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EDITOR F. J. CAMM

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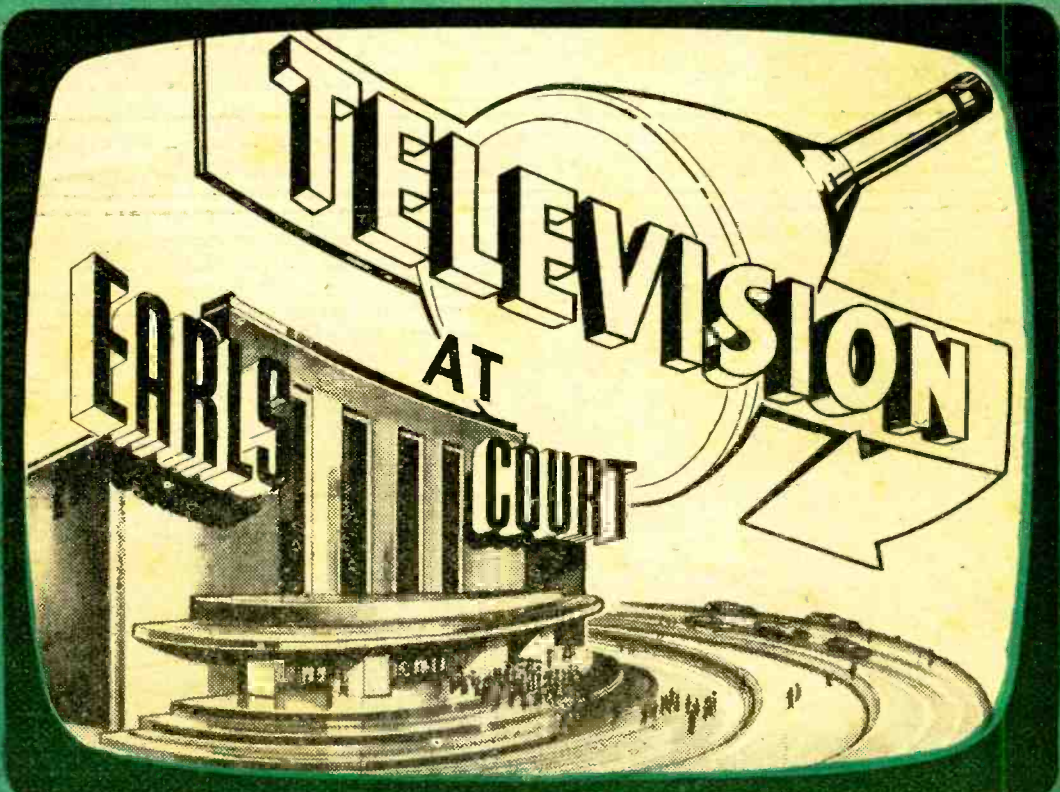

FEATURED IN THIS ISSUE

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& "TELEVISION TIMES"
Editor: F. J. CAMM

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Televiews

The TV and Radio Show

WITHIN a few days of the publication of this issue Earls Court will open its portals to the public and reveal what the manufacturers have to offer for the ensuing year. Elsewhere in this issue we give a preview of some of the exhibits, but it must not be concluded that this is necessarily complete. This journal goes to press, owing to its large circulation, some time in advance of its publication date, and the omission from our preview of any important developments which may be disclosed at the show must not be taken as indicating that we have passed them by. Manufacturers in some cases withhold information concerning their exhibits until a few days before the show, Next month we shall, of course, review the exhibition in greater detail.

In the meantime we extend a cordial welcome to all TV enthusiasts to visit us at our stand No. 52.

OPENING OF WENVOE

THE last link in the chain of five main television stations, Wenvoe, was forged on the 15th of this month when the station was officially opened. Thus the country has now a reasonably complete TV coverage. If and when sponsored TV arrives there will, of course, be others, but the whole problem of sponsored TV is in a somewhat nebulous state. The position is that the Government has approved it in principle, but does not commit itself to a starting date beyond airily referring to "the not too distant future."

Now that the five stations are complete we suggest that the hire purchase order which restricts the period over which payments must be made should be changed. There is little purpose in putting up another television station to create a demand for TV receivers and then destroying the demand by restrictive legislation. Only a small percentage of the population to-day are able to put down the whole amount to purchase a TV receiver, and those who are unable to make one are thus denied the pleasure of this newest of sciences. We understand that a meeting is to be held between the Minister of Supply and representatives of the radio industry so that the effects of hire purchase restrictions on the sale of television and radio receivers can be fully discussed. It is common knowledge that since the H.P. order was made there has been a serious decline in the sale of both types of receiver. A Member of Parliament described the decline as catastrophic. The object of the order was to restrict home sales and force manufacturers to export, but if home sales drop much further it will do great damage to the industry and it must finally affect export.

STOCKHOLM CONFERENCE ON V.H.F.

A CONFERENCE to consider the assignment of V.H.F. for sound and television broadcasting in Europe, and which commenced activities on May 28th of this year, completed its work on June 30th. The use of television and V.H.F. to any extent by European countries is a recent development.

The World Radio Conference held in Atlantic City in 1947 allocated three bands of very high frequencies for broadcasting in Europe—41-63 Mc/s (band 1), 87.5-100 Mc/s (band 2) and 174-216 Mc/s (band 3).

The Stockholm conference has produced an agreement with which are associated three plans for the assignment of frequencies to European broadcasting stations, one for each of these three bands. In band 1 the conference accepted the assignments which Great Britain had made for the five high-power television stations of the BBC, and for the five low-power stations which are to open in due course, but the manner in which sound and television broadcasting services will develop in Great Britain in bands 2 and 3 has yet to be decided. In order to secure the most favourable conditions for the future development of our radio services in those bands, provisional proposals for sound and television broadcasting respectively were submitted to the conference.

For band 2 the delegation sought alternative sets of frequencies for amplitude modulation and frequency modulation and was successful in securing both sets as alternatives in the plan.

Great Britain signed subject to a formal reservation preserving complete freedom of action for United Kingdom with regard to the use of frequencies in bands 2 and 3. The Stockholm plans will come into force on July 1st, 1953, and are due to be reviewed not later than July 1st, 1957.—F. J. C.

The A.C.-D.C. Television Receiver

CONSTRUCTIONAL DETAILS OF A NEW RECEIVER FOR A.C.-D.C. MAINS, 210 TO 250 VOLTS

By S. A. Knight

(*Continued from page 103, August issue*)

BEFORE mounting the tube, of course, the scanning coils should be slipped on to the neck, and the position of the focus magnet should be adjusted so that it lies fairly well forward on the neck. The E.H.T. side-cap connection should be set towards the timebase side of the receiver.

Mains Filter Coils

The mains filter coils have not been mentioned so far because they are an added refinement which may be omitted from the design. If, however, the mains in a particular district tend to be "noisy," it is a good plan to include them. They are easily constructed, and full details are given in Fig. 14.

It is sometimes useful to fit a pair of similar coils and condensers at the main fuse box where the mains enter the house; in this case a heavier gauge of wire is necessary, say 18 S.W.G. enamelled copper, and the size of the winding sections should be increased to accommodate the same number of turns as given in Fig. 14. The condensers C50 and C51 *must* be paper of 1,000 volts working.

Heater Dropping Resistance

The dropping resistance R82 depends upon the mains voltage supplied to the receiver, and the following table gives suitable values for supplies from 210 to 250 volts, A.C. and D.C. In practice, some slight change may be required to these values, but this will be detailed later. The rating of the resistance is given in the right-hand column. The vitreous enamelled types are quite suitable, and a series or parallel combination is permissible to obtain the required value in each case.

