained.

**TSC48 Models**

After the multi-pin connecting plugs have been removed and refitted several times, it often happens that one or more leads may become disconnected. This particularly applies to the screened A.F. cable where the inner and more fragile lead may become detached from its pin or soldering tag.

These voltage figures are intended as a guide and some small variation need not indicate a fault.

| | Valve | Anode | Screen | Cathode |
|---|---|---|---|---|
| V1 | 6F13 | 212 | 212 | 1.8 |
| V2 | 6F13 | 210 | 210 | 1.8 |
| V3 | 6F13 | 215 | 215 | 1.7 |
| V4 | 6F13 | 196 | 196 | 1.7 |
| V5 | D1 | — | — | — |
| V6 | 6F13 | 220 | 245 | 42 |
| V7 | D1 | — | — | — |
| V8 | 6D2 | — | — | — |
| V9 | T41 | 53 | — | 3.1 |
| V10 | PEN45 | 271 | 271 | 12.5 |
| V11 | 6F13 | 217 | 217 | 1.7 |
| V12 | 6F13 | 210 | 210 | 1.8 |
| V13 | 6D2 | — | — | — |
| V14 | 6LD20 | 58 | — | 1.3 |
| V15 | PEN45 | 244 | 152 | 5.3 |
| V16 | T41 | 55 | — | 4 |
| V17 | PEN46 | 345* | 205 | 15 |
| V18 | P61 | 350 | — | — |
| V20 | UU8 | 480 each anode | — | 382 |
| CRT | CRM92 | 6kV | — | 240 |

*High A.C. voltage at PEN46 anode makes testing inadvisable. This also applies to the P61 EHT generator.

## Independent Television in Scotland

THE Independent Television Authority has now completed its negotiations in connection with the selection of a contractor to supply all the programmes from the Authority's station in Central Scotland, and has decided to accept, subject to contract, the application of Scottish Television, Ltd. This is a new company which will have as its chairman Mr. Roy Thomson, who is also the chairman of The Scotsman Publications, Ltd. It plans to include a number of other Scottish interests.

The I.T.A. is about to start the construction of a new television transmitting station at Black Hill between Airdrie and Bathgate, and the necessary planning and other permissions have already been obtained. The site will be 900ft. above sea-level, and the transmitting mast will be 750ft. high. This means that the aerial array will be 1,650ft. above sea-level, and a very good coverage of the Central Scotland area should be possible. The transmitter will have an effective radiated power of at least 100 kilowatts, and it will serve approximately three-and-a-half million people. Those living in Glasgow and Edinburgh should receive very good signals, and most people living within the area bounded on the north by a line from Helensburgh to Dundee and on the south by a line from Prestwick through Biggar to Dunbar should be able to receive satisfactory signals. The Authority hopes to bring the transmitter into operation by August, 1957, in time for the beginning of the Festival of Music and Drama in Edinburgh.

# COLOUR TELEVISION

THE LAST ARTICLE IN THE SERIES DEALING WITH THE PRINCIPLES AND PRACTICE OF MODERN TELEVISION IN COLOUR

## 4.—THE COLOUR CATHODE RAY TUBE

By C. Grant Dixon, M.A.

### Colour Picture Display Tubes

THE three previous articles in this series have dealt with the various methods of producing a television signal which will satisfactorily represent a coloured image, but the weakest link in the whole chain from studio to viewer is undoubtedly the picture display tube at the receiving end. Much effort has gone into the design and production of standard monochrome cathode-ray tubes, and if this type of tube could be used in conjunction with a device to give colour to the white image a successful system would result. The frame sequential system with its rotating colour wheel is, in fact, a simple example of this method. Working along other lines, several patents have been taken out which describe crystal " sandwiches " which are stressed electrically to give a colour filter effect in conjunction with Polaroid film, but the loss of light in such a system is very great, and most work has been directed towards the production of a tube the screen of which can be made to fluoresce in the required colours. It will be recalled that any colour may be reproduced by the addition of the three primary colours in the proper proportions. Therefore, for any screen to be able to reproduce these colours it must either consist of a three-layer arrangement with the front two layers translucent ; or be divided up into a large number of small areas, such areas being grouped in sets of three. An example of the first system was Baird's original two-colour tube on which he was experimenting just before his death. Fig. 1 shows the three-colour version of this tube which he called the " Telechrome." The screen of the tube is viewed from one side only (the picture is reversed on the other side) and a fully detailed picture is seen in green. The red and blue pictures appear through the transparent green screen and are limited in definition by the fact that the red or blue screen consists of a series of lines. This is no detriment provided these lines are small enough, because the eye does not see fine detail in red or blue as explained in the last article. The chief disadvantage of this tube is its bulk, but it is interesting to note that one of the new American experimental colour tubes uses this same transparent plate principle built into a flat glass bulb.

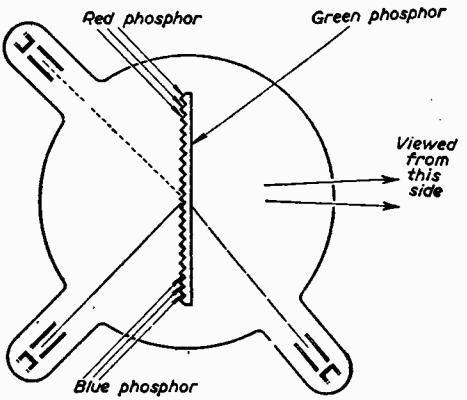



**Fig. 1.—The Baird " Telechrome " tube.**

### Colour Strips

The second method, that of dividing up the screen into a series of small colour areas is employed in almost all colour tubes. There is a choice between dividing into small colour strips, or small colour dots, and the " Chromatron " invented by Prof. Lawrence uses a system of colour strips. The phosphors which glow in the three primary colours are deposited on the screen of the tube in the form of thin strips as shown in Fig. 2, and a short distance behind the screen is an accurately positioned double wire grid, alternate wires being brought out to a common connection. When the wire grids are at the same potential the electron beam is made to converge towards the green strips because there is a potential difference of 13.5 kV. between the screen and the wire grids, and this produces an electron lens effect. If the wires are given opposite polarities as shown in Fig. 3, then the stream of negative electrons is attracted towards the positively charged wires and the beam strikes the red strips. Reversal of polarity will cause the beam to strike the blue strips. One disadvantage of the tube is that the colour presentation must be sequential ; owing to its novel method of construction it is impossible to excite all colour phosphor strips at the same time. Nevertheless, it is possible to use an R.F. switching voltage and a " dot sequential " display is produced. Another disadvantage is the fact that the strips are laid

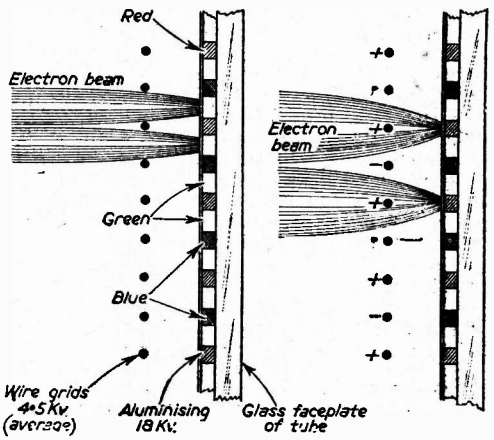



**Fig. 2.—Showing the focus action of the wire grids.**




**Fig. 3.—Vertical section through " Chromatron " screen.**

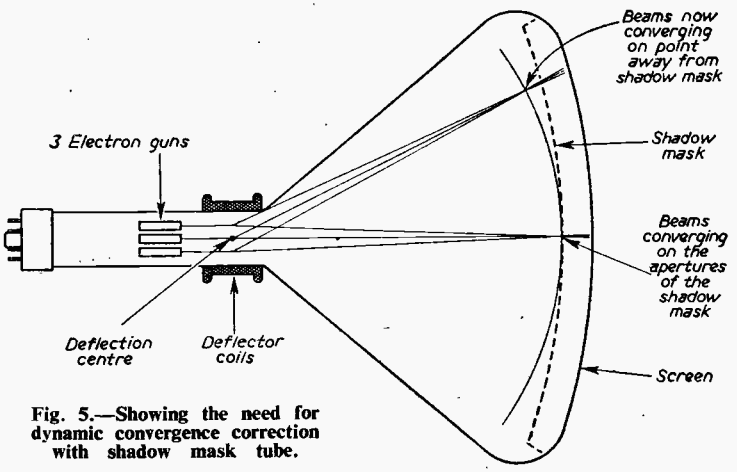



**Fig. 5.—Showing the need for dynamic convergence correction with shadow mask tube.**

horizontally and are 720 in number, this limits the vertical definition, and can cause spurious patterning by a "beat" effect with the scanning lines. On the credit side there is the fact that it is a simple gun tube and requires much less setting up than the three-gun colour tubes; also it requires just the normal deflecting power as the wire grids are only at 4.5 kV. above the cathode, but despite this it can give a brilliant picture owing to the post deflection acceleration of 13.5 kV. referred to previously.

### Colour Dots

A screen of phosphor dots is used in the tube developed by R.C.A. The dots are arranged in groups of three, one for each primary colour, and these "dot triads" are distributed over the screen in a regular manner. A short distance behind the screen is a sheet of metal perforated with a large number of small holes, one hole for each group of phosphor dots, this is the shadow mask and in conjunction with the three electron guns in the neck of the tube it ensures that the screen may be caused to fluoresce in any desired colour. The dot screen is actually produced by using the shadow mask in a photographic printing process repeated three times, once for each colour phosphor. The electron guns are so situated in the neck of the tube that each gun, directing a stream of electrons at the shadow mask can only cause the dots of one colour to fluoresce (see Fig. 4). Thus the three electron guns are responsible for the images in each of the three primary colours. In practice the electron beam is wide enough to cover several holes and the spot on the screen is caused by the excitation of several dot triads, thus to the observer who is a reasonable distance from the screen the apparent colour spot depends on the relative intensity of the different colour dots. One of the disadvantages of this tube is the requirement that the three electron beams should all converge at a point on the shadow mask. This is easily arranged if the beams are stationary at the centre of the screen, but when they are deflected to one side of the picture the distance of the shadow mask from the centre of deflection is greater, and they must converge at a point farther away (Fig. 5). This means that the convergence depends on the position of the spot on the screen and thus dynamic convergence signals are fed to special convergence coils on the neck of the tube. These signals are of a parabolic wave form and are derived from the line and frame timebase generators. A further requirement is that the high voltage supply of 25,000 volts for the final anode shall be stabilised and special regulator valves have been developed for this particular service. All this adds considerably to the complexity of a colour TV receiver and may account for some of the increase in cost over a monochrome receiver. As mentioned in last month's article the Y, or brightness, signal is normally fed to the cathodes of all electron guns and the R-Y, B-Y, and G-Y signals are fed to the grids. In the latest 21-inch R.C.A. tube there are also separate screen electrodes which equalise the beam currents for all signal levels so that the three guns can be adjusted to give a true black-and-white picture when receiving non-colour transmissions. This type of phosphor dot tube seems to have stabilised itself in the American colour TV market and is now being produced by various firms, although there is still a lot of research being carried out to see if an even simpler receiving tube can be found.

### Discs Again ?

A method of receiving colour transmissions which will appeal to the amateur experimenter is that in which the simultaneous colour signal is turned into a frame sequential signal by gating the drive to the

*(Continued on page 36)*

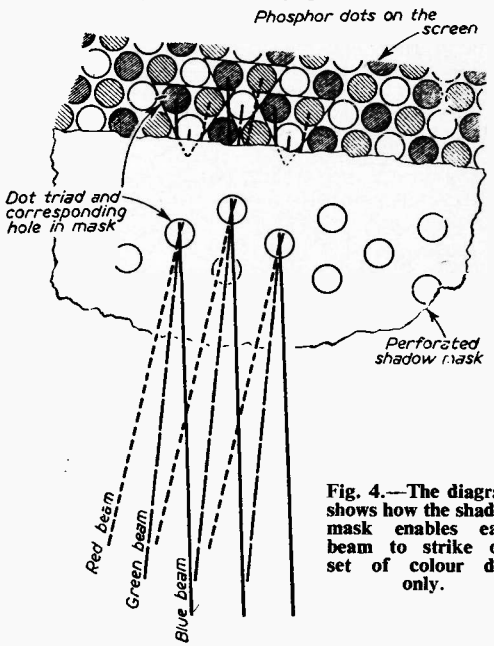



**Fig. 4.—The diagram shows how the shadow mask enables each beam to strike one set of colour dots only.**

# THE I.T.A. NETWORK

## SOME INTERESTING DETAILS OF THE COMPREHENSIVE RELAY SYSTEM

THE elaborate network of vision and sound circuits set up by the Post Office to enable the I.T.A. to operate the new independent television service has now been extended to Lancashire. Manchester and the new transmitter at Rivington Moor are now added to a network which has grown rapidly out of the local network of studio links provided for the first I.T.A. transmitter in London which opened as recently as 22nd September, 1955. The network is routed through the main Post Office repeater stations and links the I.T.A. transmitters at London, Lichfield and Rivington Moor to the various studios, theatres and master controls of the programme contractors.

Vision and sound circuits in the London network radiate from the Post Office Television Control at Museum Telephone Exchange near Tottenham Court Road. Television House in Kingsway, which accommodates the master control of Associated Rediffusion Ltd. and also the Independent Television News, is linked by two balanced cables to Museum yielding 10 vision circuits. The master control of Associated Television Ltd. at Foley Street is linked by two coaxial cables to Museum yielding eight vision circuits. Further vision circuits link Museum to the London I.T.A. transmitter and to a number of studios and theatres in London, some as far distant as Wembley. Vision circuits have also been

(*Continued on page 26*)

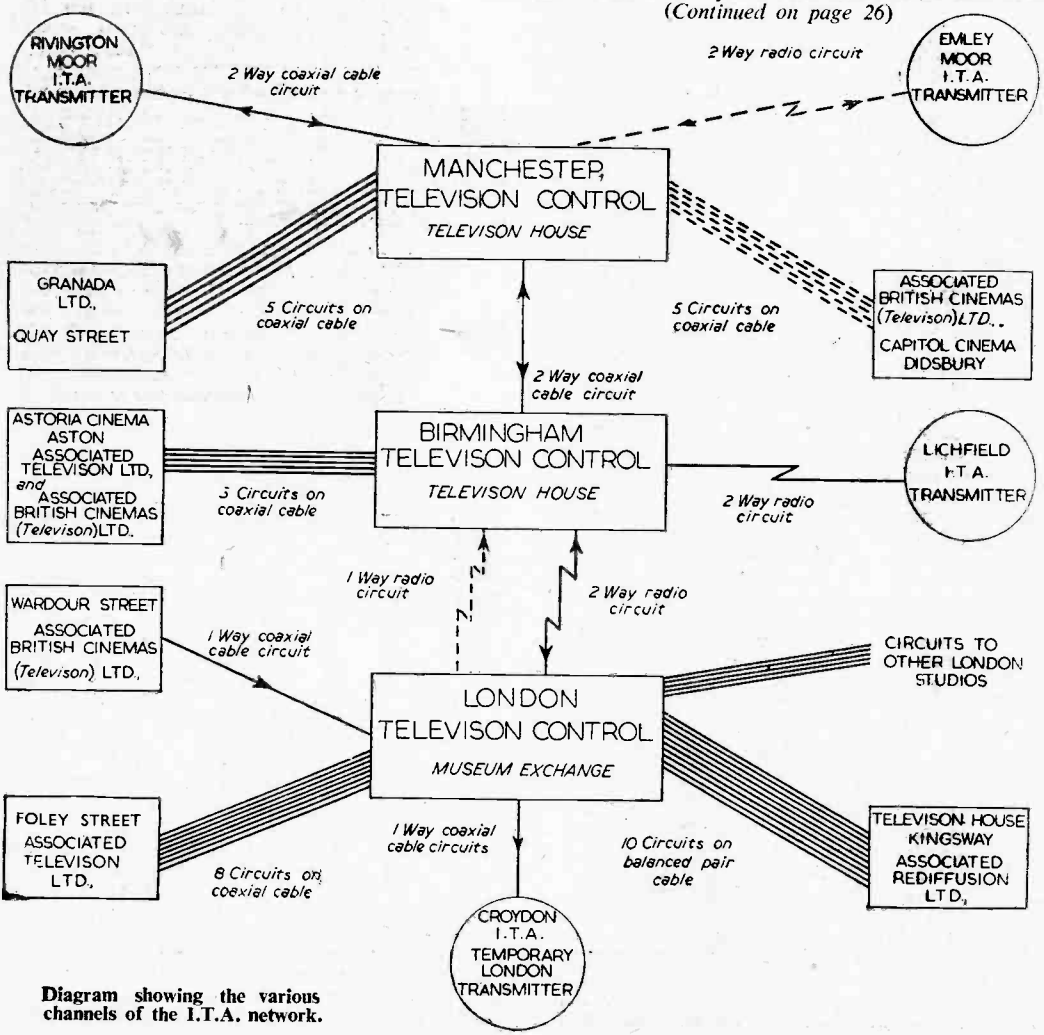
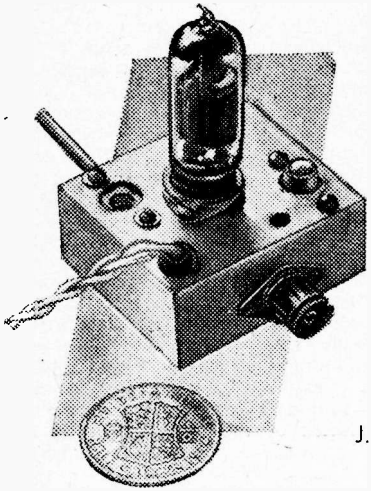



**Diagram showing the various channels of the I.T.A. network.**



# BAND 1 pre-amplifier

## AN INEXPENSIVE PRE-AMPLIFIER FOR IMPROVING RECEPTION

By J. E. Tanner

THE writer was asked to try to improve the reception on a friend's TV. After checking the valves in the R.F. stages, it was decided that a pre-amp. was necessary, and the one shown here was built and is proving very successful; there are no special circuits and everything is quite straightforward. The main feature of it is its small size—only 2¼in. x 2in. x 3¼in. with valve.

### The Circuit

The circuit is built up round the well known EF91 valve. This is very common and is readily available on the surplus market at about 7s. 6d. There is a tuned circuit in the anode and grid, and the decoupling for the anode is provided by a 4.7k. resistor and a 500 pF capacitor. The cathode is by-passed with another 500 pF capacitor. The pre-amp. is very easy to line up and shows no sign of instability. The bandwidth is quite sufficient to give a really good improvement in both vision and sound.

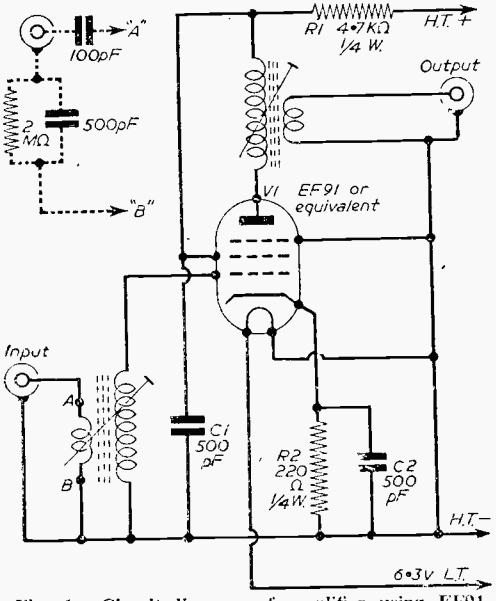



Fig. 1.—Circuit diagram of amplifier using EF91.

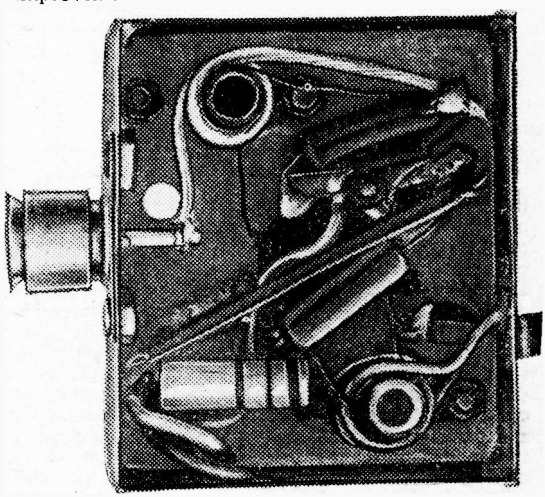


Fig. 3.—Under-view of chassis showing the layout.

### Building the Pre-amp.

First, the chassis should be cut out and bent up: the material used is not critical, but in the original ordinary tin-plate was used because the chassis is sufficiently small to hold itself rigid, and tin-plate is easy to solder at the corners. No special tools are necessary: a hammer, a file, a pair of metal shears, a drill and a soldering iron only were used in the original. The large hole may cause some difficulty, and if a chassis cutter is not available a ring of small holes should be drilled and the edges filed smooth afterwards, a large drill should not be used because it tends to tear and stick. All the holes for cables, core adjustments, etc., should be drilled after clamping the metal firmly between two pieces of wood. The hole for the power supplies should be provided with a grommet. The internal screen should be soldered in position after mounting the valveholder, and the screen soldered to pin 3 on it. This eliminates the need for any wires to pass from one compartment to the other. Any other details regarding the chassis should be self-explanatory from the drawing (Fig. 2). When the chassis is completed and the valveholder and the screen fixed, the coil formers and three-way tag strip should be fixed in their positions. All is now ready to wire up the input compartment; first, wind the coil (11 turns for Channel 1, London) according

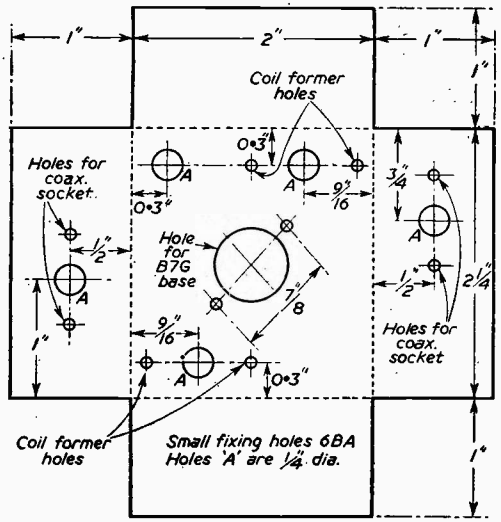



**Fig. 2.—Showing drilling and fixing hole details.**

to the table. Now solder in the cathode resistor and condenser after having previously twisted them together. Connect the "earth" ends of the coil and cathode circuit to a common point in the middle of the screen (no earthing tag provided—it is possible to solder directly to the screen). The aerial input coil is two turns of about 20 gauge P.V.C. insulated cable wound round the aerial coil as near to the centre of the coil as possible. It should be wound in the same direction, and the same end earthed as in the grid coil; the other end goes directly to the co-axial input socket. The other end of the grid coil is wired directly to the grid pin on the valveholder (pin 1). This completes the input compartment. For the position of the bias resistor and capacitor see the drawing of the component layout (Fig. 3). Now proceed to the output compartment; first wire the heater lead from the tag board to pin 4, then wind the coil with the same number of turns as the aerial coil. Take one end to pin 5 and the other to pin 7. Earth pin 6 to the nearest point on the screen. From pin 7 take a 500 pF to the same point on the screen as pin 6, and take a 4.7 k. to the other spare tag on the tag board. The output coupling coil is wound in an exactly similar way to the input coil, with the same number of turns (two). Now connect the three power leads to the tag board, taking care to note which is which.

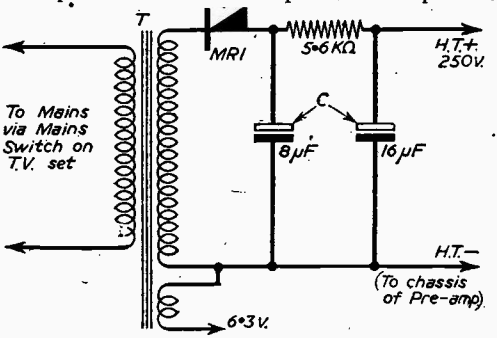



**Fig. 4.—The circuit diagram of the power unit.**
**MR1—Any metal rectifier or combination of rectifiers giving 250 volts at 15 mA. (2 RM1 in series.)**
**T—Mains transformer giving:**
**(i) 250 volts at approximately 25 mA.**
**(ii) 6.3 volts at approximately .3 amp.**
**C—Electrolytic condenser—8 and 16 mfds. 300 volts working.**

### Testing and Lining-up

After checking connect aerial (70 ohm co-axial) to the input and a co-axial lead from the output to the aerial of the set. Connect up the power supplies and switch on. Allow the normal warming-up time to pass, set the contrast and volume controls for maximum gain, reducing them as the signals get stronger. Using a knitting needle filed to a screwdriver shape, or any other similar trimming tool, slowly adjust L1 for maximum vision, then adjust L2 in a similar manner. The sound signal should be strong enough, but if not a slight readjustment of the cores will solve the problem.

### Power Supplies

The current consumption is small enough to permit both the H.T. and the L.T. being taken from the main set. This is permissible in sets with the chassis isolated from the mains, but in the A.C./D.C. type of set a separate power unit is necessary. This can be of standard design and a circuit is given (Fig. 4).

**Coil Winding Table**

| Channel | Turns |
|---|---|
| 1 | 11 |
| 2 | 10 |
| 3 | 9 |
| 4 | 8 |
| 5 | 8 |
| Coupling coils have two turns for all channels. | |

However, some sets use a transformer for L.T. only. In this case the pre-amp. may be used on the existing power supplies, if the aerial socket is mounted on a small paxolin sheet and wired up as shown in dotted lines.

## GLASS PROCESS FOR TV EQUIPMENT

MULTIFORM glass, the result of a new method of fabrication, originally developed in the United States, is now being produced for the first time in Britain at the works of James A. Jobling & Co., Ltd., of Sunderland, world-famous manufacturers of heat-resisting glass.

In this process specially treated glass powders are compressed in moulds and subsequently fused to form a uniform opaque glass, destined in the main for the electronics industry, where high-precision glass parts are required for television tubes and mounting electrodes.

By the new method the existing difficulty of making small and accurately dimensioned articles on long production runs is eliminated, for Multiform glass can be controlled to one-thousandth of an inch.

Production is being initially confined to television gun-mount rods and to small beads which are being manufactured for glass-to-metal seals in order to speed up certain classes of production in the electronics field.

## C.R.T. ISOLATION TRANSFORMER

**Type A.** Low leakage windings. Ratio 1 : 1.25 giving a 25% boost on secondary.
2 v., **10/6**; 4 v., **10/6**; 6.3 v., **10/6**; 10.8 v., **10/6**; 13.3 v., **10/6**.
Ditto with mains primaries, **12/6** each.
**Type B.** Mains Input 220/240 volts. Multi Output 2, 4, 6.3, 7.3, 10 and 13 volts. Input has two taps which increase output volts by 25% and 50% respectively. Low capacity, suitable for most Cathode Ray Tubes. With Tag Panel, **21/-** each.
**Type C.** Low capacity wound transformer for use with 2 volt Tubes with falling emission. Input 220/240 volts. Output 2-2½-2½-2-3 volts at 2 amps. With Tag Panel, **17/6** each.
**NOTE.**—It is essential to use mains primary types with T.V. receivers having series-connected heaters.

**TRIMMERS, Ceramic.** 30, 50, 70 pf., **9d.** 100 pf. 150 pf., **1/3**; 250 pf., **1/6**; 500 pf., 750 pf., **1/9.**
**RESISTORS. All values.** 10 ohms to 10 meg., ½ w., **4d.**; ¼ w., **6d.**; 1 w., **8d.**; 2 w., **1/-.**
**HIGH STABILITY.** ½ w., 1%, **2/-.** Preferred values 100 ohms to 10 meg.

**WIRE-WOUND RESISTORS**
5 watt, 10 watt, 15 watt } 25 ohms—10,000 ohms..... { **1/3** **1/6** **2/-**
15,000 ohms—50,000 ohms, 5 w., **1/9**; 10 w., **2/3.**
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**MAINS TRANS.** 350-0-350, 80 mA., 6.3 v. tapped 4 v. 4 a., 5 v. tapped 4 v. 2 a., ditto 250-0-250, **21/-.**
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5in. Goodmans, **17/6.** 7in. x 4in. Goodmans, **21/-** 3½in. square Elac **21/-.** 8in. Elac. **22/6.**
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8in. M.E. 2.5 k. or 2 k. field, tapped O.P. transf., **24/6.**
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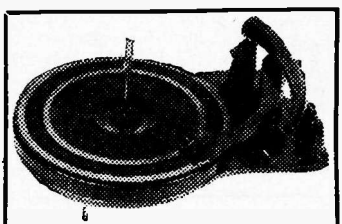

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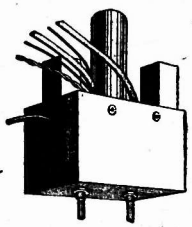

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# CIRCUIT EFFECTS AT HIGH FREQUENCIES

## THE EFFECTS OF STRAY CAPACITANCES

By C. H. Banthorpe

### Decoupling

IT is not always appreciated by the experimenter how important are the effects of stray capacitance and inductance which inevitably become added to a circuit when it is made up from a circuit diagram. These "strays" explain many cases where circuits which appear to be good on paper are disappointing in practice, where wide differences occur between the performance of the same circuit made up by different constructors and, something which must have happened to us all at some time, the difference between the performance of a "breadboard" circuit and the cleaned-up edition.

One danger point is inductance which occurs in the leads of capacitors. For instance, it is important that decoupling capacitors should not only be of a suitable capacity but also of a suitable physical construction. At high frequencies the impedance of the inductance of the leads to a capacitor may be so great that the capacitor will be quite ineffective for decoupling purposes. If the value of a capacitor is chosen to form, with its lead inductance, a series resonant circuit at the operating frequency, then the decoupling effect can be actually improved. Fig. 1 shows two most interesting curves. It will be seen that the capacitor used as a standoff and with a 0.5 cm. lead has a *lower* impedance over the band 10 mc/s to 75 mc/s, approximately, than that of a 1,500 pF. capacitor with no series inductance. Above 75 mc/s, however, the combination becomes much worse than the same capacitor used as a feed-through or than the theoretical 1,500 pF. If the lead cannot be reduced below 0.5 cm. then a smaller value capacitor would provide better decoupling or it should be feed-through connected.

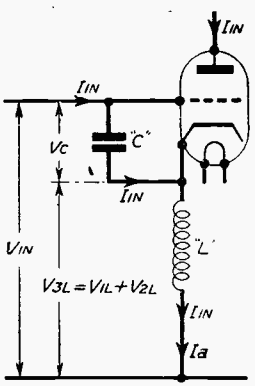



**Fig. 2.—Grid-cathode capacity (C) and circuit constants.**

Sometimes a decoupled point has two capacitors, e.g., a 0.1 $\mu$F and a 0.001 $\mu$F in parallel between it and the point to which it is coupled, chassis, cathode, etc. The object is to provide a low impedance at lower frequencies by means of the larger capacitor and a low impedance at high frequencies by the small capacitor, it being assumed that the inductance of the large capacitor prevents it being effective at high frequencies. What is not always remembered, however, is that the small capacitor may form a parallel resonant circuit with the effective inductance of the larger capacitor and at some frequency practically no decoupling at all will be present.

If the cathode circuit of a valve is not properly decoupled at high frequencies an effective *resistor* can appear between the grid of the valve and earth. This resistor will damp the input circuit and this may be undesirable as too much damping may occur. A simplified explanation of how this resistance appears is as follows.

Assume that at the frequency considered the cathode circuit is effectively an inductance, "L." This is due to the actual length of leads from the real cathode of the valve to the external circuit and to the

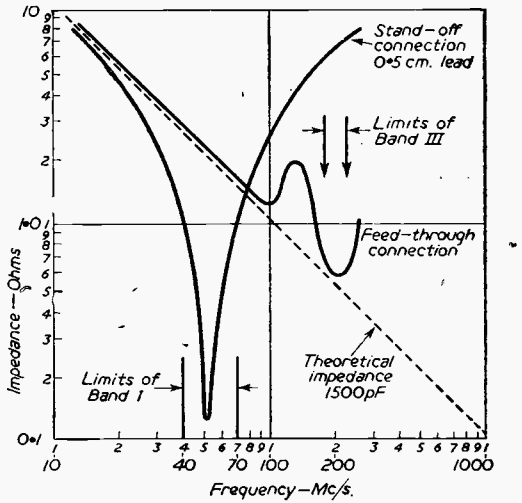



**Fig. 1.—Set of curves for a Dubilier stand-off insulator, reproduced by courtesy of Messrs. Dubilier.**

inductance of the leads of the decoupling capacitor, etc. This assumption is true up to some high frequency, the actual frequency depending upon the type of valve, components and length of wiring. Fig. 2 shows the circuit with the input capacity of the valve shown as "C."

To show that an effective resistor appears across the input, it is only necessary to prove that the input voltage is no longer lagging the input current by 90 deg., as it would be if there were no impedance between the cathode and earth, when "C" would be directly across the input which would, therefore, appear to be purely capacitive to the external circuit.

Fig. 3 shows the vectors of the circuit, the various current and voltages also being marked as on Fig. 2.

An input current Iin flows through "C" and "L" and causes a voltage Vc and VIL, respectively, to appear across each of them, the two voltages being 180 deg. out of phase because the current through a capacitor leads the voltage across it while the reverse is true in the case of an inductor. The voltage developed across "C" by IIN is the grid/cathode voltage of the valve, and this causes an anode and cathode current Ia in phase with Vc. There are thus two currents flowing through "L," one, IIN, produces a voltage VIL which leads IIN by 90 deg. and a

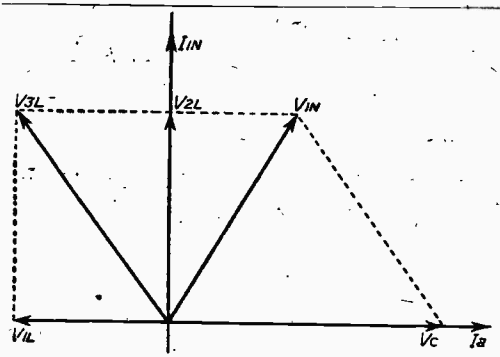



Fig. 3.—Circuit constants of Fig. 2 shown in vector form.

second, IA, which produces a voltage V2L which leads IA by 90 deg. When these two voltages are added together *vectorially* they produce V3L. V3L and Vc added together vectorially produce VIN. It will be seen that VIN is not lagging IIN by 90 deg. as it would be if the input was purely capacitive ("L"=O) but is less than 90 deg.