Mains Voltage	Resistance	Wattage
210	—	—
220	15 Ω	5
230	47 Ω	5
240	82 Ω	10
250	110 Ω	20

N.B.—The resistance values are not necessarily those obtained by a straightforward application of Ohm's Law.

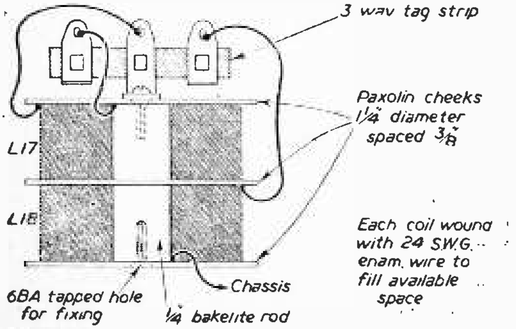


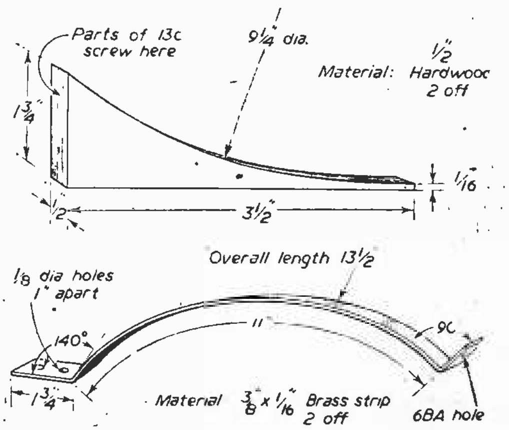
Fig. 14.—Details of the mains filter coils.

Alignment Details and Modifications

The following advice should not be treated as "scare" news, but it is absolutely essential to check on two points before the alignment and testing of this receiver is attempted. First, the floor material of the test-room should not be stone or any form of direct earth floor such as is found in many sheds and outhouses, and secondly, the polarity of the mains must be checked before connecting. This receiver has its chassis directly connected to one pole of the mains supply, and unless the above points are observed a nasty shock may result.

The best conditions for working under are (a) the bench top should be of wood, and (b) the floor should also be of wood and preferably covered with some sort of carpet or mat. If these points are observed, and if the polarity of the mains is checked, there is no danger whatsoever, and the receiver can be handled and tested with as much safety as the normal A.C. type.

To check the mains (if this is not known already) a voltmeter (reading at least 500 volts) or an ordinary mains bulb (about 40 watts type) should be connected between a *good* earth point such as the water tap or pipes and one side of the mains supply at the power point from which the receiver is to be connected. A reading (or light) will be obtained from one pole of the mains, and nothing, or only a very small voltage, from the other. This latter pole is connected to go directly to the receiver chassis. The above applies to all A.C. supplies and most D.C., but in some cases the positive



Figs. 15 and 16.—Details of the tube support and clamp.

D.C. pole is earthed. In any case, for D.C. supplies, the negative pole must go to chassis whatever the earthed rail happens to be, and so here it is simply a matter of finding the polarity with a simple voltmeter check.

The following notes are given assuming that the above points have been checked and that the wiring of the receiver has been carefully gone-over. All valves *must* be inserted before switching on, or damage may result to the others.

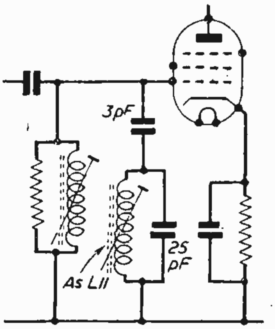


Fig. 17.—Circuit details of the sound-trap or rejector coils.

Heater Voltage Check

Disconnect all wires from the cathode of V20 so that no H.T. is applied to the receiver; connect an A.C. or D.C. voltmeter, appropriate to the mains supply, across the tube heater pins, and set it to about a 10 volt range; plug in the receiver and switch on. The tube heater voltage will rise at first, then fall a little, then rise again to its final value, reaching this after about 30 seconds or so. This should be 6.3 volts ± 5 per cent., or about 0.3 volt. If the voltage tends to rise above the upper limit of 6.6 volts, switch off and increase R82 a little. If the voltage is below the lower limit of 6.0 volts, decrease R82 a little. Adjust R82 in this way until the tube voltage is within its correct limits; it is a good plan to use a dropper for R82 of the type having an adjustable tapping clip, afterwards replacing it with a fixed resistance of appropriate value. If no voltage is recorded on the meter, the heater circuit is open-circuited somewhere, or a valve has a broken heater. *Do not* unplug any valve for continuity testing with the set switched on or the heater-cathode insulation of some of the others may be destroyed.

When the tube voltage is correct, test the other heater voltages in turn; these should all be roughly within their rated limits as listed below, but wide variations may occur, particularly among the 6.3 volt valves. Obviously, if a valve exhibits a very low or a very high voltage, it should be replaced (R82 must not be altered again), although a *high* voltage case can be corrected by shunting the heater with a suitable resistance; as a guide, an excess volt on an EF91 can be corrected by a shunt of about 160 ohms, rating 1 watt. The other

Valve	Voltage	Tolerance ±
EL42, EA50 / EF91, 6SJ7	6.3	0.3 volt
PZ30	52	2.6 volts
PY31	17	0.8 volt
PL38	30	1.4 volts
PL33	19	0.9 volt

valve voltages and tolerances are given in the table below.

No attempt must be made to measure the heater voltage of the EY51 rectifier (this will not light until H.T. is applied), and due note should be taken of the fact that all heaters, except the PL33, are above chassis potential.

General Receiver Check

When satisfied that the valve heaters are correct the leads to the cathode of the main rectifier should be replaced and the set switched on again. While warming up is taking place, a watch should be kept for any signs of trouble, and the Brightness control should be set at minimum. After about 30 seconds the time-bases should begin to function, and some sort of whistle should be heard from the line oscillator. This whistle should be capable of adjustment by the Line Hold control, and should be set so that it is near the threshold of hearing; the Linearity control R64 should be all in circuit at this stage. Check at this stage on the PL38 and the EY51; a faint blue glow will probably appear inside the glass of the former, and the heater of the latter should be glowing. Now advance the brightness control and some sort of a raster should appear on the screen. Set the Width and Height controls so that the screen is filled, and roughly focus the lines, orientating the scanning coils so that the lines are horizontal. Don't bother about some corner cut-off or "kinking" at this stage. If only a horizontal line appears, the frame timebase is inoperative and should be checked.

After these preliminary checks, reduce the brightness and take the following voltage reading checks, if a suitable meter is available:

Mains Voltage	Smoothed H.T. Approx.
210 D.C.	190 volts
250 D.C.	235 volts
210 A.C.	225 volts
250 A.C.	265 volts

and intermediate for other mains voltages.

The following table gives the valve readings for a 230 volt A.C. mains supply, i.e., a smoothed H.T. line voltage of about 245 volts. For other H.T. values, an adjustment will have to be made, but any serious error should be easily spotted.

Valve	Anode	Screen	Cathode
V1	220	220	2-10
V2	225	225	1.7
V3	228	228	1.8
V4	235	235	2.0
V6	135	190	3.0
V7	210	60	—
V8	200	200	1.9
V9	200	200	2.1
V12	230	245	10.5
V15	—	205	—
V19	225	230	4.5
V17	−25	—	—

Alignment

If a signal generator is available, alignment can follow normal procedure, the sound circuits being aligned first on a modulated signal, and the vision circuits following, using a 1 mA. meter in series with the diode load R17 as output indicator.