This is the same so far as the input circuit is concerned, as if the input consisted of a pure capacitor and a pure *resistor* across Vin. The magnitude of the resistance depends, among other things, upon the value of the inductor in the cathode circuit. It will be seen that extra damping occurs in the input circuit if the cathode circuit of the valve is inductive. Other somewhat unexpected effects which occur in circuits and valves at high frequencies will be discussed in later articles.

# New Safety Aid in London Power Station

A NEW type of periscopic television unit, incorporating Marconi industrial TV equipment, has been installed at Barking "C" power station for the remote observation of the interior of a boiler furnace.

With furnaces of the latest type, such as are installed at Barking "C," it is essential that the jet-injected pulverised fuel remains ignited at all burners, otherwise a serious explosion might result. This has hitherto been ensured by constant observation through small inspection doors, but modern boilers have now become so tall that a complete tour of inspection could take half an hour and involve climbing more than 100ft. of galleries and ladders.

The new periscopic TV unit solves this problem by enabling all burners to be observed by one television camera, the resultant picture being displayed on a monitor screen, or screens, at any convenient points in the power station. The comprehensive view obtained is far greater than is possible by direct visual examination through any one inspection door.

Basically, the unit consists of two main assemblies, namely the panoramic periscope and the industrial TV camera.

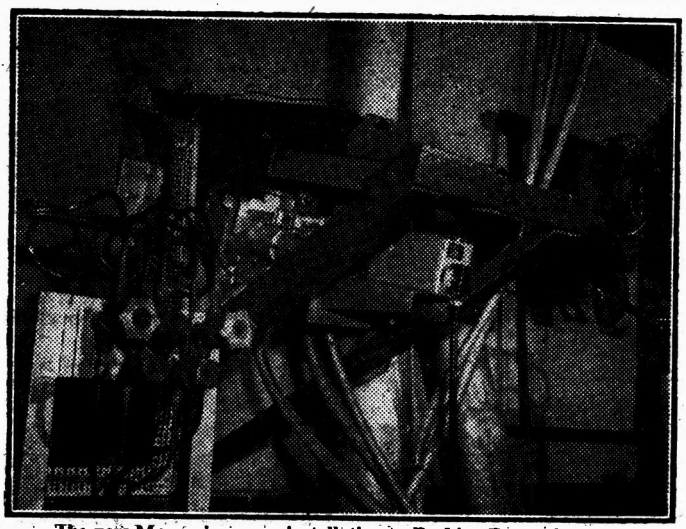
The periscope is completely water-cooled, with an incorporated air-blast to keep fly ash from settling on the lens windows. Twin-entrance apertures are used, with lenses and prisms so arranged that the two fields of view are combined in panoramic form, with a dividing line at the centre of the picture. A field of 90 deg. in one plane and 45 deg. in the other can easily be resolved.

The camera, which forms part of the standard Marconi industrial equipment, measures only 5¼in. by 4in. by 8½in. and weighs only 4½lb. The output from it is fed to a Control Unit and thence to the monitor screens, which may be up to 2,000ft. away from the camera itself.

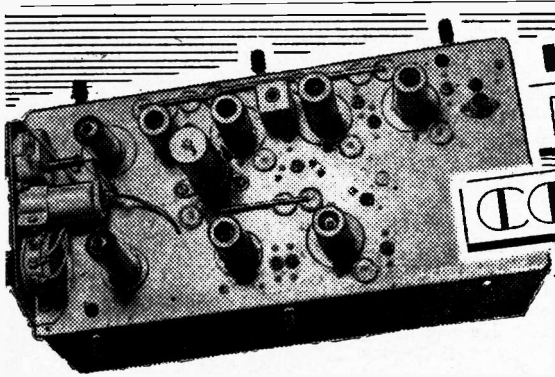
The complete unit is mounted on a carriage which is designed to project the nose of the periscope through a 4 in. diameter aperture in the furnace wall, or to retract the unit from the furnace when it is not required to view the interior. The carriage is power-operated by compressed air, and is remotely controlled. Specially-designed entrance mechanisms ensure that "blow-back" from the furnace cannot occur during the operation, while a full complement of safety interlocks guard against failure of the cooling water or blast air supplies.

The periscope unit is normally used only when lighting-up operations are in progress. When the furnace is operating under stable conditions, the unit is withdrawn and monitoring is taken over by a photo-electric cell. Should the overall brightness of the furnace decrease, the photo-electric cell operates an alarm on the control panel; at the same time the periscope nose is automatically advanced into the furnace, and a picture obtained to show which burner has been extinguished.

The unit has been developed by Babcock and Wilcox Ltd., in conjunction with the British Iron and Steel Research Association, the Foster Instrument Co. Ltd., and Marconi's Wireless Telegraph Co. Ltd.



The new Marconi camera installation at Barking Power Station.



# IMPROVED BAND III CONVERSION

## SOME PRACTICAL SUGGESTIONS

By G. T. Layton

WITH the commissioning of further ITA stations on Band III, the matter of converters for reception of this band is receiving the attention of amateurs in all districts, and from the articles in this journal and also the various pieces of commercial equipment available several methods of approaching this problem are possible. First with existing five-channel receivers such as the later commercial versions, the simplest addition is that of a superhet converter which changes the Band III signal into a Band I signal and feeds into the front end of the existing receiver.

This is not a particularly good method because there is always the danger of the signals being superimposed to a certain extent on each other from set pickup, and there are two oscillators that can drift, although with appropriate rejector coils the former trouble can be overcome. Alternatively with the same type of receiver a better method is to convert the Band III signal to the existing intermediate frequency of the receiver by removing the first valves and plugging into these valve bases. Although this is much improved it still suffers from the disadvantage that the I.F. has a rather low frequency as compared with the incoming frequency. If the existing receiver employs a T.R.F. circuit this form of converter using Band I frequency output will cause interference to others when the converter is in action.

The later type of commercial receiver with the 13-channel turret has a 38 Mc/s I.F. band, is a single superhet, and this particular I.F. band has been carefully chosen by the manufacturers because of its freedom from various troubles. Again this method has its disadvantages, and they are that it does not give a pre-set switchable receiver, in that on changing from one band to the other a fine trimmer on the oscillator always needs to be adjusted, and also the signal strength on each band will inevitably be different and thus the contrast and brilliance will need to be readjusted. In most cases the functioning of this trimmer is quite critical and can only be set right by an experienced operator on test card C. It follows that in general due, to the difficulty of recording the true setting on all controls when changing from one band to the other, most of such receivers will not be set correctly by the average householder and only passable results will normally be obtained. Apart from this it must be remembered that these turret switches are operating a very high frequency and, as such, dirt and wear on these switches will in due course cause trouble, particularly when one considers that they may be switched to and fro several times in an evening. There are obvious reasons why this method is used commercially, but it does not follow that this is the best method for an amateur to adopt. In the case of an amateur he is only interested at present in the reception of two stations, but they should be receivable in a perfectly adjusted state and the other members of the household should be able to change by the operation of one simple switch giving immediate results.

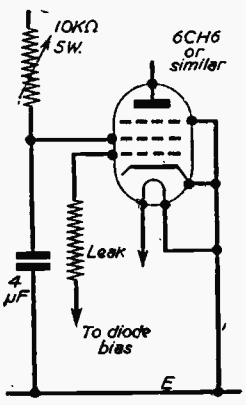



**Fig. 12.—Video output with variable bias and variable screen volts.**

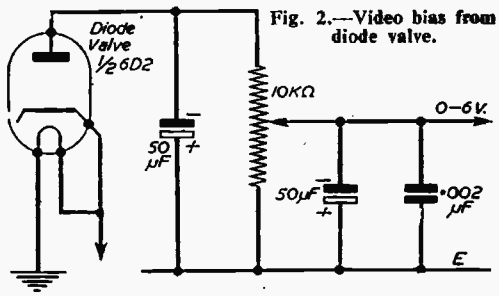



**Fig. 2.—Video bias from diode valve.**

### Preferable Arrangement

Given an existing set which is a T.R.F. of the type so popular amongst amateurs such as the Viewmaster, the obvious course is to convert the existing set to an I.F. strip on the 38 Mc/s band similar to the description in this journal some months ago. As a matter of interest there are one or two modifications incorporated in addition to those mentioned in this article. For example, the replacing of the coils as suggested makes a fairly extensive alteration and it is worth while to replace the EF50s by modern miniatures such as 6F12 as shown, 6CH6 as a video output valve and EL84 as a sound valve. At the same time provision of bias by a diode rectifying the heater current is a more convenient method of supplying the bias to the video output valve than the original Viewmaster (see Figs. 2 and 12). In inserting

the new modern miniature valves blanks need to be cut to fill the existing holes, with smaller holes cut for the miniature valves, and then a small tinplate screen can be soldered in to make the necessary screen between anode and grid (which is the underside view of this chassis). Having completed the I.F. strip it is highly desirable to line this up as accurately as possible by feeding in signals around the 35-40 Mc/s band. The writer used a Televet instrument which very conveniently combines a signal generator and oscilloscope with which the output curve can be thrown up on the screen of the oscilloscope tube as in Fig. 3. In this figure the 3 Mc/s frequency has been marked on. The aligning can, however, be carried on with any good calibrated signal generator. In this case signals of the various frequencies would need to be fed in and the A.C. voltmeter could be connected across the video load resistance so that the voltage could be read at each frequency and the characteristic curve could be drawn after this. It is, as previously mentioned, very desirable to be quite certain that the I.F. amplifier is functioning as near perfectly as possible before proceeding to the next stage.

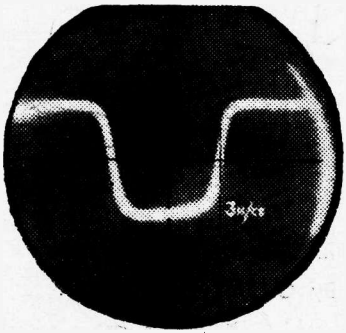


Fig. 3.—Shows the overall response of the I.F. unit.

### The Converters

On the market at the moment one can purchase simple sets of coils and chassis as supplied by Creton Radio, of Portsmouth, and one of the types is arranged for a cascode first valve followed by a frequency changer, the circuit being as conventionally used in most converters. The chassis is already punched and is quite small. The units are designed to be coupled in front of existing five-channel receivers for use when receiving Band III and to be disconnected when reverting to Band I. On building up one exactly as suggested to the circuit of Fig. 4, the signal could be fed into any existing receiver to check that this converter is

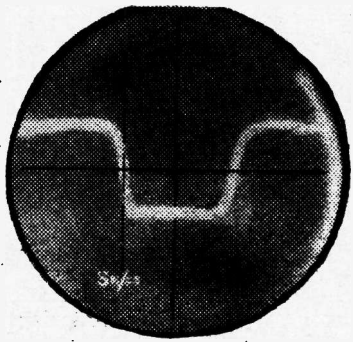


Fig. 5.—The overall response on Band III.

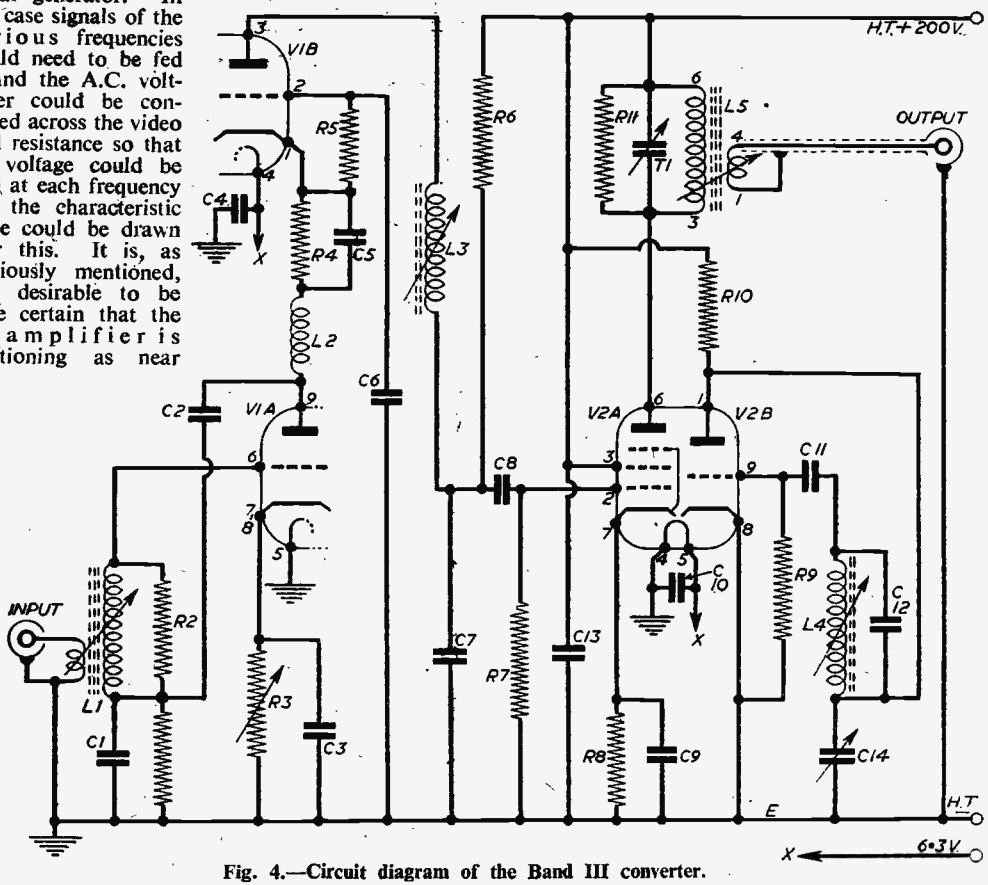



Fig. 4.—Circuit diagram of the Band III converter.

functioning as designed. However, it is necessary to make certain modifications due to the fact that in the I.F. strip, following normal practice, the sound frequency is arranged to be above the vision frequency whereas on the transmission the sound frequency is below the vision frequency (see Fig. 5). Thus with the oscillator running at a frequency above the incoming signal the necessary reversal will take place to give the desired characteristic. The oscillator coil as supplied by this firm consists of about eight turns of wire, whereas, in fact, only three are required at 1/16th spacing. It is well worth while experimenting with the number of turns and spacing finally required, because if this coil is made just right size, as the iron slug is screwed on there will be a very slow change in frequency and thus the adjustment will be less critical than if a close-wound coil is used in its stead. The ideal size of this coil is such that with the end of the iron slug entering to about the centre-line of the coil the right frequency is achieved. As regards the output coil of this design this will without alteration comfortably cover the 38 Mc/s band. Having made this up completely it can then be connected to the I.F. unit and tested on Band III signals. It will be noted that a low value of pre-set contrast control is used to give easy operation, and a further fixed resistance could be inserted in series if required.

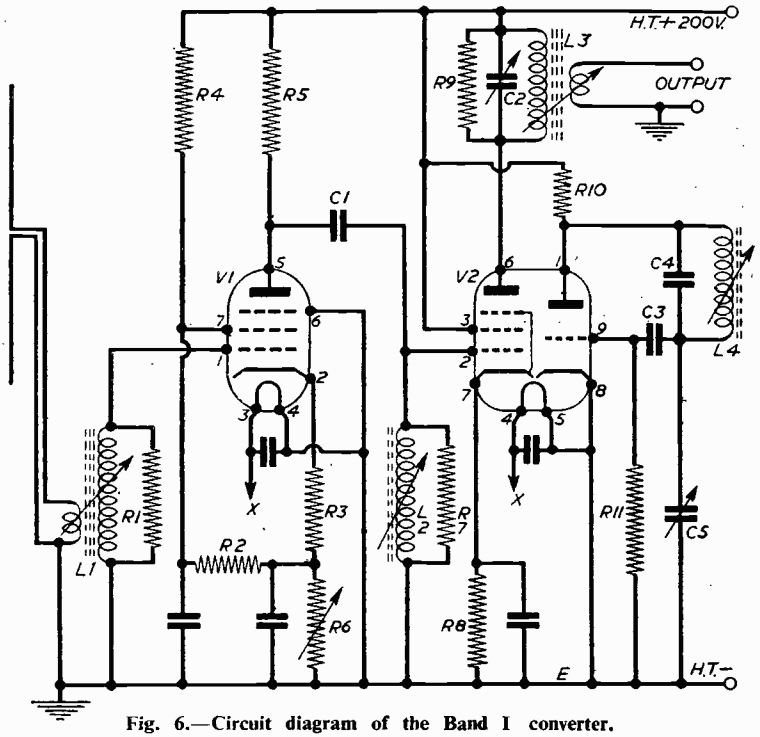



**Fig. 6.—Circuit diagram of the Band I converter.**

### The Second Unit

Similarly another unit can be made up in a slightly different fashion to convert the Band I signal to 38 Mc/s. In this case not all of the coils in the kit are required, as from Fig. 6 it will be seen that an ordinary R.F. valve is used in this case, plus a frequency changer, as there is not much point at these frequencies in using a cascode stage. The extra coils that need to be made are perfectly normal and very similar to the original first coils in a Viewmaster receiver. Having completely wired this, it can be added to the I.F. unit and tested for Band I signals.

*In the continued article we will give details on the connecting up of the two units as described in these pages, and also further information on the alignment of these converters.*

*(To be continued)*

## TABLE OF VALUES

**All Resistors ½ w. with the exception of R10 which is 1 w.**
**MINICOIL COILSET. L1—Blue Spot. L2—Resonant Coil. L3—Green Spot. L4—Black Spot. L5—Red Spot.**

**BAND I UNIT**

| | | |
|---|---|---|
| V 1—GF12 | L2—12t | |
| V 2—ECF82 | L3—14t-2t | |
| R 1—4.7 k Ω | L4—6t spaced | |
| R 2—220 k Ω | C1—75 pF | |
| R 3—50 Ω | C2—2-10 pF | |
| R 4—1 k Ω | C3—10 pF | |
| R 5—4.7 k Ω | C4—5 pF | |
| R 6—1 k pot. | C5—1-5 pF | |
| R 7—4.7 k Ω | Other Condensers— | |
| R 8—680 Ω | 1,000 pF | |
| R 9—3.3 k Ω | (L3 Minicoil C Red | |
| R10—10 k (1 w.) | Spot) | |
| R11—22 k Ω | (L4 Minicoil C Black | |
| L1—1½t-13t | Spot) | |

**BAND III UNIT**

| | |
|---|---|
| R1—47 k Ω | V2—ECF82 |
| R2—10 k Ω | C1, C11—10 pF |
| R3—1 k pot. | C2—2 pF |
| R4—100 Ω | C3, C4, C6, C9, C10, |
| R5, R9—22 k Ω | C13—1,000 pF |
| R6—1 k Ω | C5—100 pF |
| R7—220 k Ω | C7—2,000 pF |
| R8—680 Ω | C8—25 pF |
| R10—10 k Ω | C12—3 pF |
| R11—3.3 k Ω | T1—2-10 pF |
| V1—ECC84 | C14—1-5 pF |

provided to sites on high ground at Kensington and Highgate which serve as radio reception points for the longer distance outside broadcasts. With the exception of the circuit to the London I.T.A. transmitter, all of the studio vision circuits have been provided on standard coaxial cables containing coaxial tubes of diameter ⅜in. The vision signals on the shorter circuits are transmitted directly in the video frequency spectrum 0-3 Mc/s; but, on the longer circuits, vestigial sideband carrier transmission is used, the vision signals being translated into the carrier spectrum 3-7 Mc/s. The circuit to the London transmitter also operates in this spectrum. The cable, however, is a low-loss type containing coaxial tubes of diameter 0.975in. which enables the distance of approximately nine miles to be spanned without the aid of intermediate amplifiers.

The opening of the Independent Television service on 17th February, in Birmingham, necessitated the provision of vision and sound circuits from Museum to the Post Office Television Control at Telephone House, Birmingham. This in turn was extended to the new transmitter at Lichfield, and to the master control of the two programme companies at the Astoria Cinema, Aston. Additional circuits in London were also provided for Associated British Cinemas (Television) Ltd.—week-end contractors for Birmingham. The London-Birmingham vision link consists of a two-way radio circuit operating at 900 Mc/s. Later this year, the link will be reinforced by the addition of a second vision circuit working in the north-going direction.

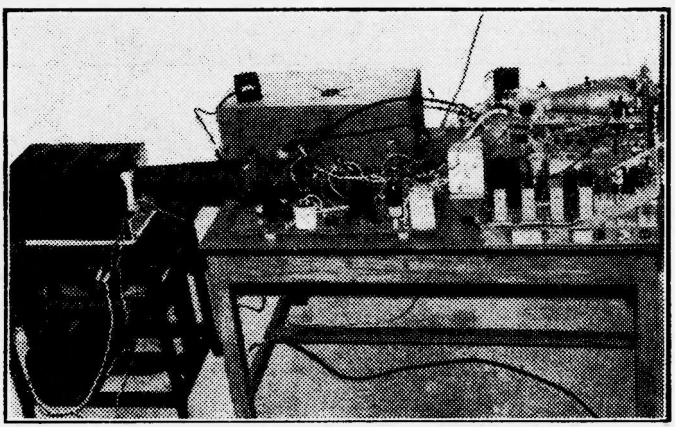
# *Experimental Closed Circuit TV System*

SO far India has no television service, and perhaps the greatest attraction for many visitors to the recent Indian Industries Fair which concluded in New Delhi in December, 1955, was TV demonstrated by American, Dutch and Russian organisations. After witnessing radio and closed-circuit TV, also large-screen television for the first time, I decided to see what I could do to rig up quickly a simple low-cost experimental TV system using ex-radar equipment throughout. The results have been very promising.

A 5FP7 flying-spot C.R.T. in an AN/APS3 deflection and focus-coil housing (see front centre of illustration) scans a slide or film transparency, and the resulting light impulses are picked up by a 931A PM phototube as in wartime radar-video-mapping systems. A 6AC7 amplifier with cathode-coupled output followed by five stages of 6AC7, video amplification (3 Mc/s bandwidth) boosts the signals, which are then applied, via co-ax. cable, to the grid of a 5CP1 receiving C.R.T. unit (see respectively extreme left, and right rear of illustration). L.F. compensation is provided in the anode circuits of the amplifier, and there is an H.F. peaker in the third stage.

It was originally intended to use the 100 kc/s crystal-controlled step-down counter chain of a Loran indicator (AN/APN4) to trigger the line and frame timebases, but satisfactory results were obtained from the 20 kc/s blocking oscillator for line-scan sync, and 50-cycle power-supply for frame sync, so several tubes were saved. A 2-valve 50-cycle frame timebase is incorporated in the Loran indicator (right-rear) and a similar 2-valve unit with modified R-C constants was built as a line timebase (see small box in centre of table). The TV raster can be adjusted for sequential scans up to 400 lines. The timebases are common to both transmitting and receiving C.R.T.s. The 5FP7 magnetic tube uses a 6SN7 (with both sections in parallel) as a frame-coil driver, and an 807 line-coil driver. In both cases low-power audio modulation-transformers were used for coupling to the deflection coils.

The power-supply portion of the Loran receiver (see illustration right front) is arranged to supply low, medium and high tension voltages to the whole equipment, with the exception of the video amplifier, which has an independent 50-cycle mains-operated power unit. As the 5FP7 C.R.T. requires an accelerating potential of 6 kv, a second Loran 3,000 volt high tension unit, in series, makes up the difference. This is housed in a safety wooden box (see rear centre of picture). An input power source of 115 volts 400 cycles is required for the Loran equipment so all unnecessary valves were removed from their sockets in order to conserve power, and to ensure that only a few minor wiring modifications are required in the Loran units.



The experimental layout referred to by Mr. Sweet.

**Valve Complement**

Power Supply: 1-5U4 for H.T. and 2-2X2 for EHT (also 2-2X2 for second EHT unit).

C.R.T. Indicator Unit: 1-6SN7 20 kc/s blocking oscillator, 1-6SJ7 frame sweep generator, 1-6SN7 frame sweep inverter and input sync, 1-6H6 C.R.T. D.C. restorer, 1-5CP1 C.R.T.

Line Timebase: 1-6SJ7 sweep generator, 1-6SN7 sweep inverter and input sync.

Flying-spot Scanner and Driver Unit: 1-6SN7 frame-scan driver, 1-807 line-scan driver, 1-5FP7 C.R.T.

Video Amplifier and Pick-up unit: 6-GAC7 TV pentodes, 1-931A photo-multiplier.—C. M. SWEET.

# Simplified Fault Finding

IMPROVISED METHODS FOR THE HOME CONSTRUCTOR

By B. L. Morley

(*Continued from page 535 July Issue*)

AN interesting point to note is that if there is a serious discrepancy in the components so that the frequency is above 50 c.p.s. then this will be revealed by the pitch of the tone produced.

The frame oscillation can be traced through the amplifier circuit to the scan coils or the deflector plates themselves but the precaution of disconnecting the EHT should always be taken.

As with the line circuit it is advisable to disconnect the aerial or to take out the sync separator valve.

Our simple test instrument can also be used for checking infiltration of line oscillations into the frame circuit by simply taking out the frame oscillator valve and listening for the line whistle. Similarly a check can be made for infiltration of the frame oscillations into the line circuit by taking out the line valve.

Note that in electromagnetic circuits some induction takes place between the two sets of scan coils and it is possible to detect infiltration in the outputs to a certain extent.

### Sync Faults

A rough check on the operation of the sync circuits can be made and the sync pulse examined.

A typical sync separator as used in many receivers is shown in Fig. 8. This particular example is again taken from the PRACTICAL TELEVISION Simplex televisor.

Using the test instrument as before with the test lead on point "A" it should be possible to hear the composite video signal; this will indicate that the signals are actually reaching the sync valve.

The next step is to take out the line oscillator valve and the frame oscillator valve, it should then be possible to hear the line sync pulses at "B" and at "C," and the frame pulses at "D." The point "E" occurs before the integrator circuit and will not give a true representation of the frame sync pulses.

Note that the oscillator valves *must* be removed or the oscillations produced by them will mask the sounds produced by the sync pulses.

Note also that because of the small value of the condenser "C" the line sync pulses will sound rather on the faint side. In this case it is often helpful to connect the testing point to the pick-up sockets of a broadcast receiver.

### Sound Receiver Faults

So far as the audio side of the sound receiver is concerned, normal audio technique can be employed. The earphone tester will, however, prove quite useful in enabling the sound to be traced.

The usual form of supplying sound is by tapping the R.F. or I.F. from the vision stages at some point, providing a further stage or stages of R.F. or I.F. amplification followed by detector, noise limiter, first sound amplifier and finally sound output.

With the phones tester, tests can be made from the loudspeaker back to the dectector. A simple and rapid check of the audio stages is to tap the grid of the first audio valve with the finger and a "plop" or howl should be heard in the loudspeaker if the stages are functioning.

It is a little more difficult to test the I.F. or R.F. stages, but a rough check can be made by connecting the phones across the L/S output and tapping the detector input with the blade of a screwdriver. A distinct click should be heard if all is well.

The screwdriver blade can be used to make a rough check of the R.F./I.F. stages working from the grid of the valve nearest to the detector to the grid of the valve nearest the aerial.

Finally a short-circuit tapped across the aerial should be heard in the phones.

As each stage amplifies then the clicks should become louder as the aerial circuit is approached. If, for example, a click is heard at the last I.F. or R.F. stage and a fainter click is received from the next stage nearest the aerial then weak amplification in the intervening stage is suspected.

The "click" test will prove that the circuit is "alive" and through, but no more; it will not prove that the coils are tuned correctly, for example, but nevertheless will provide a good method of making a check when the receiver seems dead.

### Vision Receiver

The vision receiver can be roughly checked in a similar manner to the sound receiver. The phones can be connected between the anode of the video valve and chassis (including the condenser in the circuit to act as a D.C. block). A more sensitive arrangement is to insert the phones without the condenser directly between the anode of the video valve and the load resistor.

The video valve can be tested by tapping the grid and a click should be received if all is well. The test can then proceed by tapping the input of the

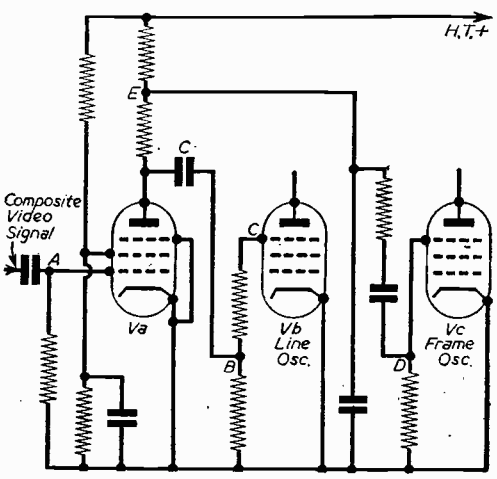



**Fig. 8.—A typical sync circuit.**

detector valve, then the grid of the last R.F. or I.F. valve and so on up to the aerial circuit.

In the case of a superhet tuned to a suitable intermediate frequency, such as 13 Mc/s, a useful check is to attach a lenth of wire to the grid of the first I.F. valve. If this is done, stations operating at the same frequency as the I.F. tuning should be heard in the phones.

If the EHT is disconnected the video signal can be traced right through to the grid or cathode of the C.R.T. and the circuit proved right through.

An important point to note is that the phones should be disconnected when attempting to receive the picture on the tube. At the worst condition the signal will be severely attenuated so far as the tube is concerned, so that it will not produce a picture ; at the best the resultant picture will be of very poor quality and difficult to identify.

**Checking the Video Signal**

As we have indicated in the foregoing section, it is possible to check the video signal right through to the C.R.T. It is quite easy to identify as it sounds like a rather rough mains hum mixed up with motor-boating and which varies in pitch, up and down.

There are two points which should be observed about this signal. First, it sounds similar to the frame oscillator and can sometimes be mistaken for it. This is especially true where, due to lay-out or stray wiring, etc., induction exists between the receiving circuits and the timebases. If the frame oscillations get into the sound section it makes a noise like vision on sound which cannot be tuned out ; if it gets into the vision stages it may be mistaken for the vision signal.

A second important point is that it is possible to receive the sound signal through the vision stages. This is often a useful check that the stages are working, but confusion is liable to arise when both signals, sound and vision, are received together.

This is particularly noticeable with wide-band straight receivers, especially where a VCR97 tube is employed. The VCR97 is much less sensitive than commercial magnetic tubes and quite a large volume of sound signal is allowable before the picture becomes affected. The main point is to keep the sound as low as possible by correct adjustment of rejector coils and it should be quite practicable to keep it low enough so as not to trip the sync or to produce bands on the screen.

**Other Simple Checks**

Our simple little tester in Fig. 1 can be used to make a rough check of the aerial system. If a folded dipole is used then a test across the ends will show that the cable is through to the aerial. The evidence of the tester is not wholly conclusive, however, for a short-circuit in the junction box, etc., would also light the lamp.

If the aerial is not one of the folded dipole types then a check with the tester across the cable ends would show if a short-circuit existed ; it would not, however, show if one of the leads was disconnected.

The tester can be used to check the continuity of tuning coils and for short circuits to chassis, but it will not test the continuity of anything which has a resistance greater than a few ohms.

A method which can be used to check such items is to employ a good condenser of about 4 $\mu$F or more. If the article to be tested (say a loudspeaker transformer) is connected in series with the condenser, H.T. and chassis, then the condenser will charge up. If the condenser is disconnected and then short circuited a spark should be obtained if the item tested was continuous.

Fig. 9 shows the method to be employed.

A useful method of tuning in the signal in a weak area where it is thought that the coils may possibly be wrongly wound is to use the audio side of the sound section of the televisor.

All that is necessary is to disconnect the output of the sound detector from the audio input and to connect, in its place, the output of the video detector. A useful increase in amplification is obtained which will enable a weak signal to be detected.

In some cases, where picking up of the signal proves very difficult it is helpful to make use of the sound I.F. or R.F. stages. In this case the output from the last vision R.F. or I.F. valve is taken to the input of the first sound I.F. or R.F. stage, the existing coupling between the two stages being disconnected.

This method has some danger in it as the circuits are liable to break into oscillation. It can, however, prove very useful on many occasions.

One of the difficult things to check without instruments is the functioning of an oscillator. It is very useful to know if a valve is oscillating or not in the case of a superhet and it is possible, in some cases, to employ a simple bulb tester.

The basic tester is shown in Fig. 10 and is very simple to construct. A two-turn coil is made which should be of sufficient diameter to go over the oscillator coil without actually touching it. Ideally a $\frac{1}{4}$in. gap should be between the two coils (the oscillator coil and the testing coil) all round.

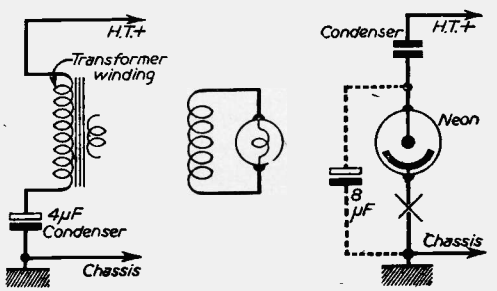
The turns of the coil should be separated by about $\frac{1}{8}$in. The wire should be of heavy gauge (preferably of about 10 s.w.g.) and should be insulated.

The two ends of the coil are taken directly to a low consumption bulb, a rear-lamp cycle bulb of about 0.04 amp. rating, or a peanut bulb should do the trick.

If the coil of the tester is closely coupled to an oscillating circuit the bulb will light up. If the oscillations are very weak the bulb will only light dimly or will not light at all.

Confirmation that the bulb is lighting due to the oscillator functioning can be verified easily by temporarily short-circuiting the oscillator grid to chassis, whereupon the bulb should go out.

Leaky condensers are one of the bugbears of the constructor who employs ex-Govt. parts and only careful testing will show the good ones.