Sound Circuits: Inject a modulated input of the appropriate sound frequency at the grid of V9 and adjust L14 and L15 for maximum sound output. Transfer the generator to the grid of V8 and adjust L12 and L13 similarly. Finally, with the generator on the grid of V1, adjust L11 *critically* for maximum output.

These cores should not be sealed just yet as it will be necessary finally to tune them up on the actual transmission.

Vision Circuits: The alignment here is different for the different channels, and so the following table is drawn up giving suitable frequencies. For all channels except London, additional sound traps will have to be fitted, and the wiring of these is shown in Fig. 17. The coils are untapped versions of L11 and are fitted on the dividing screen so as to be very close to the grid circuits into which they are inserted. The coils should be at least 2in. apart, otherwise a small screen should be fitted between them. These traps are tuned to give a *minimum* output on the 1 mA. meter with the input frequency set to the appropriate sound channel.

Turn the Contrast control to maximum when V1 is in circuit.

Circuit	Frequencies (Mc/s)			
	London	B'ham	H. Moss	K' Shotts
L9	45	61	51	56
L7	48.5	58.5	48.5	53.5
L5	46	59.5	49.5	54.75
L3	47.8	60.5	50.5	55.25
L1	43	59	49	54

In all cases, the signal generator is injected into the grid of the valve previous to the circuit being tuned. For L1 tuning, the input is to the aerial socket. The sound traps, when fitted, are tuned with the signal generator connected to the grid of V2.

N.B.—The signal generator should have condensers in both its positive and negative output leads; if these are not already fitted, 0.001 μF condensers should be used.

For constructors not in possession of a signal generator, the receiver will have to be aligned on an actual transmission. The sound tuning is fairly easy, as once sound is heard in the speaker all that has to be done is to peak up L12, L13, L14, L15, L11 and (temporarily) L1 for maximum signal, after which the cores should be sealed with some wax.

For the vision side, some test card transmission is best; once a picture is received, the cores of the vision coils should be adjusted to produce the best definition. It is not easy to adjust the sound traps by this method, but they should be set so that they do not interfere with the actual picture, but at the same time do not allow sound breakthrough to occur. The order of adjusting the controls finally is as follows:

Adjust the Height control in conjunction with the Frame Linearity and Hold controls to give a picture of mask height in which the lines are all equally spaced and interlaced.

Adjust the Width plunger to give a picture of mask width; then adjust the Line Linearity a few degrees at a time to linearize the left-hand side of the screen. The Line Hold will have to be adjusted regularly as this proceeds.

Adjust the Focus periodically to give a sharp picture, and skew the magnet bodily to centre the raster. The deflector coils must be as far forward as possible.

Low Supply Voltages

As was explained previously, this receiver will give a full line scan on 210 volt supplies, but in case a completely full scan cannot be obtained on a particular model at low supplies, the following modifications should be applied in turn:

Connect a 500 pF mica condenser across the line scanning coils.

Short out the Width coil.

Reduce R70 to 220 kΩ.

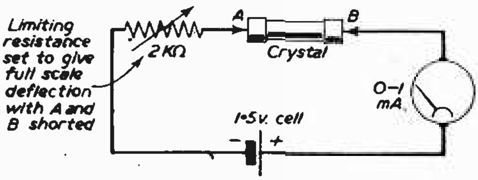
Reduce R72 to 500 ohms or less, but check that the PL38 screen is not overrun, i.e., the screen must not run hot.

Tap the tube final anode one resistance down the R77 bleeder chain.

When adequate width is obtained, no further changes need be made. In practice, the first mentioned modification should prove sufficient.

Crystals

There is a small point which should be mentioned in regard to the crystals V10 and V11. Crystals are available in which the red end corresponds to the cathode of the equivalent diode, while there are still others marked in this way to represent the anode of an equivalent diode. It is essential, therefore, that the constructor checks his crystals individually and ignores the + and — markings as given in Fig. 1. This is best done by means of a simple test as drawn below.



The end of the crystal which, when connected to the *positive* pole of the battery, shows the lowest resistance is the equivalent *anode* (whether marked red or black) and must be connected to the side marked as + in the circuit diagram. If the crystals are reversed, the set will still work, but there will be loss of volume and no noise suppression.

§ Some notes will be given later for possible use in 200v. supplies.

Lime Grove Studios

THE LATEST INFORMATION ABOUT THE NEW TELEVISION STUDIOS

By Peter Bax

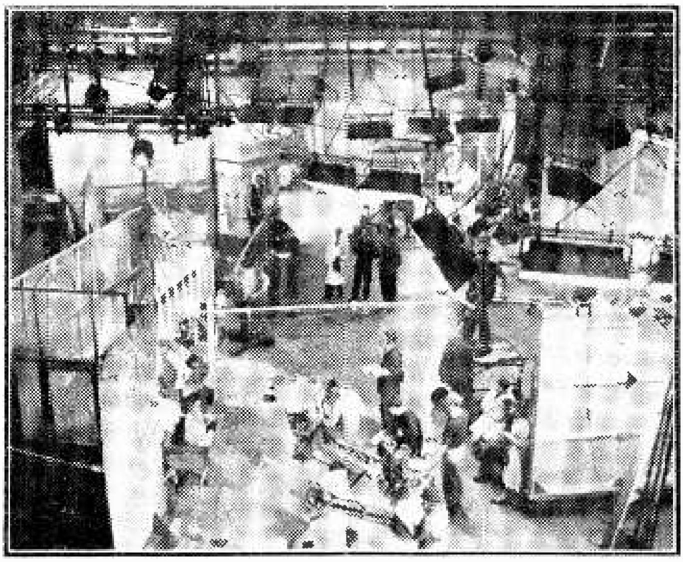
(Head of BBC Television Design)

SINCE I last wrote about the scenic side of television (PRACTICAL TELEVISION, June, 1950), two very important changes have taken place. The first is that three studios have been developed at Lime Grove and now most productions are done there instead of at Alexandra Palace. The second is that television cameras have become much more sensitive.

Taking them in order it may be as well to ask what it means to "develop" a television studio. Why, for example, cannot a large hall be taken, some cameras trundled in and production begun at once? Well, the first thing that would happen is that exterior noises (trains, cars, etc.) would very soon interfere with the interior noises (speech, music, etc.). It is therefore necessary that the whole studio should be sound-proofed. This means not only the walls but the roof and floor as well. This in turn means that silent ventilation becomes a major problem. If you shut all your doors and windows to keep your room quiet you very soon begin to feel stuffy. In a television studio with its scores of people and batteries of light, the position may quickly become acute. At Lime Grove a completely new ventilating system had to be installed as the old one, used when films were made there, was not big enough. It will be understood that television production is a continuous process, while film production is, to a large extent, a matter of comparatively short shots. There is therefore a greater cumulative ventilation problem in television than in films.