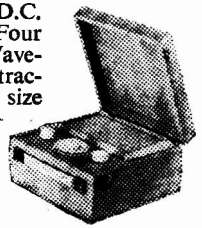

**Figs. 9, 10 and 11.—Testing for continuity ; an oscillator tester, and (right) a condenser test.**

# FOR VALVES—GUARANTEED NEW AND BOXED

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| OZ4 | 6/- | 6F14 | 12/6 | 9006 | 6/- | ECC31 | 3/6 |
| 1A3 | 6/- | 6F15 | 14/- | 954 | 2/- | ECC40 | 14/- |
| 1A5GT | 8/6 | 6G6G | 4/- | 955 | 4/6 | ECC84 | 14/6 |
| 1C2 | 10/6 | 6H6 | 3/6 | 956 | 3/6 | ECC85 | 12/6 |
| 1A7GT | 11/6 | 6J5G/GT | 5/- | 10C1 | 12/6 | ECF82 | 15/- |
| 1C5GT | 9/6 | 6J5M | 6/6 | 10C2 | 12/6 | ECH35 | 13/6 |
| 1H5GT | 10/6 | 6J6 | 7/6 | 10F1 | 12/6 | ECH42 | 11/- |
| 1L4 | 6/6 | 6J7G | 6/6 | 10F9 | 12/6 | ECL80 | 10/6 |
| 1LD5 | 6/9 | 6K6GT | 7/- | 10P13 | 11/6 | EF37A | 9/- |
| 1N5 | 10/6 | 6K7G/GT | | 12A6 | 6/9 | EF22 | 8/6 |
| 1R5 | 8/- | | 5/9 | 12AH7 | 6/9 | EF41 | 11/6 |
| 1S5 | 7/6 | 6K7 | 6/9 | 12AT7 | 9/6 | EF42 | 13/6 |
| 1T4 | 7/6 | 6K7G | 5/9 | 12AU7 | 9/6 | EF80 | 11/6 |
| 1U5 | 8/- | 6K7GT | 6/9 | 12AX7 | 10/- | EF86 | 13/6 |
| 2X2 | 4/- | 6K8G | 8/9 | 12BA6 | 9/6 | EF89 | 13/6 |
| 3A4 | 7/- | 6K8GT | 9/6 | 12BE6 | 10/- | EL2 | 12/6 |
| 3Q4 | 9/6 | 6L6G | 9/- | 12H6 | 5/- | EL35 | 7/6 |
| 3Q5 | 10/- | 6L7M | 7/6 | 12J5 | 6/- | EL41 | 11/6 |
| 3S4 | 8/6 | 6N7 | 7/- | 12J7 | 9/6 | EL84 | 12/- |
| 3V4 | 8/6 | 6R7 | 9/- | 12K7 | 9/6 | EL91 | 5/- |
| 4D1 | 3/- | 6SA7GT | 8/- | 12K8 | 11/- | EM34 | 11/6 |
| 4Z | 8/- | 6SG7 | 7/6 | 12Q7 | 9/6 | EM80 | 11/- |
| 5R4Gy | 9/6 | 6SH7 | 6/- | 12SC7 | 2/6 | EY51 | 12/6 |
| 5U4G | 8/6 | 6SJ7GT | 8/- | 12SG7 | 7/6 | EY86 | 14/6 |
| 5Y3GT | 8/6 | 6SK7 | 5/6 | 12SH7 | 5/6 | EZ40 | 10/- |
| 5Z4G | 8/9 | 6SL7 | 8/- | 12SJ7 | 8/6 | EZ41 | 11/- |
| 6A7 | 11/6 | 6SN7 | 8/- | 12SK7 | 6/6 | EZ80 | 10/6 |
| 6A8GT | 10/6 | 6SQ7 | 9/3 | 12SQ7 | 9/6 | E1148 | 2/- |
| 6AC7 | 6/6 | 6S8T | 8/- | 12SR7 | 7/6 | EY91 | 7/- |
| 6AG5 | 6/6 | 6U4GT | 15/- | 15D2 | 5/- | FW4/500 | |
| 6AK5 | 6/6 | 6U5G | 8/6 | 20D1 | 10/6 | | |
| 6AK7 | 8/- | 6U7G | 9/- | 20L1 | 12/6 | GZ32 | 12/6 |
| 6AL5 | 7/- | 6V6G/GT | 7/6 | 25L6GT | 9/6 | H30 | 5/- |
| 6AM5 | 5/- | 6X4 | 8/- | 25U4GT | | HL2 | 5/6 |
| 6AM6 | 7/6 | 6X5G/GT | | 25Y5 | 9/9 | HL1320 | 4/- |
| 6AQ5 | 9/- | | 7/9 | 25Y5G | 9/9 | HL23DD | 8/- |
| 6AT6 | 8/9 | 7B6 | 9/6 | 25Z4G | 9/6 | HP211C | 6/9 |
| 6B4 | 5/- | 7B7 | 9/- | 25Z6GT | 9/6 | HP4101 | 6/- |
| 6B8 | 4/- | 7C5 | 8/6 | 35L6GT | 9/- | KL35 | 8/6 |
| 6BA6 | 8/- | 7C6 | 9/- | 35Z5GT | 9/- | KT2 | 5/- |
| 6BE6 | 9/- | 7Q7 | 8/- | 35Z4GT | 9/- | KT33C | 10/6 |
| 6BW6 | 8/6 | 7R7 | 8/6 | 50L6GT | 9/- | KT66 | 12/- |
| 6C4 | 7/- | 787 | 9/- | 807 | 6/6 | KTW63 | 8/6 |
| 6C5GT | 7/6 | 7Y4 | 8/6 | 954 | 2/- | KTZ41 | 6/- |
| 6C6 | 6/6 | 75 | 10/6 | 955 | 4/6 | LP230 | 6/9 |
| 6C9 | 10/6 | 77 | 8/- | 956 | 3/6 | MS/Pen | 5/- |
| 6CH6 | 9/- | 80 | 8/6 | 10C1 | 12/6 | MS/Pen | 7/- |
| 6D6 | 7/3 | 807 | 6/6 | 10C2 | 12/6 | N709 | 12/- |
| 6F1 | 13/6 | 8D2 | 2/9 | 10F1 | 12/6 | P41 | 9/- |
| 6F6G | 7/6 | 9D2 | 3/9 | 10F9 | 12/6 | P61 | 6/9 |
| 6F6M | 8/6 | 9001 | 5/6 | 10P13 | 11/6 | P215 | 5/- |
| 6F11 | 13/- | 9003 | 5/6 | 12A6 | 6/9 | PEN25 | 6/- |
| 6F13 | 14/- | 9004 | 5/6 | 12AH7 | 6/9 | PEN46 | 8/6 |
| | | | | 12AT7 | 9/6 | PEN220A | |
| | | | | 12AU7 | 9/6 | | 4/- |
| | | | | 12AX7 | 10/- | PCC84 | 13/6 |
| | | | | 12BA6 | 9/6 | PCF80 | 13/6 |
| | | | | 12BE6 | 10/- | PCF82 | 12/6 |
| | | | | 12H6 | 5/- | PCL83 | 12/6 |

| | | | |
|---|---|---|---|
| PL81 | 12/6 | U403 | 10/- |
| PL82 | 11/6 | U404 | 11/6 |
| PL83 | 13/- | UAF42 | 12/6 |
| PP225 | 5/- | UB41 | 9/- |
| PX28 | 15/- | UBC41 | 11/- |
| PY80 | 10/- | UCH42 | 11/- |
| PY81 | 11/6 | UF41 | 11/6 |
| PY82 | 10/6 | UL41 | 11/6 |
| QP21 | 7/6 | UY41 | 10/6 |
| R19 | 13/6 | UU9 | 9/- |
| SP22 | 6/- | VR21 | 3/- |
| SP220 | 6/9 | VR53 | 6/6 |
| U10 | 9/- | VR54 | 2/- |
| U22 | 8/- | VR55 | 7/6 |
| U25 | 13/6 | VR56 | 6/- |
| U403 | 10/- | VR57 | 8/- |
| U404 | 11/6 | VR65 | 3/6 |
| UAF42 | 12/6 | VR65A | 3/3 |
| UB41 | 9/- | VR66 | 3/9 |
| UBC41 | 11/- | VR91 | 5/6 |
| UCH42 | 11/- | VR91SYL | |
| UF41 | 11/6 | | 7/6 |
| UL41 | 11/6 | VR92 | 2/- |
| UY41 | 10/6 | VR105/30 | 7/6 |
| UU9 | 9/- | VR116 | 4/- |
| VR21 | 3/- | VR119 | 4/- |
| VR53 | 6/6 | VR136 | 7/- |
| VR54 | 2/- | VR137 | 5/6 |
| VR55 | 7/6 | VR150/30 | 8/- |
| VR56 | 6/- | VP23 | 8/- |
| VR57 | 8/- | V870 | 3/- |
| VR65 | 3/6 | VT52 | 8/- |
| VR65A | 3/3 | VT501 | 6/- |
| VR66 | 3/9 | VU39 | 8/9 |
| VR91 | 5/6 | VU64 | 9/- |
| VR91SYL | | VU111 | 3/6 |
| | 7/6 | VU120A | 3/- |
| VR92 | 2/- | W77 | 8/6 |
| VR105/30 | 7/6 | W61 | 8/- |
| VR116 | 4/- | X65 | 10/- |
| VR119 | 4/- | X66 | 11/6 |
| VR136 | 7/- | X78 | 12/6 |
| VR137 | 5/6 | Y63 | 9/- |
| VR150/30 | 8/- | | |
| VP23 | 8/- | | |
| V870 | 3/- | | |
| VT52 | 8/- | | |
| VT501 | 6/- | | |
| VU39 | 8/9 | | |
| VU64 | 9/- | | |
| VU111 | 3/6 | | |
| VU120A | 3/- | | |
| W77 | 8/6 | | |
| W61 | 8/- | | |
| X65 | 10/- | | |
| X66 | 11/6 | | |
| X78 | 12/6 | | |
| Y63 | 9/- | | |

# A NEW ALPHA KIT FOR YOU TO BUILD



**Modern Portable.** A.C./D.C. Mains/Battery Receiver. Four valves (latest types), 2 Waveband Superhet. In an attractive Lizard Grey Case, size 8¾in. x 8½in. x 4½in. Full Kit of Parts down to last nut and bolt.

## £9.9.0

Or if you prefer you can build the battery version first for **£7.17.6** and add the mains components later.

Post extra on Kit, 2/6.
Full Circuit Diagram, Shopping List, and Point-to-Point Wiring Diagram, 3/-.

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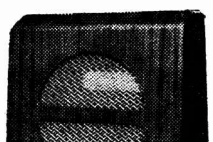
Aerialite Band III Aerials, 5-element, 702XU. An array with Universal 1in-2in. masthead bracket, suitable Channels 8, 9, and 10. Price 41/- carriage 4/6.
Aerialite Coaxial Outlet Boxes at **4/6** each.
Aerialite Coaxial Plugs and Sockets at **1/1** each.

**TRANSFORMER MT6**

Small mains transformer suitable for T.V. convertors, etc. Primary 230 v., Secondary 250 v., 40 M/A and 6.3 v. 1.5 amp. Price **15/6** each, postage 1/6. Transformers T1154N, **25/-** each; T1154H, **27/-** each; T1154, in rough condition, **15/-** each. Carriage and postage on these three is 1/6. Meters 0-100 M/A, panel mounting, **7/6** each; 0-5 amp. R.F. panel mounting, **7/6** each.



**LOUDSPEAKER CABINETS**

This attractive walnut finished cabinet is available for 6½in. or 8in. speaker units. Metal speaker fret, complete with back and rubber feet.
**6½in. type :**
Measures 8½in. x 8½in. x 4½in. at base. Price **16/6** each.
**8in. type :**
Measures 10½in. x 10½in. x 5in. at base. Price **20/6** each.
**5in. type :**
Measures 6½in. x 4½in. x 7½in., **16/6.**

**LOUDSPEAKER UNITS, ETC.**

| | Each |
|---|---|
| 3½in. Types ... ... ... | 17/6 |
| 5in. Types by Elac, Lectrona, Celestion, etc. ... ... ... | 17/6 |
| 6½in. Types by Goodmans, Rola, R. & A. ... ... ... | 18/6 |
| 8in. Types by Goodmans, Plessey, R. & A. ... ... | 19/6 |
| 10in. Types by R. & A., Celestian, etc.... ... ... ... | 25/6 |
| 6½in. Wafer Speaker by Truvox, suitable for Car Radio, etc. ... | 20/- |
| 12in. Plessey Lightweight Elliptical Speakers, Goodmans 4in. x 7in. ... ... ... ... | 35/- 19/6 |

All above are P.M. Speakers. Standard 2-4 ohms. Speech Coil.

**HEATER TRANSFORMERS**

230v. Input 2 volt .5 amp., each **5/-**
230v. Input 2 volt 3.0 amp., each **8/3**
230v. Input 4 volt 1.5 amp., each **5/6**
230v. Input 4 volt 3.0 amp., each **10/6**
230v. Input 5 volt 2.0 amp., each **10/6**
230v. Input 6.3 volt, .5 amp., each ... ... ... ... **5/6**
230v. Input 6.4 volt 1.5 amp., each ... ... ... ... **6/6**
230v. Input 6.3 volt 3.0 amp., each ... ... ... ... **9/6**
230v. Input 12 volt, .75 amp., ea. **5/6**

**MAINS TRANSFORMERS**
**3-way mounting type**

**MT1**
Primary : 200-220-240 v.
Secondaries : 250-0-250 v., 80 M/A 0-6.3 v. 4 amp., 0.4 v. 2 amp. Both tapped at 4 v. each ... ... ... ... **18/6**

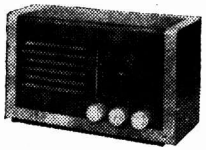
**MT2**
Primary : 200-220-240 v.
Secondaries : 350-0-350 v. 80 M/A 0-6.3 v. 4 amp., 0.5 v. 2 amp. Both tapped at 4 v. each ... ... ... ... **18/6**

**MT3**
Primary : 200-220-240 v.
Secondary : 30 v. 2 amps.
Taps at 3 v., 4 v., 6 v., 8 v., 9 v., 10 v., 15 v., 18 v., 20 v., 24 v., each ... ... ... ... **18/6**

2/- Post and Packing on above transformers.

**If you are not in possession of our 1956 24-page illustrated catalogue, please forward 6d. for your copy.**

# 3-VALVE T.R.F. KIT



- **Easy to Build.**
- **Valves 6J7, 6K7, 6V6GT plus metal rectifier.**
- **Walnut cabinet.**

Full instructions, point to point wiring diagram. Circuit diagram, and full shopping list **1/-**. All components may be purchased separately.

## £5.10.0

Post and Packing 3/-.

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

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

**MAIL ORDER ONLY.**

# Unfailingly fresh

Tobacco at its best. Player's Medium Navy Cut is once again supplied in the familiar pocket tin, vacuum sealed, which means that absolute freshness is retained and enjoyment assured whenever you buy it.

**2 oz. tin 9/7d.**


*To open, simply remove small rubber seal.*

**PLAYER'S MEDIUM NAVY CUT TOBACCO**

***'The choice for a lifetime'***

[NCT 94M]

## BAND III CONVERTER.

Coil kit by TELETRON, with circuit and wiring details, etc. For use with TRF or Superhet TV Receivers. **ONLY 15/-.** Cascode coil kit **17/6.** Drilled chassis **3/9,** or slightly larger to hold power pack components, **6/-** (postage on either 6d.). Instruction leaflet only, 6d.

**INDICATOR UNIT TYPE 6.**—Contains VCR 97 tube with mu-metal screen, 4 valves EF50 and 2 of EB34, valveholders, CRT holder, condensers, resistors, etc. NEW CONDITION. ONLY **39/6** (carriage, etc., 7/6).

**AMPLIFIER TYPE 223A or 208A.**—As described in July, 1955, issue of *Practical Television*, for making a TV CONVERTER. Complete with 2 valves EF50. ONLY **10/-** (post, etc., 2/-).

**PYE 45 MC/S I.F. STRIPS.**—Ready-made for London Vision Channel. Complete with 6 valves EF50 and 1 of EA50, and details of very slight mods. required. BRAND NEW. ONLY **49/6** (post, etc., 2/6).

**I.F. STRIP 194.**—Another easily modified strip for TV. Complete with 6 valves SP61, 1 of EA50, and 1 of EF36; also mod. data. ONLY **29/6** (post, etc., 2/6).

**RECEIVER UNIT 159.**—Contains 4 valves, 1 each EF50, EA50, SP61, RL37 and 24 v. Selector switch. ONLY **7/6** (post, etc., 2/-).

**R.F. UNITS TYPE 26.**—Complete with 2 valves EF54 and 1 of EC52, this is the variable tuning unit covering 65-50 mc/s (5-6 metres). BRAND NEW IN MAKER'S CARTONS. ONLY **27/6.**

**POCKET VOLTMETERS.**—Read 0-15 and 0-300 v. A.C. or D.C. BRAND NEW. ONLY **18/3.**

**COMMAND RECEIVERS.**—Huge purchase from the Air Ministry. These famous compact American receivers which can be used for a variety of purposes are offered at ridiculously low prices while stocks last. Complete with six metal type valves, one each of 12K8, 12SR7, 12A6 and 3 of 12SJ7, in aluminium case, size 11in. x 5¼in. x 5in. Used, but in good condition. Choice of models, BC 455 (6-9 Mc/s), **25/-.** BC 454 (3-6 Mc/s), **27/6.** BC 453 (190-550 kc/s), **59/6,** and a few of the 1.5-3 Mc/s model, **65/-.** (Postage on all models 3/-). Circuits supplied.

**COLLINS TRANSMITTERS.**—The renowned American TCS models covering 1.5-12 Mc/s in 3 bands. Complete with 7 valves, employing 2 of 1625 in P.A. stage, one of 1625 in each of buffer and modulator stages, and 3 of 12A6 in oscillator stage. Provision for V.F.O. or crystal control for 4 Xtal positions. Incorporates plate and aerial current meters. In Brand New Condition. ONLY **£12.10.0** (Carriage, etc., 15/-).

**COLLINS RECEIVERS.**—Matches the above transmitter and is exactly the same size, 11in. x 13in. x 11in. Has same coverage, and is complete with 7 valves, 1 each of 12SA7, and 12SQ7, 2 of 12A6, and 3 of 12SK7. Also has provision for Xtal control. A really terrific receiver for the serious operator. In Brand New Condition. ONLY **£8.10.0.** (Carriage, etc., 15/-).

OR THE TRANSMITTER AND THE RECEIVER TOGETHER, **£20.0.0.** (Plus Carriage, as above).