Flooring

Then there is the necessity for an absolutely level floor. Film studios usually have tracks laid down for moving cameras. This would not be possible in television. The whole floor is their track. Therefore at Lime Grove the floors had to be resurfaced and covered with thick lino. Next we come to the television gear itself. Film cameras need plugs and cables just as television cameras do, but there the electrical resemblance ends. The film camera uses film which, when exposed, can be taken away to another part of the building, or even a far distant building, to be developed. The television camera transmits its pictures via a complex chain of cables, amplifiers and other electronic gear, all of which must be housed in or very near the studio itself. The television producer needs a control room with a sound-proof window into the studio. The actors need dressing rooms not too far away and so on. In view of all this it will be easy to understand that, before continuous production can be started, there

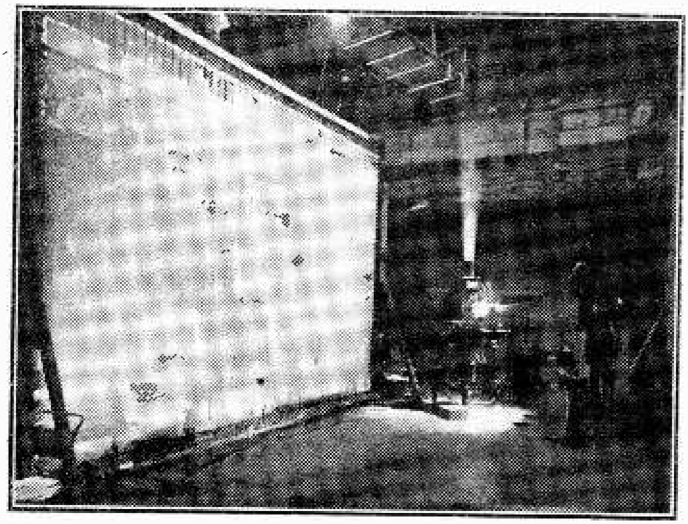


A general view of Studio G during the rehearsal of "The Venus of Bainville." This studio has a floor area of over 5,500 square feet.

are some intricate building and engineering problems to be solved. It also explains why so many months elapse before each studio can come into action.

Cameras

Turning to the Lime Grove cameras, these are very different from the ones which have been in use at Alexandra Palace since 1936. I must leave detailed electronic descriptions of them to my engineering colleagues, but, from a production point of view, they are a great advance. They are more sensitive and this in turn means that they give greater depth of focus. They are, moreover, fitted with lenses in rotating turrets. It will be seen at once that these two factors—depth of focus and ability to vary lenses—give producers a much more useful tool. They can now vary their angles of vision at will instead of being condemned to one for all purposes. The scene designers, too, have been given a different outlook. At Alexandra Palace it was not possible to go in for very effective lighting. Usually it was necessary to turn all the lights available on to the set and hope for the best. Now night scenes and the dramatic effects that can only be achieved by strong unidirectional lighting are not only possible but are already common practice.



A general view of a still back projector in use at Lime Grove.

Back Projection

Another result of increased sensitivity is that back projection has become a practical proposition. It is now perfectly feasible to project enough light through a translucent screen to combat the lights on the performers in front of it and still make an impression on the camera. This means that actors can appear in front of a photographically accurate background which has been projected from what is really only a powerful magic lantern. In some cases this not only provides a more realistic backing, but does it very economically. Back projection has, of course, been in use for many years in both theatre and film worlds and we have long been looking forward to using it in television. Now with several months of experience it bids fair to be one of the most useful tools in our bag. Other devices to assist the designer are in the offing. Various electronic aids to both captions and scenery are being busily developed by BBC staff. Colour has not been forgotten and the BBC Research Department has already studied many of its problems. Colour is by no means "just round the corner," as there are tremendous financial hurdles to be negotiated as well as many technical high jumps. Various people estimate the beginning of colour television in Britain as being from five to ten years. I incline toward the latter estimate as obviously the economic position of this country and the defence programme must inevitably slow us down.

What, you may ask, does a television studio look like now. Well, apart from being larger, very much the same to the visitor. There is the same mixture, as before, of performers, musicians, technicians, make-up girls and stage hands, the same labyrinth of scenery and apparatus. It is only on closer examination that the new techniques are revealed. In one corner, for example, is a quiet, unobstructed space that looks as though it had been forgotten when the designer arranged his sets. All the rest of the studio is cluttered with gear and people. Here there is a bare floor. You walk forward and are stopped by a rope. You then see that the whole area is roped off and that, on one side, two men are intently and continuously doing things to a quaint looking machine that emits queer streaks of light. You realise then that this is the back projector and, turning round, you see the screen with the image of a room on it. The room looks queer because the text on the wall is written backwards. You have to go to the other side of the screen to see it right way round. From the picture above you will see that the projector instead of being directly behind the screen, as you might expect, is placed to one side. Just out of the picture, to the right, is a large mirror which reflects the beam from the projector to the screen. The reason for this is that it saves studio space. Indeed, were it not for this arrangement, even the larger studios at Lime Grove would not be long enough for us to take full advantage of back projection.

Lighting

The lighting arrangements are now much more complex than at Alexandra Palace. Where we used to have a lighting gallery near every scene owing to the smallness of the studios, now many scenes are built in the middle of the large studios and in consequence are far away from the galleries. This means that special overhead gantries have to be erected to hold their lighting units.

The scenery itself, apart from that which is projected, does not look so different as you might expect. After all, the interior of a "library" or "sitting-room" must look much the same even though the technical devices all round it have changed.

Most of it is still made at Alexandra Palace and then transported in a fleet of lorries to Lime Grove. This adds enormously to the difficulties but it is a temporary situation which will be cured next year.

Franco-British Joint Television Programmes

AN ACCOUNT OF THE PRESS VISIT TO PARIS FOR THIS MEMORABLE OCCASION

By Our Special Representative

THE MARQUIS OF DONEGALL

TO start at the wrong end—the vision end, as received in London—the only thing General Leschi, Director of Technical Services, and M. J. D'Arcy, Programme Director, were apprehensive of was a thunderstorm round the Eiffel Tower. They certainly got one for the very first programme (7.40 p.m., July 8th) when the British Ambassador, Sir Oliver Harvey, opening the series in the garden of his Paris Embassy, was left to the imagination. As for the rest of the 17 programmes I thought that the 14 I was able to see came through remarkably clearly. The bilingual commentary was fun, as a novelty. Both Peters and Dimbleby did a difficult job, with no precedent to guide them, extremely well and obviously expected everybody to laugh with them, rather than at them, when things threatened to become inextricable. This mainly occurred when everybody on the screen talked in different languages at the same time; to achieve a similar result in only one language you have only to play back a tape-recording of four people having a conversation in your own sitting-room! (And yet, each will swear that he never said a word when anybody else was speaking!)

But it was all excellent entertainment and the rough edges, for better or for worse, will be worn off as Continental programmes become a commonplace on British screens.

The week's activities for the 25 British newspapermen started with a press conference at the French television studios in the rue Cognac-Jay, near the Eiffel Tower. Here I found myself taking up a half-way position between colleagues whose sole interest appeared to be whether the girls in the cabaret programme would be made to wear tops and those whose lives appeared to depend on the correct translation of "*tube cathodique à phosphores de longue rémanence*" and "*relais hertziens à deux voies.*"

Here we met, with their French colleagues, Cecil McGivern, Peter Dimmock, Newbiggin-Watts, M. J. L. Pulling and others of the BBC who had been working on the forthcoming week's Anglo-French programmes.

Here is a brief summary of the equipment allocated for the purpose:—

(1) In Paris

(a) Camera equipment.

Four mobile units working on a definition of 819 lines. These consist of:

(1) A mobile unit with four "Image-Orthicon" cameras built by the "Société Pye" of Cambridge and put at the disposal of R.T.F. by this company for the duration of the week.