**L.T. HEAVY DUTY TRANSFORMER.**—Ex Admiralty. Has 3 separate windings of 5v.-0-5v. at 5 amps. and by using combinations will give various voltages at high current. BRAND NEW. ONLY **29/6** (post, etc., 2/6).

**MODEL MAKERS MOTOR.**—Reversible poles. Only 2in. long and 1¼in. diameter, with ¼in. long spindle. Will operate on 4, 6, 12 or 24 volts D.C. ONLY **10/6** (post, etc., 1/-).

**TRANSFORMERS.**—Manufactured to our specifications and fully guaranteed. Normal Primaries. 425-0-425 v. 200 ma. 6.3 v. 4 a., 6.3 v. 4 a., 5 v. 3 a., **ONLY 65/-**; 350 v.-0-350 v. 160 ma., 6.3 v. 5 a., 6.3 v. 3 a., 5 v. 3 a., **ONLY 47/6**; 250 v.-0-250 v. 100 ma., 6.3 v. 6 a., 5 v. 3 a., **ONLY 37/6.** 350 v.-0-350 v., 150 ma., 6.3 v. 5 a., 5 v. 3 a., **ONLY 37/6.** 250-0-250 v. 60 ma., 6.3 v. 3 a., 5 v. 2 a., **ONLY 21/-.** The above are full shrouded, upright mounting, 5.5 kV. E.H.T. with 2 windings of 2 v. 1 a., **ONLY 79/6**; 7 kV. E.H.T. with 4 v. 1 a., **ONLY 89/6.** PLEASE ADD 2/- POSTAGE FOR EACH TRANSFORMER.

**E.H.T. TRANSFORMER FOR VCR97 TUBE.**—2,500 v. 5 ma., 2-0-2 v. 1.1 a. 2-0-2 v. 2 a., **42/6** (postage 2/-).

**SPEAKERS.**—P.M. 6½in. less trans., **19/6**; 8in., less trans., **16/6**; 10in. with trans., **27/6** (post 2/-).

**CHOKES.**—10H 60 mA., **4/-**; 5H 200 mA., **7/6** (post 1/-).

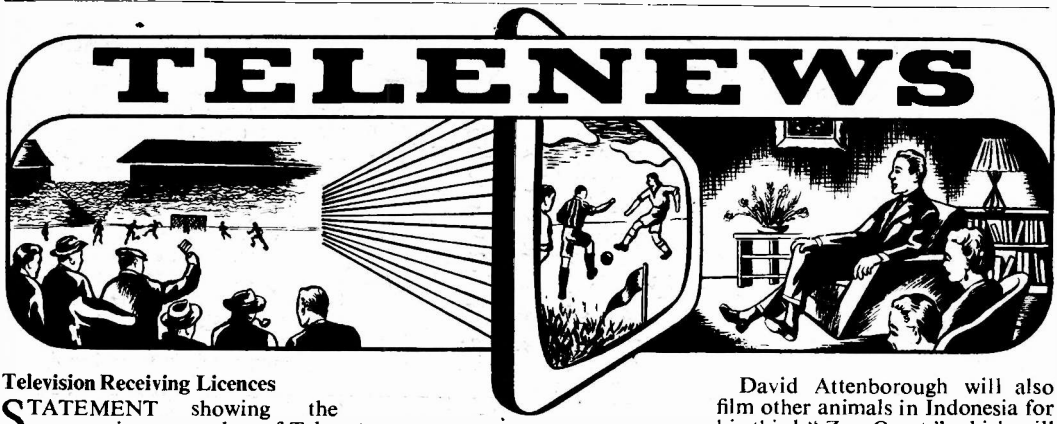
**Open until 1 p.m. Saturdays, we are 2 mins. from High Holborn (Chancery Lane Station) 5 mins. by bus from King's Cross.**

*Cash with order, please, and print name and address clearly. Include postage and carriage on all items.*

**U.E.I. CORPN.** **THE RADIO CORNER, 138, GRAY'S INN ROAD, LONDON, W.C.1**

**(Phone TERminus 7937.)**

# TELENEWS



## Television Receiving Licences

STATEMENT showing the approximate number of Television Receiving Licences in force at the end of May, 1956, in respect of receiving stations situated within the various Postal Regions of England, Wales, Scotland and Northern Ireland.

| *Region* | *Totals* |
|---|---|
| London Postal ... ... ... | 1,315,921 |
| Home Counties ... ... | 671,431 |
| Midland ... ... ... | 1,011,743 |
| North Eastern ... ... ... | 893,346 |
| North Western ... ... ... | 845,413 |
| South Western ... ... ... | 393,369 |
| Wales and Border Counties ... | 326,999 |
| Total England and Wales ... | 5,458,222 |
| Scotland ... ... ... | 360,537 |
| Northern Ireland ... ... | 44,714 |
| Grand Total ... ... ... | 5,863,473 |

## New BBC Station for Cumberland

THE BBC announces that a site has been chosen for the projected medium power television station in Cumberland at Sandale, 1,200ft. above sea level and some 14 miles south-west of Carlisle.

The new station is expected to be ready for service before the end of 1957 ; it will bring the BBC's television service to the greater part of Cumberland and Westmorland as well as to the coastal areas of south-west Scotland.

The site will also be suitable for V.H.F. (F.M.) transmissions of the Home, Light and Third programmes when it becomes possible to extend this system to this part of the country.

## Radio Show Catalogue Features

A COLOURED plate of H.M. The Queen—a reproduction of the Annigoni portrait which caused so much interest in last year's Royal Academy exhibition —is to be included, by special permission, in the catalogue of the Radio Show, August 22 to September 1, 1956. The Queen, as has already been announced, is again patron of the show.

A sale of 50,000 is expected and applications for advertising space, more than half of which is already booked, are asked for by the R.I.C. immediately.

## Another Zoo Quest

ON Thursday, May 3, David Attenborough left London Airport for Djakarta via Singapore on the first state of another Zoo Quest. With cameraman Charles Lagus he will spend three months in Indonesia, visiting Sumatra, Bali and other parts of the islands. His main objective is to find and film the Komodo Dragon for the London Zoo.

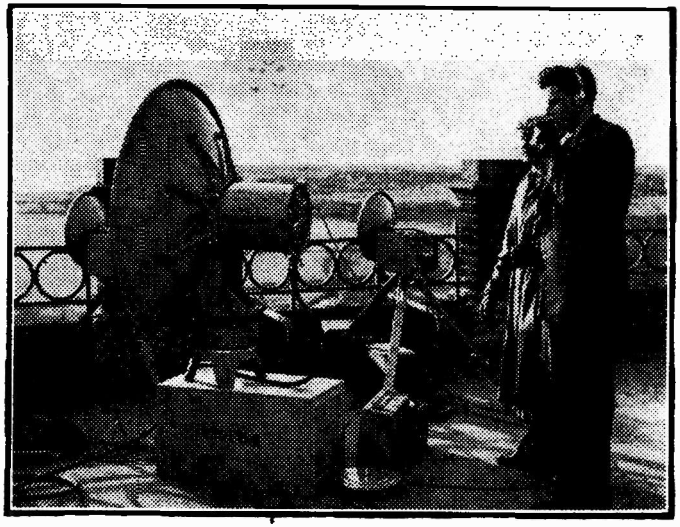
David Attenborough will also film other animals in Indonesia for his third " Zoo Quest " which will consist of six programmes beginning probably in October.

## Hungarian TV Plans

OPENING of a second television station in Hungary is scheduled in the Second Five Year Plan, details of which are now being discussed prior to submission to Parliament in a few weeks' time.

The new station will be at the industrial city of Miskolc, North-east Hungary. A five kilowatt transmitter is to open there in 1958.

The plan proposals add : " We must ensure connecting up with the international television network and introduction of colour television must be prepared."



**RUSSIA BUYS BRITISH TV EQUIPMENT**

**The above picture shows Marconi centimetric link equipment undergoing field trials before being shipped to Russia. This apparatus represents part of a large quantity of television equipment which Marconi's are supplying to the U.S.S.R. Amongst the main items in this order are included two three-camera television outside broadcast vehicles, two mobile petrol-electric trailer power units and a comprehensive supply of spares.**

The country's first TV station is already operating from Budapest on low power, but next year a 30 kw transmitter is being installed.

Domestic manufacture of TV receivers is now just getting under way. It is planned to turn out 110,000 in the next five years.

**Channel Island TV**

AS we go to Press it is announced that the first television programme from the Channel Islands will be transmitted in July. For the transmission the BBC will move 10 tons of equipment to the islands to set up a temporary link. The broadcasts will be fed into the Eurovision network at Cherbourg, thence to London.

**Production of TV Screens**

PRODUCTION of television filter screens at a Birmingham factory has now reached the 1½ million mark.

An official of the Triplex Safety Glass Co., Ltd., said that production started four years ago, since when the screens have been leaving the production line at a steady rate, on occasions reaching a peak of 14,000 a week.

**I.T.A. Preferred**

IN homes receiving both BBC television and I.T.A., it is estimated the commercial programmes attract "more than twice as many viewers as those of the BBC." This is claimed by the Television Audience Measurement organisation which recently issued a report on the first six months of I.T.A.

**Colour Television in the United States**

THE Director of Technical Services of the BBC, Sir Harold Bishop, spoke about colour television in the United States at a luncheon on his return from a visit to the United States.

He said that colour television had made a good start there, but he thought progress would be slow until the price of sets drops. The system which they had adopted—the National Television Standards Committee system—was capable of excellent results, and intensive work on the development of television sets was continuing.

So far only about 25,000 colour television sets had been sold at a price of about 800 dollars (£300 approximately) each. The service on these sets averaged about 100 dollars (£35) a year. The R.C.A. company was now making about 30,000 sets a month at a cost of 700 dollars each. Sir Harold had been told that as manufacture developed it was hoped that the price would come down to about double the cost of an ordinary black and white television set.

**Automation at the Opera !**

WHEN the 1956 opera season opened at Glyndebourne in June, television was there for the first time in this country as an integral part of the production facilities.

A miniature Pye television camera, of the sort used in industry in many parts of the country, was installed in the stage of the Glyndebourne Opera House beside the prompter's box to enable the chorus-master in the wings to follow the conductor of the orchestra.

In previous years, in opera houses all over the world, chorus masters have had to peer through holes in curtains or scenery in order to cue the chorus at the right moments. Now that television has made its debut, things are no longer left to chance. The chorus is grouped round a monitor in the wings and the chorus master has the conductor in full view.

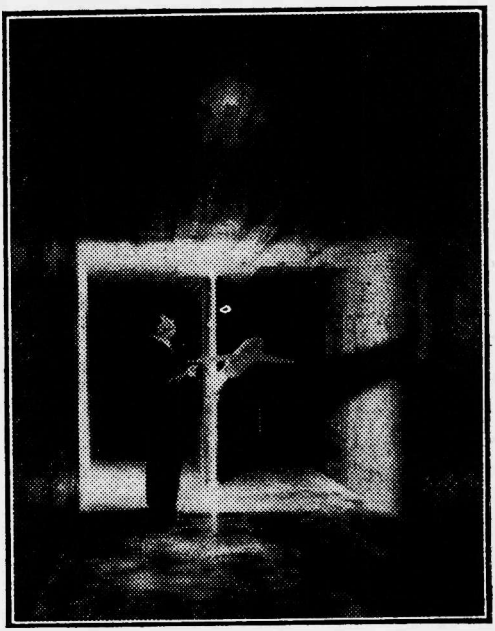
**Fall in TV Sales**

THE Radio and Television Retailers' Association report that sales of TV sets in May averaged 5.38 per shop as compared with 5.74 a year ago.

**New BBC Television Tuning Signal**

THE BBC introduced, on Saturday, June 16th, a new television tuning signal to replace the old one. The new tuning signal retains all the essential features of the old one but the presentation and general appearance have been improved.

The purpose of the tuning signal is to assist viewers in making any necessary minor adjustments to their sets immediately before the start of the programme. It is not to be confused with Test Card "C" which is radiated at regular times for the benefit of the radio industry.



**A technician seen checking the lights and position of the industrial television camera set up above a model to be tested inside the trans-sonic wind tunnel recently inaugurated by H.R.H. The Duke of Edinburgh at the Aircraft Research Association's establishment at Bedford.**

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

*Owing to the rapid progress in the design of radio apparatus and to our efforts to keep our readers in touch with the latest developments, we give no warranty that apparatus described in our columns is not the subject of letters patent.*

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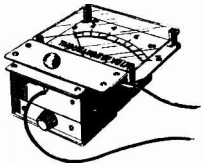
### HIGH VOLTAGE TESTER



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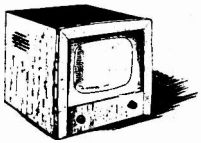

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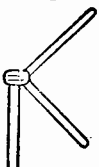
New, unused and guaranteed, **32/6,** plus 2,6 post.

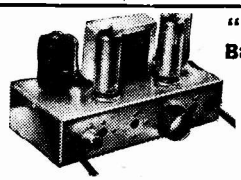
### Band III Aerial Kit



"The Folded V" was described in the July 1955 number of this magazine. We tried this and found it to be most efficient. The kit comprises alloy elements and connectors, neat plastic centre piece and saddle for mounting. **8/6,** post 1/6.

### BAND III PRE-AMP

In difficult areas it will be necessary to increase the signal level and this is the ideal unit for this purpose. It is A.C. mains operated and is fitted with input and output coax. plugs. Price **£4.** post and packing 3/6.



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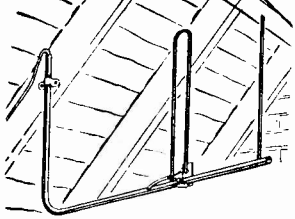
## BAND III AERIALS



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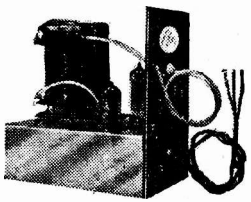
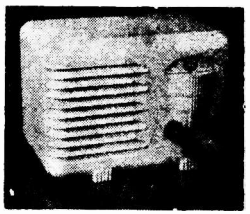


This unit contains three BVA valves. Output from 6 kV to 9 kV rectified with normal H.T. rail input but somewhat higher outputs can be obtained with higher H.T. supply. Dimensions are 6½ x 4½ x 7in. Price **69/6,** post packing, etc., 5/-.



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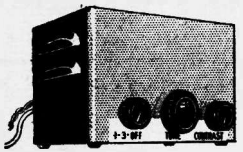

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# CORRESPONDENCE

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

## IMPROVING I.T.A. CONVERTERS

SIR,—I would like to thank you for publishing the article, "Improving I.T.A. Converters," in the June issue of PRACTICAL TELEVISION.

Newark is well inside the fringe area of the Lichfield transmitter, so an efficient convérter is essential for good reception here.

I found my converter quite efficient on vision, but not so good on sound, so I made the necessary modifications, according to the article. The result was a 50 per cent. increase in sound and a "cleaner" picture.

Once again, many thanks.—J. H. TWYDELL (Newark).

## ADDING A TURRET TUNER

SIR,—Having had requests from various people to add converters to television receivers, more particular the "Tele-King" and "Supervisor," I found many ways in which to do this and they have appeared in your journal and others.

The most convenient and quickest is merely to remove from the sockets, valves 1, 2 and the frequency changer No. 3. Disconnect the anode-load resistor (R13, also C10 and C11 in the "Supervisor") from V3.

Bring the grid output lead of the Valradio or Teleng tuners, etc., to the top end of L5, where we have just disconnected the resistor and condensers mentioned and of course, ground the shielding. A dropping resistor from the B+ (180 volts.) of about 2 K provides approximately 150 volts for the tuner connected at the point originally occupied by R13.

Where there has been difficulty with either tuner as to connection using the suggested circuitry provided by the manufacturer or a magazine the above has proved to be 100 per cent. perfect and much simpler.

In the latter tuner having pre-set position for sensitivity on both bands, it depends on the district, but at Ealing, using just a Band I "X" aerial a 50 K control fully extended on Band I and on Band III short circuited, gives equal gain. The aerial by the way, is in the loft and not outside, and does not face either station due to fitting position.

I make these points because I am quite certain that the many methods described in various journals have served to mislead and make the addition to a turret type tuner very complicated.—A. G. BOURNE (Ealing).

## TV SOUND BREAK-THROUGH ON 80 M.

SIR,—I have just read the current edition of PRACTICAL TELEVISION, and would like to raise a few points. First, the TV sound break-through on the 80 metre band is probably caused as follows: The distance between the vision and sound transmissions is 3.5 Mc/s. It is possible for these to beat together in the TV receiver and produce a radiation of TV sound superimposed on a rough hum, which is the video signal. This will be a 3.5 Mc/s or 85.75 metres.

Secondly, Iconos complains of poor quality I.T.A. sound, and I would like to mention that the quality of sound of the I.T.A.'s Winter Hill transmitter far surpasses that of Holme Moss. The frequency response is really amazing in both bass and treble registers, but I have often failed to hear the bass accompaniment of an organ or a double bass on the BBC. The I.T.A. sound has, however, less volume than the BBC's.

Thirdly, S. P. complains of BBC break-through on his converter. This can often be cured on the Mark I by altering it to a tuned input. This means replacing the 1 k$\Omega$ resister in the grid of the first valve by a coil. This can be done by winding 4½ turns of 22 gauge wire on a ¼in. former (such as a radio screwdriver). This coil is then connected between the grid and chassis. The signal from L1 being tapped in one turn from the chassis. The coil can be tuned by altering the spacing between the turns with a knitting needle. As well as reducing break-through a useful increase of gain can be achieved by careful tuning. It might also be helpful for me to point out that the performance of a Band III converter can be completely spoilt by the use of four iron dust cores. If proper Band III ones are not available I have found Radiospares "A" type cores to be very good.—HARRY LEEMING (Blackburn).

## A SCOPE FOR TV

SIR,—I am interested in making the oscilloscope described by Mr. J. Hillman in the last two issues. There are two points, however, regarding which I should like confirmation.

The theoretical circuit shows the control grid of V3 taken to the slider of a potentiometer which is strapped between the H.T. rail and chassis. Consequently, at one end of its traverse the grid of this valve will be at full H.T. potential.

Probably the control will never need taking to its extreme setting, but the arrangement still seems questionable. Will you please state if this particular provision is in order?

Two of the switches, as listed, would be more expensive than they need be. Only a five-way switch is required for S2, where a six-way is specified, and only a one-pole switch is required for S1, although there is no one-pole four-way switch listed among the components.—J. BROADBENT (Sale).

*[The connections to R25 as shown in Fig. 1 are quite in order and follow normal procedure for a Miller integrator circuit. The action is as follows: When the slider of R25 is at the H.T.+ end with S2B in position 1 then C20 is charged to full H.T. voltage. The anode of V3 is —ve with respect to H.T.+ due to the anode current flowing in R19, 20, 21, 22 and because C20 is charged then the grid is —ve with respect to the anode by the full H.T. voltage. The grid is then —ve with respect to the cathode by the amount of the volts drop across the anode load resistors. The valve is thus working with a —ve grid and grid current does not flow in spite of the fact that the grid return of the valve is taken to H.T.+.*

*With regard to the switches used, the reason for quoting a six-way switch was that this particular switch is an ex-government type, and quite cheap, and the contacts are spaced radially equidistant and by using two of the two-P six-way types one three-P six-way can be made up.*—ED.]

### CAR RADIO—APPROPRIATE

SIR,—In view of recent reports that a television set has been manufactured for use in a car, I would like to register a strong protest. It is a well-known fact that the number of deaths on the road has increased tremendously since the war, until now the number killed and injured each year is becoming so high that one is afraid even to cross the most unfrequented lanes.

Surely it is about time we all woke up and started doing something about this dark patch that hangs over us all. But no, we seem to shrug our shoulders, and now, what is worse, we allow motorists to have television sets in their cars so that it will distract them even more. I am aware that the proposed law will forbid a motorist to look at a television set whilst driving, but the present law also forbids a motorist to drive a car whilst under the influence of drink. However, I notice that they still do drive in a state of intoxication. It is to be hoped that the dangers are realised before it is too late. Television has undisputedly a place in our homes today, so let it remain there.—W. J. WILKINSON (London).

[*According to Sir Alker Tripp, the number of accidents caused by drunken motorists is so small as to be not worth considering. We do not think that car TV will be popular.*—ED.]

### COMMUNITY OF CRYSTAL GAZERS?

SIR,—I have for some time waited to hear on TV a programme that has any good music included in it, and it would appear so have others, judging from the speech given by Lord Lucas when addressing the 42nd anniversary of the Performing Rights Society in London recently. He said that "we are becoming a glassy-eyed community of crystal gazers" and that both the BBC and the I.T.A. had "failed utterly" to give the public any good music on television. He also went on to say that "Sound broadcasting did more to educate people in the appreciation of good music than any other single force. But with the advent of television I hold an entirely different view."

Lord Lucas continued, "I watch television with keen interest and I see arrogant and impertinent people pretending to produce and direct Beethoven, Chopin, or any of the great composers. Their ideas of production generally result in showing the artists performing in every posture except standing on their heads."

He went on to say that to tie up culture and commercialism is a great mistake. "What have we in place of good music? Alleged humour which starts as mediocrity, gets to vulgarity and on all too many occasions reaches the level of obscenity.

"I believe this is the result of a great mistake made in trying to tie up cultural education with the commercial considerations of advertising.

"I hope the day will come when we shall have a government with the common sense to give the BBC facilities for a second programme, which can give the cultural artistry of good music, and allow the other to compete with the squalid profanity which is at present the hallmark of commercial television"—G. A. MANUEL (Bromley).

### I.T.A. CRITICISED

SIR,—Just lately I had my set converted so that it would receive the Band III programmes, but after looking at these I now wish that I had left it to receive Band I only. Some of the programmes put on by the I.T.A. are very interesting and one becomes absorbed in them; however, just when you relax, look at the show and enjoy yourself, what happens? A gaudy advertisement accompanied by a stupid song suddenly flashes on the screen and completely takes one's interest away. This type of advertising is doing a lot of harm to the I.T.A., for this half-hearted attempt to copy the American style of high pressure selling is not appreciated by British viewers.—B. FILMER (Kilburn).

### A BOUQUET

SIR,—I have been a regular reader of PRACTICAL TELEVISION since the first and I would like to take this opportunity to thank you for the mine of information that is in each issue.—F. MORGAN (Australia).

### PRAISE FOR OUR "SUPERVISOR"

SIR,—Whilst sorting through some old copies of PRACTICAL TELEVISION some time ago, I decided to build the "Supervisor" as described in your August, 1953, issue.

I was surprised to find that although the "Supervisor" is now three years old, and a lot of advances in electronics have taken place during those three years, it is still comparatively up-to-date in its design. I might add that I am more than satisfied with its performance.—N. J. OHME (Isle of Wight).

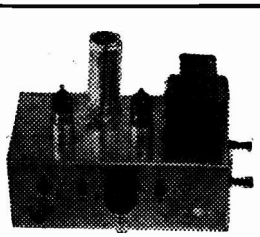
## COLOUR TELEVISION

(*Continued from page 15*)

synchronous detector so that it delivers a different colour signal for each frame. (A phase shift is introduced by means of a tri-stable switch which is triggered from the frame timebase.) This means that if this signal is displayed on a normal tube which is then viewed through a disc of rotating colour filters a colour picture is seen. This picture will, however, suffer from a rather low repetition rate and colour fringing and flicker may be present. Obviously, this is not the method which will lead to a standard home colour television set but it is mentioned in passing to show that there is plenty of scope for interested amateurs once colour transmissions are commenced in this country.

**British Colour TV**

What of the future? The system which will eventually be adopted in this country is a matter of guesswork at the present time. There is much to be said for the American system scaled down to our 405 line standards, and this has been demonstrated by the Marconi company last year and is currently the subject of experiments by the BBC. The chief disadvantage is the occurrence of patterning in areas of highly saturated colours when the transmission is being received in monochrome on the normal set. Many advantages would be gained by the use of a wider bandwidth, but overcrowding of the wave bands seem to preclude this solution. In the meantime, it is satisfying to note that a compatible system is considered essential and this means that if colour does come sooner than we now think, a 1956 TV set will not be out of date as it will still be able to reproduce the colour transmission, though only in black and white.



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**Suitable for London, Birmingham and Northern Transmission**

## £2 - 5 - 0 post free.

A highly successful unit (*W/World* circuit), incorporating variable oscillator tuning, Midget BVA valves, etc. Chassis size 7 x 4 x 2½in. Thousands already in use. Suitable for most types of T/V sets. TRF or Superhet. Kit of parts 45/-, Blueprint 1/6, Power pack kit 30/-, Switch kit (Band I—Band 3 Ae switching), 6/6—all Post Free. Wiring and aligning of above 20/- extra.

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

## Volume Controls

Log. ratios, 10,000 ohms —2 Meg. ohms. Long spindles. 1 year guarantee. Midget Edis-wan type.

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

Linear Ratio, 10,000 ohms—2 Meg. ohms. Less switch, 4/- each. **Coax plugs, 1/2. Coax sockets, 1/-. Couplers 1/3. Outlet boxes, 4/6.**

## 80 ohm CABLE COAX

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

**8d. yd.**

**SPECIAL** — Semi-air spaced polythene. 80 ohm **Coax** ½in. diam. Stranded core. Losses cut 50%.

**9d. yd.**

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

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

**50 OHM COAX CABLE 8d.** per yd. ½in. dia.

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

**RESISTORS**—Pref. values 10 ohms 10 megohms.

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

**STANDARD 3 WAVEBAND COIL PACK.** Size 2¼in. x 2¼in. x 1¼in. depth. 4 pos. Switching, Long, Med., Short, Gram. Dust-core coils prealigned for 465 Kc/s I.F. Complete with trimmer, ready to use. A very sensitive and efficient Coil Pack. **Manufacturer's Surplus. Bargain Offer, 30/-.**

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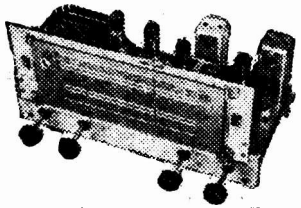

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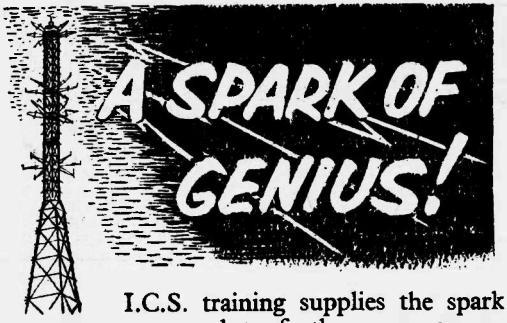


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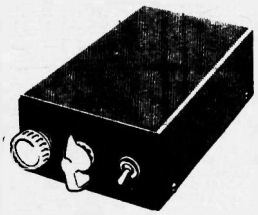

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As we have been selling tubes for the past 5 years. All enquiries welcomed. Please send cash with order.

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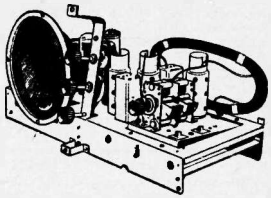

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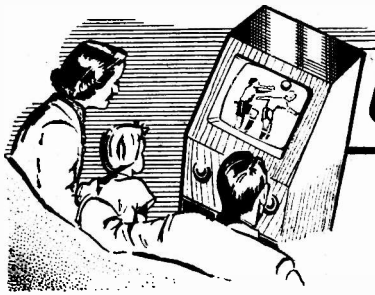


# UNDERNEATH THE DIPOLE

TELEVISION PICK-UPS AND REFLECTIONS

**By Iconos**

## NEWS PRESENTATION

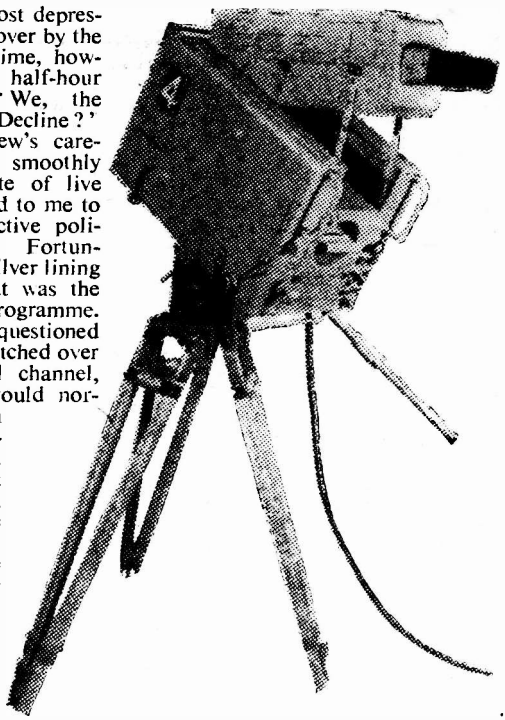
THE BBC do not seem to be satisfied with the presentation of their TV news. At any rate, they still seem to be experimenting with various trick devices to give a more visual effect. The idea of projecting still photographs appropriate to each headline in the corner of the picture as they are read by the announcer is an ingenious one, but doesn't quite come off. This is possibly due to the BBC's restraint upon the announcers putting over their own personality; their policy is for the announcer to remain a kind of catylitic agent, quietly and factually reporting news items without a glimmer of emotion. This has the unintentional effect of making even the best of good news sound slightly depressing. I see no reason why the headline visuals should not be shown filling the screen, with no announcer in the picture. On the other hand, the I.T.A. News has more of a "tabloid" flavour, savouring of the four-million or so circulation newspapers of Fleet Street. The I.T.A. newsreaders have a little more scope for dramatising events on occasion and are often given amusing silly-season items to finish off the bulletin in a more cheerful vein, which brings the viewer more into contact with the newsreader. I.T.N.'s interviews with typical "men in the street" are not always successful, chiefly because the interviewer seems to ask the most obvious and rather feeble questions. This kind of thing requires a very strong personality to put it over. Still, I think it can be said that both of the TV News services are improving. If you read a staid, factual newspaper, then you'll probably prefer the BBC news. If you normally read a high-circulation pictorial newspaper (and its strip cartoons) then you will plump for the I.T.A. News. For amusing and vivid reporting, however, I put the BBC's Jaqueline Mackenzie at the top. Her vivid descriptions of the Grace Kelly wedding and the Chelsea Flower Show were bright and chatty, interpolated with dainty, thumb-nail imitations which ranged from French taxis to tulips! Miss Mackenzie is definitely a personality-plus reporter, whose charm is putting her into the star class. The BBC cautiously keep her entirely separate from their factual TV news. She could not produce the correct depressing effect even if she tried.

## DECLINE ?

PERHAPS the most depressing item put over by the BBC, for a long time, however, has been the half-hour series entitled, "We, the British—Are we in Decline?' Christopher Mayhew's carefully written and smoothly produced composite of live TV and film seemed to me to reek of unconstructive political propaganda. Fortunately, there was a silver lining to the series; that was the alternative I.T.A. programme. All of the viewers I questioned about it quickly switched over to the commercial channel, even those who would normally agree with Mr. Mayhew's political outlook. Mr. Mayhew is a skilled performer on TV, with first-class voice and appearance; he should devote himself to some other less contentious subject. Mr. Woodrow Wyatt is another politician who got himself into hot water by giving an account of the election procedure and possible extremist trends in a certain trade union. In this case, criticism was stifled a few days later by the nation-wide anger over the Electrical Trade Union's support for the terrorists of Cyprus. It seems to me that Mr. Woodrow Wyatt had some of the answers to Mr. Mayhew's tale of woe. They should get together.

## MORE PROVINCIAL I.T.A. STATIONS ?

ON account of the general hold-up of capital investment, there has been some delay in proceeding with the Scottish



**The new Emitron TV camera, the first of 17 ordered by the BBC. Several new features making for easier operation are embodied. As this illustration shows, the electronic view-finder can be adjusted so that it remains level when the camera is tilted for high- or low-angle shots; the focus control is specially designed for accurate adjustment with minimum hand movement.**

and Welsh areas of I.T.A. But I hear that two or three potential contractors are now ready with schemes to put before the executive of I.T.A. In the meantime, existing I.T.A. contractors are extending their outside commitments. Both the I.T.A. and BBC are going ahead with plans for live outside TV broadcasts from seaside resorts during the holiday season. The holiday visits will have a rousing start-off with the Jimmy James show, "Let's Have Fun" from the Central Pier, Blackpool, which will be on the BBC. This will be followed up with regular programmes from Blackpool, Morecambe and other Northern resorts by Granada and A.B.C.-TV. There are no difficulties in arranging with the town councils or entertainment managers for facilities; the difficulty is holding back the queue of "Public Relations Officers" awaiting the chance of gratis advertising. Blackpool has a special advantage with its famous tower—an ideal site for a micro-wave relay transmitter.

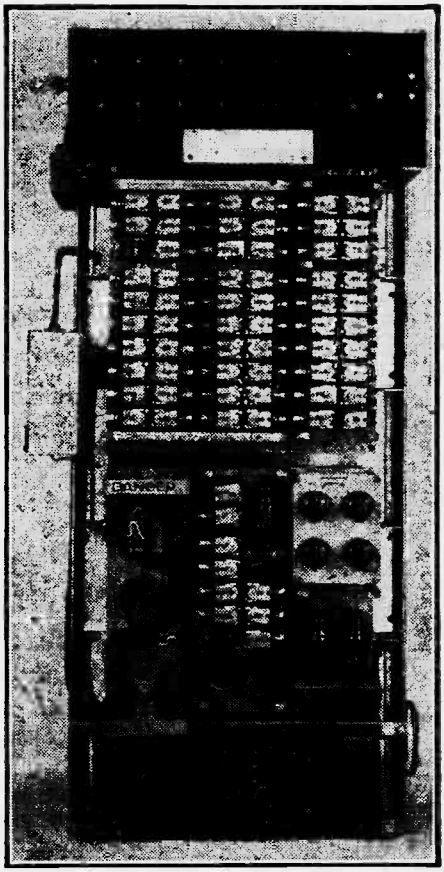
## I.T.A. NETWORKING

IT is no secret that the first few months of operation by the commercial TV contractors have been difficult, both from the financial and organisational points of view. Revenues have not reached the heights expected, in spite of strong evidence that a slight majority of viewers in a position to receive both BBC and I.T.A. programmes prefer the latter. The provincial contractors, A.B.C.-TV and Granada, have benefited by watching the teething troubles of A.R.-TV and A.-TV in London, and have been much more cautious both in their planning of programmes and in their capital outlay on equipment and premises. A.B.C.-TV had the least time of all to prepare for their openings at Birmingham and Manchester, and in some respects they have been the most successful. In spite of apparent co-operation between the different operating companies, there has been considerable poaching of staff, manœuvrings for position by executives, major and minor catastrophies in both production and engineering departments, resignations, dismissals and also, pleasanter to report, a few meteoric promotions. Agreements to exchange programmes on a network basis will lead to economies all round. The I.T.A. contractors are achieving amazing results when one considers the limited facilities at their disposal. A.-TV have virtually no studio space compared with the BBC, and their Foley Street premises are little more than a telephone exchange for outside television set-ups, such as the Palladium Show and their other regular theatre set-ups at Wood Green and elsewhere.