(2) A mobile unit with three "Image-Orthicon" cameras specially built for the purpose by the Société Française Radio-Industrie.

(3) The usual O.B. unit of the R.T.F. with two "super-iconoscope" (Radio-Industrie) cameras.

(4) A new "suit-case" unit with two "Photocon" (Thomson-Houston), belonging to the R.T.F. and which were put into service for the first time for the Anglo-French television week.

(b) Relays.

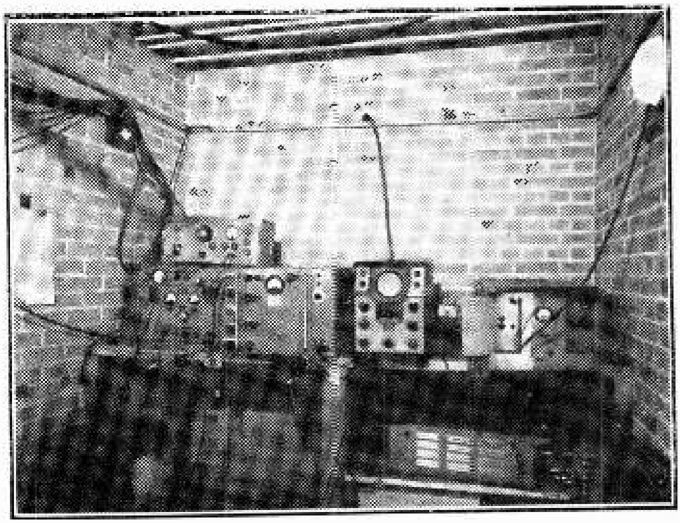
The vision signals were relayed by radio link from the place of televising to the Eiffel Tower.

Three of these work on 9,000 Mc/s and are built by the Compagnie des Compteurs.

(c) The converter from 819-441 lines.

This converter, which I saw in the south leg of the Eiffel Tower, played no part in the Anglo-French television week except that it converted the 819-line pictures to the now obsolescent French 441 lines to feed the Paris 441-line transmitter. Sets operating on the old 441 lines are to be found nowadays mostly round the Paris area.

It was something of a shock, after expecting this



Interior view of the hut at the base of the mast at Swingate, showing the radio link transmitting and receiving equipment, intercom. gear, and picture monitor.

converter and the one at Cassel—which converts the French 819 lines to the British 405—to be almost as complicated as the electronic brain, to find a comparatively Heath Robinson set-up. In fact, all that the converting consisted of was placing a television camera against a television screen and re-televising the picture transmitted on 819 lines with a camera constructed for transmission on 405 lines !

(2) Paris-Lille (136 miles)

From the Eiffel Tower the vision signals on 819 lines used the experimental radio relay of the R.T.F., passing by the intermediate stations of Villers-Cotterets (44 miles north-east of Paris) and Sailly-Saillissel (50 miles from Villers-Cotterets and 42 miles from Lille). This two-way relay works on a frequency of approximately 900 Mc/s and was built by the French company of Thomson-Houston. It is used by the R.T.F. to feed programmes to the television transmitter of Lille in anticipation of the permanent radio link in course of construction by the French Post Office.

(3) Lille

The Lille transmitter sent out normal programmes on 819 lines for the ordinary viewers of this region.

(4) Lille-Cassel (30 miles)

Two transmission channels were used for this stage.

(a) A mobile radio link working on 9,000 Mc/s of the same type as those used in Paris and also the "Compagnie des Compteurs."

(b) The high-frequency modulation of the Lille transmitter was received on apparatus specially built by the Société Desmet de Lille.

(5) Cassel.

The vision signals on 819 lines were transmitted to a converter specially built by the Research Department of the BBC. This transformed the pictures from the French standard of 819 lines into pictures on the English standard of 405 lines ; a 405-line camera was placed opposite an 819-line receiver fitted with a special cathode-ray tube which retains its phosphorescence for a long time.

(6) Cassel-Alembon (south of Calais) (18 miles).

The vision signals now converted to 405 lines accomplished this stage by means of a mobile radio link of the BBC working on 7,000 Mc/s. The equipment was built by the Marconi Wireless Telegraph Company.

(7) Alembon-Swingate (nr. Dover) (40 miles).

For the crossing of the Channel the equipment used by the BBC was a radio link working on 4,500 Mc/s and built by Electrical and Musical Industries Limited.

(8) Swingate-Wrotham (49 miles).

This radio link was of the same type as that used for the Channel crossing : 4,500 Mc/s, built by E.M.I.

(9) Wrotham-London (23 miles).

A radio link of the BBC working on 4,500 Mc/s and built by Standard Telephones and Cables Limited.

From London the pictures were transmitted from Alexandra Palace in the normal way : Sutton Coldfield, Holme Moss, Kirk o' Shotts by coaxial and radio link.

At this preliminary press conference, there also emerged the fact that this Anglo-French television week is only the beginning of the linking-up by television of the capitals of Western Europe. Ultimately, a world network should be achieved. It was General Leschi, the French technical director, who gave us this glimpse of the future.

The French are at present working on a Paris-Strasbourg link for Germany and a Paris-Lyons link for Switzerland and Italy. These are expected to be ready by the end of 1954.

"Our immediate ambition," said M. D'Arcy, "is to let British viewers understand the daily problems of the man-in-the-street in Paris as well as showing the colour and the variety of our city.

"The BBC and the French television service are now married, but I do not know which is the husband and which is the wife."

And here I give the translation of a little note on the commentaries :

"Commentaries on the pictures will be provided in French and English by some commentators of the R.T.F. and the BBC, Richard Dimbleby, Etienne Lalou and Georges de Caunes, and the announcements will be made by the 'speakerines' of the BBC, Sylvia Peters and Jacqueline Joubert. According to the nature of the programmes transmitted, the commentaries will be made sometimes independently in French and in English on two different channels ; sometimes simultaneously in French and English on a common channel."

I hope that that makes everything crystal clear and that Sylvia Peters likes the word "speakerine."

July 1st—first day of the visit of the British Press to see the preparations for the Anglo-French television week (July 8th to 14th)—was the fullest.

After inspecting the French converter from 819 to 441 lines in the south leg of the Eiffel Tower and the mobile units I have already described, there was a slight break before a cocktail party given by Radio Industrie.

It was here that we were able to meet many of the personalities who played their parts in the programmes to appear on British screens.

There was Jacqueline Joubert, pleased that she was to be allowed to wear evening-dress for once while acting as guide, guest and announcer at the Nouvelle Eve Cabaret programme.

"Speakerine" Joubert started as a student of dramatic art and toured Egypt and Lybia with two plays in 1946. She continued this stage career in Belgium, Switzerland and France, coming to the French television service in 1949. Many will remember her appearances as a guest on the BBC television in the spring of this year.

Georges de Caunes might be described as the Dimbleby of French television. Although his speciality is sport, he interviews everybody about everything : a job which he did for the French radio from the liberation of Paris until joining television.

He lives on the Ile de la Cité, near Notre Dame Cathedral and, weather permitting, goes to work in his little motor-boat as the Cognac-Jay television headquarters are conveniently near the river. His favourite sport is boxing, of which there is none live on French television, and he has made two Arctic explorations in Greenland.

A third personality of French television is Etienne Lalou, who was once the 1,500 metres junior champion of France. He is 33 and became Director of Literary Transmissions of the French radio in 1946.

During the war, Lalou was in charge of a mission in Burgundy for evacuating Allied pilots through Spain. For this he was awarded the Croix de Guerre, the American Medal of Freedom and the British King's Medal for Courage.

Until fairly recently he was Senior Programme

Assistant of the BBC French Service and should therefore know our ways and tastes pretty well for future use.

By the time I had had a word with Père R. P. Pichard, the pioneer of all French religious television, it was nearing time to leave. Père Pichard now has two television programmes a week, one being Mass in the studio—the service from the historic Basilica of St. Denis was a new departure—and has presented the Pope with a television set from the French people.

The R.T.F. and the BBC could hardly have picked on a more historic place than the Basilica or Cathedral of St. Denis for High Mass on Sunday, July 13th. As this is one of the three programmes I did not see on return to London, I do not know how much M. Aubert, professor at the University of Paris, told British viewers about it.

Suffice it to say that King Dagobert was originally responsible for its great wealth and beauty. He lived in the 7th century and is much better known—according to a French nursery rhyme—for putting his trousers on inside out! It is due to Napoleon Bonaparte, who erected the great altar for his marriage to Marie Louise and tidied up the awful mess made of the place in the French Revolution, that we can enjoy some of its ancient glory to-day.

There is little to be said—you saw it on your screens—about our visit that Tuesday evening to "La Nouvelle Eve." On the principle of "anything for a story" some colleagues inquired how much extra clothing the girls would be made to put on before appearing on British screens.

The story turned out to be hardly worth it considering that nakedness is never shown on the French television anyway; half the girls in the show are English and utterly respectable; the place would not exist except for English and American tourists and you can see a better show at London's Windmill Theatre any time you please without the necessity of adding to the headaches of the Bank of England.

Next day we went to Joinville which was much more fun. We piled into an ordinary Paris bus and in 30 minutes found ourselves at this popular Lido on the Marne. Joinville is Custer's Last Stand, as far as the Germans are concerned, every time they invade France. They began to retreat from there in the 1914-18 war and they blew up the bridge and fought a battle from the bathing cabins on their way out in the last war.

As I sat down with a cool drink outside the local and watched the bathers, the proprietor—over the din of a loudspeaker commentating the cycling Tour de France—pointed out German bullet holes in my table.

Although the French—at any rate up to the BBC's recent invasion—were nothing like as live O.B.-minded as we are, they specialise in rushing out telefilms of events like the Tour de France. This yearly event arouses wider-spread national enthusiasm than any Test Match, as the riders, followed by 16 mm., pedal and perspire for 3,000 miles over nearly a month.

Altogether, French television is a nearer relative of France's film industry than of France's theatre. The reverse is the case in Britain. You can see this as we did, if you visit the three studios in the disused Magie City Music Hall, where sets are built on film studio principles, as opposed to Drury Lane methods. (In one R.T.F. studio, they were constructing a bar for a play. After the performance it could perfectly well have gone into any hôtel to do service for 20 years!) Film actors and actresses form the backbone of French television; whereas, BBC television surely draws mostly from the British stage.

Discussing this with M. Jean D'Arcy, Director of Programmes of R.T.F., we guessed the reason might be that the British film world is geared to a higher economic standard than the BBC can take as its everyday basis. The film population of France is not too prosperous to play with R.T.F.

On Friday, July 4th, we set out at 7.30 a.m. by motor coach and first stop was the two-way radio link on 900 Mc/s at Villers Cotterets, 44 miles from Paris. This consisted merely of a tower erected in the middle of the forest, next to the house of the old forester. What with servicing technicians, tourists, small boys who want to climb the thing and, finally, a coachful of mad Englishmen in the mid-day sun with notebooks, quite a social life has suddenly formed round this gentleman's hitherto solitary existence.

After an excellent picnic luncheon some kilometres farther on we roll sleepily into Cassel, headquarters first of Foch and then of Plumer in the 1914-18 war, and up the steep hill to the ancient fortress where, in a room below the flat expanse of roof the BBC technicians take over from R.T.F. by placing a 405-line television camera against an R.T.F. 819-line picture from the transmitter in Lille, 30 miles away. We stood duly awed in the presence of the great converter of which we had heard so much. No electronic brain, no maze of soldered wires, plugs, jacks, knobs or gadgets: just a supreme example of the triumph of simplicity over 20th-century complexity.

Perhaps one of us who enjoyed the hospitality of R.T.F. and the BBC in the Paris heat-wave of 1952 will find out his name and raise a monument to the so far unknown technician whose mind managed to remain so normal that he was still able to think of something quite simple to benefit humanity.

SHOW ANNOUNCERS

THE Radio Industry Council, organisers of the National Radio Show, guided by its Exhibition Technical Committee, engaged three announcers (not a blonde among them!) to work in the studio in the glass-enclosed Control Room, nerve centre of the Radio Show.

The announcers, who were seen on the hundreds of TV receivers throughout the hall as well as heard, were:

PAMELA MAY—24-year-old announcer on BBC "Children's Hour." Pamela trained at the Royal Academy of Music and started her career on television in 1948 when she told Children's Hour stories—she now writes and tells her own stories. When Mary Malcolm was ill for 10 weeks Pamela took over and has since had several spells of announcing. She has also appeared in some sound radio plays. Pamela is a brunette and 5ft. 7in. in height.

NOELLE MIDDLETON—Irish-born, smiling-eyed ex-Trinity College, Dublin, student. Before coming to London last autumn, Noelle was a member of the Dublin Gate Theatre Company and before that worked with the Ulster Group Theatre in Belfast. Her broadcasting experience includes announcing for Radio Eireann and since coming to London she has been a BBC guest television announcer and has appeared in television plays. Noelle has real colleen colouring—blue eyes and brown hair, and is 5ft. 5in. tall.

AUDREY WHITE—tall 24-year-old top-line fashion model, who failed her first television audition because she was "too beautiful." She has since appeared in TV as a guest announcer—and in wax; in Danish shop windows, displaying clothes! Audrey is a red-head.

PICTURE DEFINITION

AN INTERESTING TECHNICAL DESCRIPTION OF DETAIL FOR THE EXPERIMENTER

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

THE amount of picture definition is limited in the vertical sense by the number of active scanning lines employed to reproduce a complete picture, while the overall bandwidth of the entire system sets a limit to the definition obtainable in the horizontal sense. It would be, of course, pointless to increase the horizontal definition by extending the frequency coverage of the video signals, unless at the same time the vertical definition were enhanced by employing a greater number of scanning lines.

It is this latter factor, therefore, which is in sole control of maximum picture definition, and which determines also a criterion of the maximum frequency contained in the video signal.

The BBC transmissions are styled so that with correctly adjusted receivers the picture definition is approximately equal in both vertical and horizontal senses. This is generally computed by assuming a picture to be comprised of a number of elements with sides equal to the width of a scanning line; in this case the line width is equal to the picture height divided by the number of scanning lines, while the number of elements to each portion of active scanning line is found by dividing the picture width by the width of a line.

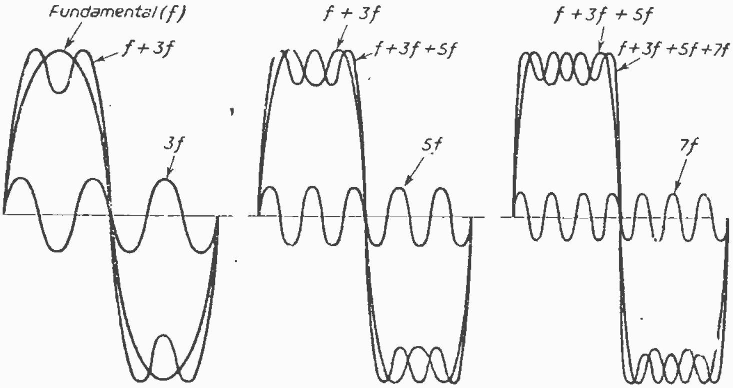


Fig. 2.—Curves showing the formation of a square wave.