A.R.-TV have a well-equipped studio at Wembley, but have had to reduce facilities (and operating costs) temporarily. Birmingham studios turn out to be the Astoria Cinema only (used by A.-TV and also A.R.-TV) and Manchester has A.B.C.-TV's converted Capitol Cinema at Didsbury and the Granada Studio in the centre of that city. However, out of chaos seems to come order, so far as the viewers are concerned. The enormous rise in TV licences since commercial television started has benefited the BBC financially, and BBC executives are rather touchy on this point, Sooner or later, they expected the I.T.A. to ask for a "cut" in the increased revenue from licences. The thought seems to have had results. I hear that application is to be made for a subsidy for the more "cultural" items. If this means that we will see more shows of the Hallé Orchestra type on I.T.V., then I, for one, would be in favour of it.

## CO-OPERATION

It is pleasing to note the increasing measure of co-operation which is growing between all the TV organisations and the music hall artistes. The show put on by their own special kind of masonic society, the Grand Order of Water Rats, last year, was such a big success that the variety folk are taking more kindly to the advancing "menace" of television. Both the Water Rats and the Variety Artistes are now willing to co-operate *en masse* as well as accept individual engagements. Celebrations usually give the excuse for this, much to the enjoyment of viewers, and the Golden Jubilee of the Variety Artistes Federation is an admirable time for the presentation of a Variety Cavalcade. Of course, with this type of show, everybody wants to take part and Dave O'Gorman (of O'Gorman Brothers, the cross-talk comedians) has had quite a job fitting in a large number of acts in a limited time. You can't very well blame them for wanting to jump on the band wagon. They realise that the TV public must be encouraged to re-acquire a taste for the music hall. Streamlining of variety acts by TV producers who really know something about variety will accomplish this.



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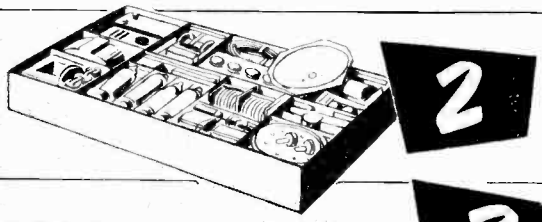


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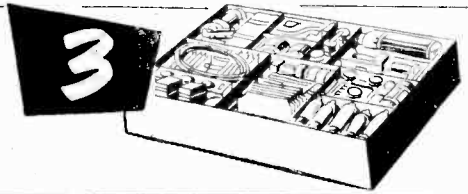


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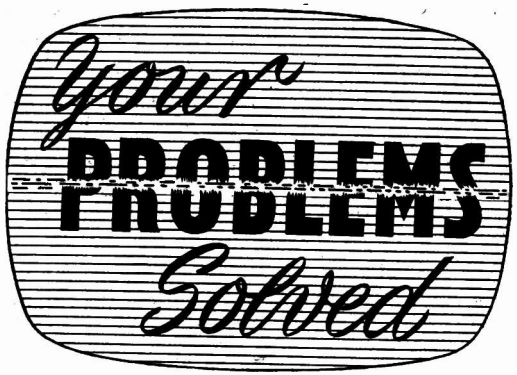


*Whilst we are always pleased to assist readers with their technical difficulties, we regret that we are unable to supply diagrams or provide instructions for modifying surplus equipment. We cannot supply alternative details for constructional articles which appear in these pages. WE CANNOT UNDERTAKE TO ANSWER QUERIES OVER THE TELEPHONE. The coupon from p. 47 must be attached to all Queries, and if a postal reply is required a stamped and addressed envelope must be enclosed.*

### H.M.V. 1808

**My trouble developed after fitting a 3.3 kΩ resistor in the noise-limiter circuit.**

**The picture seems to have lost all highlights and has dark streaks across it. I can get rid of the streaks if I turn up the brightness, but the picture is still rather dim. I have replaced some of the Z77 valves and also the X78, but with little difference.—A. W. Heywood (Rotherham).**

It would seem that you have used the wrong value resistor. Our records do not show a 3.3 K resistor associated with either of the noise-suppression circuits.

### MARCONIPHONE VT56DA

**My trouble is that at times the picture disappears, and is replaced by black and white lines travelling down the screen.**

**To overcome this I have to turn the picture interference limiter fully anti-clockwise ; if this does not bring back the picture, I have to turn the set off for a few minutes. On switching the set on the picture flashes and jumps for about half a minute. There is bad sound on vision all the time.—A. C. Perrin (S.W.6).**

This trouble is probably caused either by a faulty valve or a short in the picture tube. Try gently tapping the valves and the neck of the tube while the set is working, taking care to avoid electric shock. If the fault can be provoked by this action, then the valve concerned should be replaced. You should also ensure that the valve pins are making good connection to the valveholders ; if necessary, clean the pins with fine emery cloth.

Excessive sound on vision may indicate that the signal is now too strong due to the recent increase of power from Crystal Palace. Try a 12 db attenuator in the aerial lead.

### DECCA DM146531

**I am having difficulty in getting the I.T.V. Channel 9 on my set. The picture is not very bright and sometimes it is alive. I have an eight-element aerial on a 20ft. pole, but at the back of the house is a hill and trees, and at front more trees. I get a perfect BBC picture with an " H " aerial.**

**Is there any way of getting a good picture on Channel 9 or improving it in any way ?—R. F. Edwards (High Wycombe).**

Yours is undoubtedly trouble as the result of a weak signal on Band III. The Decca series is generally extremely sensitive on Channel 9 and operates well in fringe districts. We can only suggest that you pay attention to the Band III aerial system, ensuring that the array is accurately oriented for optimum pick-up and that it is connected to the receiver through low-loss feeder. If you are using a combining filter, ensure that this is properly connected.

### COSSOR 933

**My set has developed a peculiar fault. After it has been on an hour or two, there is a distinct click from inside the set, like the discharge of a condenser ; the picture dims considerably and slightly folds at the corners, then immediately starts to build itself up again to its original fullness and brightness. This may happen periodically for perhaps half-hour or less and then settles down again. It may happen the next night or for several nights running, or may not happen again for some considerable time. A friend of mine told me it was due to a weak signal. I have an indoor, under-the-roof H aerial, self installed. Would an outdoor one be better, do you think ?—A. Moore (Coventry).**

We do not think this trouble is the result of a weak signal. In our opinion, the " click " which is heard is due to an EHT flashover, thereby starving the tube of EHT a few seconds before it builds up again. Check the EHT rectifier and the associated wiring ; make sure all soldered connections in this vicinity are formed of small blobs with no sharp edges. Suspect an E.H.T. flashover within the tube.

### STELLA ST.8314U

**I am at present using a Stella model which has given me good service until recently, but is now giving trouble with the horizontal hold. The setting of control is critical and has to be reset frequently during the programme. The valves ECL80 and PL81 have been tested and found up to standard. Can you please inform me where I may locate the trouble ? I have a service sheet for the above model.—H. Philips (Stapleton).**

Re maker's service sheet : check V8, R52 and C62. If these parts are in good condition, the trouble is sometimes caused by poor insulation in the line oscillator transformer (S30-S31-S32).

### EKCOVISION 231

**When first switched on the picture will fail to appear for perhaps 10 minutes ; at other times it will appear after normal warming up period, but the screen will suddenly become blank after a few minutes, the picture reappearing just as suddenly after another few minutes. The set has given seven months' trouble-free service, and is normal in every other respect. — G. B. Spackman (Byfleet).**

Check for EHT when the trouble next occurs. If this is missing during the time when the screen is blank suspect (a) the EHT rectifier, (b) the reclaim diode, (b) the line amplifier valve, (c) the line oscillator valve, in that order. If EHT is present check the tube feed circuits and the tube itself for an internal short.

### EKCO T217

**I am wanting to change my TV set from the Holm Moss frequency to which it is at present tuned to Pontop Pike frequency. Could you give me the necessary information on which controls to adjust ? I assume there will be the aerial H.F. and osc. tuning to adjust.—A. Palfreeman (Hurworth).**

Looking at the chassis from the rear of the cabinet, you will observe four adjustments coloured red, black, yellow and green on the top of four coils situated in the near right-hand corner of the chassis. These controls correspond to the R.F., mixer input, oscillator and aerial coils respectively. The oscillator should be adjusted for maximum sound and the other circuits followed up for maximum sound and vision. The oscillator should finally be re-set for maximum sound consistent with minimum sound on vision.

### REGENTONE BIG 12

**I should be glad if you would help me diagnose a fault to Regentone Big 12B. The set has been going well for a number of years but has just recently developed sound distortion, but does not lack volume. — G. Rogerson (Liverpool, 7).**

Check the value of the 1 megohm resistor from the anode (pin 7) of the noise limiter diode (20D1) to the H.T. circuit. You will probably find that this is up in value.

### MURPHY V150

**I have a Murphy V150 which has been giving very inferior results since the change-over of the BBC London transmitter.**

**I have a circuit diagram and I shall be pleased to know :**

**Should I remove R10 33 KΩ shown across L8 and marked London only ?**

**Which coils should be re-trimmed in the vision circuit ?**

**What is the reason for L14 ?**

**This is shown completely disconnected in the diagram.—E. Metcalfe (W.9).**

The disconnected coil is for use when the channel is changed for use in the Midlands (Channel 4). Your receiver is suitable for single sideband operation. To get best results from the new transmitter you may find it necessary to re-orient the aerial and possibly fit an attenuator in the aerial lead. The set cannot be aligned without the use of special test equipment.

### AERIAL MOUNTING

**On some TV aerial masts the I.T.A. aerial is secured to the BBC mast, whilst with others arms are used to throw the I.T.A. aerial away from the BBC aerial.**

**Is there any reason for fitting these arms, please ? —P. Humphreys (Holyhead).**

Interaction inevitably occurs between two aerials mounted in close proximity. It is best, where possible, to employ a " bent " mast to keep the Band III array away from the Band I array when the existing BBC mast is used to secure both arrays.

### BAND I ATTENUATION

**When receiving I.T.A. on my home-constructed converter, I am troubled with considerable patterning due to BBC break-through.**

**By removing the Band I aerial I can diminish this somewhat. I can then receive a reasonably clear picture by suitably arranging and positioning the Band III aerial down lead.**

**This, not always being convenient, I wonder if you could describe a suitable wavetrap for I.T.A. and perhaps an attenuator for BBC signals if you think this would cure the trouble.—L. A. Winnot (N.W.10).**

Connect the converter to the receiver through a 66in. length of close-woven low-loss coaxial feeder. This will attenuate the BBC signal in relation to the I.T.A.

### FERGUSON 988T

**Could you please inform me of any modifications needed to the Ferguson 988T for Band III reception, using the October blueprint converter, as I have just completed this but cannot get any results.**

**The converter is using own power pack with approximately 160 volts. H.T.**

**No modifications have been made to the 988T.— G. W. Allinson (Manchester).**

It is not necessary to alter the receiver in any way. Check the wiring of the converter, and ascertain that it is correctly aligned as detailed in the article to which you refer.

### ENGLISH ELECTRIC 1550M

**I am using an English Electric model 1550M TV and convert to I.T.A. with a Wolsey converter tuned to the Lichfield transmitter.**

**Reception has been quite good, but since the opening of the northern I.T.A. transmitter I am suffering from fairly heavy patterning.**

**It appears that the source of the interference is from the new transmitter as I have one or two friends who are experiencing the same trouble.**

**I would appreciate any help you may give to eliminate this trouble.—W. R. E. (Stoke-on-Trent).**

The interference may indicate that the Channel 9 signal is stronger than the Channel 8, and by tuning the converter to Channel 9 and reorientating the aerial, complete freedom from interference may result. Even if the signal strength of the northern transmitter is not so high, it does not necessarily follow that interference from Channel 8 will be worse since it may be a matter of frequency beating which is causing the trouble.

### FERRANTI T138M

**Fault: Sound on vision (distortion of picture only). On turning up contrast control, this causes an increase of sound just the same as increasing the volume control. —J. S. (Wigan).**

Viewing the receiver from the rear ; on the top (R.F.) chassis, on the left side, will be found two concentric trimmers of the " beehive " type. The lower one should remove the sound on vision upon rotating one way or the other. Hand capacity effects may be noted whilst adjustments are being made. If no amount of adjustment improves the situation, check the upper trimmer and then suspect an open-circuited capacitor beneath the power pack.

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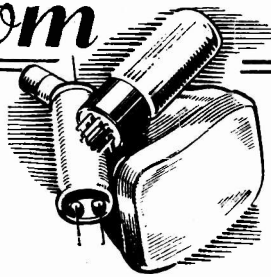
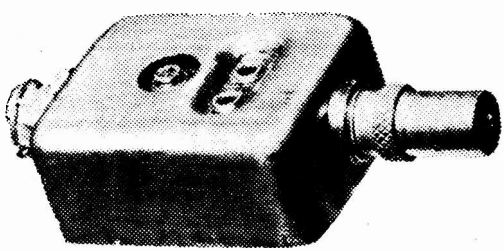
### AERIALITE TWIN BAND AERIAL MODEL 805



IT has been found possible to reduce the price of this aerial by 7s. 6d., so that it is now £7 5s. 0d. retail. Model 805 incorporates a dipole and reflector for Band I reception, with a five-element Band III array placed in broadside. The Band III section can be rotated to give different directivity from that of the Band I section.—Aerialite, Ltd., Castle Works, Stalybridge, Cheshire.

### SPENCER-WEST ATTENUATOR

A NEW type of variable plug-in attenuator is now available from Spencer-West. It is designated type 60. The attenuator is continuously variable from 6dbs to at least 36dbs. Full matching is maintained at all settings and a lockable type control is fitted. This attenuator is based on a new circuit arrangement which ensures that no frequency selective circuits likely to spoil the picture quality are present. It is priced at 12s. 6d.—Spencer-West, Ltd., Quay Works, North Quay, Great Yarmouth, Norfolk.



**The new type 60 Spencer-West attenuator.**

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SMALL and light, the type GM5650 D.C. coupled oscilloscope recently introduced by Philips Electrical, Ltd., has been designed primarily for the radio and television engineer.

The vertical amplifier provides a wide band width from D.C. up to approximately 10 Mc/s with normal sensitivity of 100 mV rms/cm. or a narrow band width from D.C. to 1 Mc/s with high sensitivity of 10 mV rms/cm.

The timebase generator can be used free-running or triggered, and covers eight ranges from 10 c/s to 300 kc/s. Pulses of short duration can be produced satisfactorily up to a maximum speed of 0.5 $\mu$sec/cm.

Input impedances are :

Via step attenuator, 1 M$\Omega$ and 50 pF.

Via fixed attenuator, 1 M$\Omega$ and 15 pF.

Via probe, 1 M$\Omega$ and 15 pF.

A saw tooth voltage is provided for connecting to a frequency modulator or sweep generator, switchover from internal to external synchronisation being effected by inserting a plug in the appropriate socket.

The cathode ray tube has symmetrical deflection characteristics. Its diameter is 7 cms. (2¾ in.), and a measuring lattice and shield to cut out incident light are provided. Measuring 4½in. wide by 9½in. high by 12½in. deep (approximately), the GM5650 weighs only 17 lbs.

### NEW STELLA TELEVISION RECEIVER

A NEW 14in. table television receiver (Model ST8514U), selling at 63 gns. (list £47 2s. 1d., plus P.T. £19 0s. 11d.), is announced by Stella Radio and Television Co., Ltd.

Incorporating automatic gain control on sound and vision, this new receiver gives a picture size of 11½in. by 8½in. and is suitable for operation on 200 to 250 volts A.C. (50 c/s) or D.C. Power consumption is 150 watts. It is fitted with an all-programme turret tuner for BBC and I.T.A. (Band I and III Channels 1-5, 8-10.)

The cabinet is in natural walnut veneer with a Tygan covered loudspeaker baffle. Volume/on/off, brightness, station selector and fine tuning controls are mounted at the front of the cabinet, as is the loudspeaker. Dimensions : height, 19½in. ; width, 17in. ; depth, 15½in. Valve line-up : PCC84, PCF80, EF80 (4), EBF80, ECL80 (3), EB91, PL81, PY81, PY32, EY51, OA70 (crystal diode). Cathode ray tube MW36/24.

### POLYSTYRENE FOR TV AERIALS

TERMINAL boxes and dipole insulators for television aerials produced by Labgear (Cambridge), Ltd., are injection moulded in high-impact polystyrene.

Moulded for Labgear by the Plastics Division of the Mentmore Manufacturing Co., Ltd., the insulator has a screw-down panel for easy access to connections. Both the panel and the detachable polythene bushes are tight-locking to prevent moisture infiltration. Holes in the base allow the aerial lead to be fixed by a self-tapping screw.

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**NATIONAL RADIO SHOW**
Practical Television Stand No. 111

**QUERIES COUPON**

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PRACTICAL TELEVISION, AUGUST, 1956.

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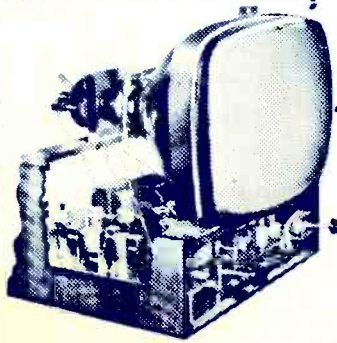

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