Video Bandwidth

For the BBC transmissions this is merely the product of the number of active scanning lines (377) and the aspect ration (4/3)—or 503 elements per line. The total number of elements to a complete picture will be, of course, the product of the number of elements per line and the number of active scanning lines—or 503 × 377—189,631.

A complete picture (two interlaced frames) is transmitted in 1/25th second, therefore, 4,740,775 (189,631 × 25) picture elements are reproduced on the picture-tube each second. We are in a position to use this figure to calculate the minimum frequency coverage required of the video signals. But first, in order to convert this figure to represent frequency (in cycles per second) we must bear in mind that a single cycle from the picture modulation point of view consists of two separate pulses—one of which may correspond to a black element while the other to a white element. It is necessary also for the pulses to be of square-wave form so that alternate elements are wholly black and white. Fig. 1 illustrates this and shows how virtually a sine-wave corresponds to two square-wave pulses; the base of the negative pulse being held at black level creates a black element, while the positive half-wave extending into the white region causes the adjacent element to appear as white.

Therefore, if we divide the total number of picture elements transmitted each second by 2 we shall get a fair idea as to the minimum range of frequencies to be contained within the video signal for equal vertical and horizontal definition—this, of course, works out to a little under 2.4 Mc/s.

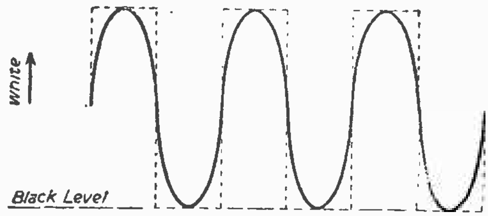


Fig. 1.—Curve showing how a single sine-wave corresponds to two square-wave pulses.

Another way of arriving at the approximate minimum video frequency is by breaking down a horizontal scan into elemental time periods. For instance, the duration of the active portion of a line is taken as 82.27 microseconds so that the duration of a picture element is 82.27 divided by 503—or 0.165 microseconds. We have already seen that the time of one complete cycle of sine-wave is equal to the duration of two picture elements, so, therefore, the duration of a complete cycle is 0.33 microseconds, and this, of course, corresponds to a frequency of 1/0.33, or 3 Mc/s.

A noteworthy point in this connection is that the black and white vertical bars on either side of the circle in test card "C" represent a width of about 0.25 microseconds. These provide a pulse test of the whole system and enable the response to isolated detail approaching the maximum resolution of the system to be judged. Further, it is clearly indicated then how the frequency gratings on test card "C" are so derived.

Whichever method is employed, however, the result is rather superficial, since we are trying to associate the response speed of the system with frequency. Nevertheless, the frequency method forms a standard by which picture definition may be judged and is adopted throughout the video chain. Thus, from the receiver's aspect, provided the response of the video channel embraces the minimum desirable video pass-band (2.7-3.0 Mc/s) little more can be expected so far as definition is concerned. The smallest detail resolvable is, of course, governed by the size of a picture element.

Picture Modulation

Now a television picture largely consists of transients or pulses which change suddenly from complete black to full white; in fact, the sharpness or definition of the picture is controlled mainly by the rate at which the video circuits respond to these sharp changes in modulation level. It will be understood, of course, that the sudden changes will vary in both magnitude and uniformity depending upon the picture make-up; sometimes, for instance, a large number of picture elements may be covered by a single change in modulation level, while at other times a rapid change in modulation level may cover a single element only, or even less. As the

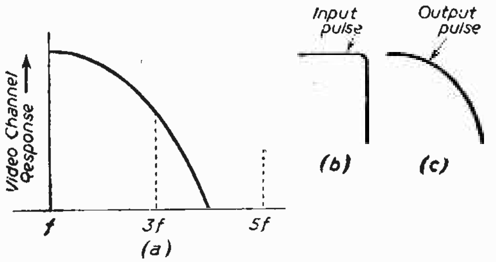


Fig. 3.—This diagram shows how distortion to a modulation pulse can occur due to an inadequate high-frequency video response.

picture content diminishes, however, the resolution efficiency decreases—this is clearly illustrated by comparing the 1 Mc/s gratings on test card "C" against those representing 3 Mc/s—the former will appear much more clearly than the latter.

Because the picture modulation consists of sudden changes it can be likened to square-wave pulses. Now a perfect square-wave may be analysed into an unending spectrum of frequencies, or sine-waves, consisting of a fundamental and its odd harmonics up to infinity—that is, frequencies three, five, seven, etc., times the fundamental.

Some idea as to how this occurs is illustrated by Fig. 2. Here the effect of adding consecutive odd harmonics up to the seventh to a sine-wave is shown. It will be observed that as each harmonic is added, so the wave-form resembles more closely a square-wave. However, a square-wave may be reproduced fairly well provided harmonics of the fundamental up to about 10 are present.

Now it will be remembered that when we computed the minimum video bandwidth we based our calculations for a single picture element on a sine-wave; therefore, in view of the foregoing, it is fairly obvious why a minute factor of a picture is reproduced less clear than something larger. A part of picture equalling in size an element, for instance, will be less accurately reproduced than, say, a picture part having size equal to a hundred elements—for in the latter case the desirable harmonic content will be present. This means that for a picture—composed of alternate black and white squares (a chessboard pattern) of elemental size—to have definition equal to a picture composed of squares 10 times the area, the frequency range would need to be extended tenfold. In other words, a maximum video frequency of 27-30 Mc/s would be necessary. Such a frequency range would not only be impracticable but also pointless,

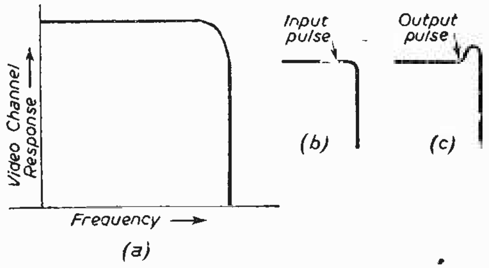


Fig. 4.—Illustrating the effect of a sharp high-frequency video cut-off.

for the maximum frequency transmitted by the BBC is only 2.75 Mc/s.

Transient Distortion

We can see, therefore, that should the video channel of the receiver be incapable of amplifying faithfully the rapidly changing modulation transients poor reproduction of picture detail is bound to ensue. A condition recognised as poor definition is when any sharp changes in picture tone are slowed down to such an extent that one change in tone is not complete before the next one starts. A result such as this simply means that the video system has inadequate amplification of the high modulation frequencies, and this, as we have already seen, tends to distort a square-wave by rounding off its corners and slowing down its desirable rapid rate of change.

Fig. 3 clearly illustrates this point, and shows at (a) a video channel response curve which is severely lacking in high-frequency response—the first odd harmonic is, in fact, well down in amplitude compared with the fundamental, while the second odd harmonic is out of the response curve altogether. A video amplifier adjusted for such a response would distort the applied square-wave pulse (b) representing a rapid change in modulation level and convey it to the picture-tube as pulse (c) having a rate of change very much slower.

Another point in connection with transient distortion—although not necessarily tied up with the question of band-width—is well worth considering at this stage, and this is that a reproduced transient can build up an amplitude greater than that of the applied pulse should the high-frequency cut-off of the response curve be too sharp. This effect is frequently referred to as either overshoot, ringing, or black after white, the latter being the more accurate definition since it indicates precisely how the effect is manifested on the picture-tube. The response curve indicative to these conditions is shown by Fig. 4 (a), while (b) and (c) illustrate respectively how the applied modulation pulse is distorted.

A compromise between the two responses is aimed at by designers to achieve an optimum response to transients within the available video bandwidth, and the form is usually similar to that of Fig. 5 (a), where the input and output pulses are shown at (b) and (c) respectively.

The Question of Phase

It is essential that the relative phase of the components frequencies comprising the modulation waveform remain unaltered during their passage through the video channel of a receiver. A sine-wave, as we know, when applied to any linear circuit (amplifier, coupling, etc.), will be altered in amplitude and phase, but unchanged in shape.

Now the application of a square-wave to such a circuit will result in the sine-components being altered in amplitude and phase ; this, of course, is quite in order provided the phase relationship between the sine-components is unaffected, for then they will add up and form the original wave-shape at the output of the circuit. If, however, the sine-components are not subjected to an equal phase shift they will add up to give a different output wave-shape.

It is necessary, therefore, for the video and coupling circuits to be so adjusted as to provide the same amplitude response for each sine-component, and also a phase shift proportional to frequency. It will thus be obvious that an important factor in this connection is in the design and lining-up of the video channel.

The waveforms of Fig. 6 (a) and (b) clearly illustrate how the fundamental and third harmonic waveform of Fig. 2 can be severely altered in shape by applying the harmonic at two different phase angles. So far as sound is concerned, however, the three waveforms in question would all give rise to the same sound ; this is due to the fact that the ear is incapable of detecting the minute modification between their component frequencies.

On the other hand, the component frequencies of the television modulation are not so important as the final shape of the modulation waveform, for obviously the three waveforms would produce entirely different results on the picture-tube.

The Scanning Spot

The scanning spot itself presents quite a problem so far as definition is concerned ; ideally it should be wholly in sharp focus and so shaped that coupled with its traverses along adjacent lines would resolve a complete picture with invisible line structure.

In practice, however, its shape is more round than of the desired shape with its brightest point in the centre so that its intensity gradually diminishes outwards in all directions. This means, of course, that generally when dynamic a slight overlap between the low intensity fringes will occur ; but provided the overlap is not excessive the definition will not seriously be impaired.

It is worthy of mention, however, that the spot size fixes a limit to the number of scanning lines which can usefully be employed ; although even with 405 lines this limit is quite frequently exceeded with the older style picture-tube. Nevertheless, the modern high-voltage tube produces a very sharp and clearly defined spot of high intensity. A spot such as this, unfortunately, appears to amplify the line structure and tends also to create a phenomenon known as interlace flicker, which is observable by a momentary disappearance of one set of lines if the eyes are moved rapidly while viewing.

By the employment of "spot wobble" both of these effects may be reduced at the expense of vertical definition. What actually happens is that the scanning spot is made to oscillate at about 10 Mc/s in the vertical direction by the addition of a special deflector coil and oscillator system, and thereby the spot is elongated in the vertical sense only.

A point to remember is that irrespective of the number of scanning lines employed, the smallest detail that can be resolved is limited also by the size of the spot itself.

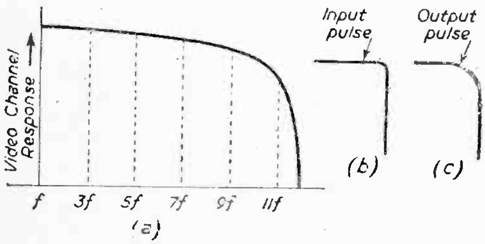


Fig. 5.—A video response curve for optimum response to picture modulation.

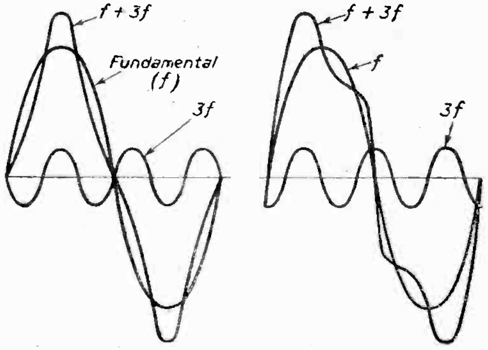


Fig. 6.—Two more wave-shapes, created by fundamental and third harmonics.

Television Trials at Sea

TRIALS were recently carried out in the English Channel with the new Marconi-Siebe, Gorman underwater television equipment. Only minor modifications have been necessary to adapt the normal Marconi Image Orthicon cameras for submarine work—indeed, the original naval equipment, incorporating a Marconi camera, which was used by the Admiralty to identify the ill-fated *Affray* last year is now held by the Admiralty as an operational camera for use should any further submarine accidents happen.

Much was learned at sea under operational conditions of tide and current and varying underwater visibility to aid the designers in finalising details of pressure casings, lighting systems, and facilities which will allow officers in command to have complete control over the movement of the television equipment at any depth. The position chosen for these sea trials was over a wreck. Monitors were fitted on the bridge and in the saloon. Another special monitor was used to make a film record of the tests.

Descents were made with the camera, both inside and outside the wreck.

By using various camera angles full details of the wreck were seen by everyone on board the vessel used for these trials.

LOSS OF LINEARITY

A SIMPLE EXPLANATION OF THE CAUSES OF A COMMON FAULT AND ITS CURE

By W. J. Delaney (G2FMY)

PROBABLY one of the commonest faults in the home-built receiver, and one which often develops in many commercial receivers, is poor linearity in the line scan. The fault gives rise to a form of picture distortion which is generally referred to as a "stretched left" or cramped side to the picture. In early forms of receiver, before scanning coil design had reached the standard met with to-day, it often showed itself as a complete fold-over (usually on the left) in which a bright band of light appeared a short distance from the left-hand side of the picture, and it could be seen that the picture actually folded over itself for a quarter of an inch or so. In most present-day designs, however, the constructor usually comes up against the trouble merely as a stretching or cramping of one side, and although it can be experienced on both frame and line, the former is not so common, or if present to a small degree does not show up so prominently on the picture. If, however, one side or the other is stretched, as a figure passes across the screen it changes its proportions and we have the humorous view of a thin person entering the screen on one side and getting perceptibly fatter as he passes across the screen—or vice versa.

Correspondence shows that in the majority of cases the reason for this trouble is not understood—as when the reasons underlying the distortion are apprecia ed, the remedy is not difficult to find.

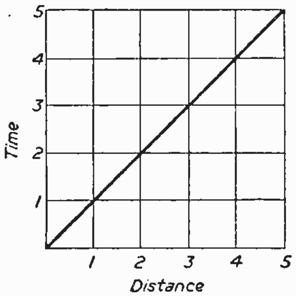


Fig. 1.—A "straight-line curve" plotted for distance against time. This is, in effect, a portion of a "saw tooth" output.

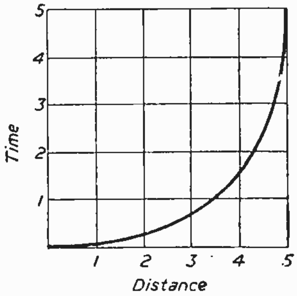


Fig. 2.—Curvature of the type generally found in a valve characteristic, which is, in effect, a distorted form of Fig. 1.

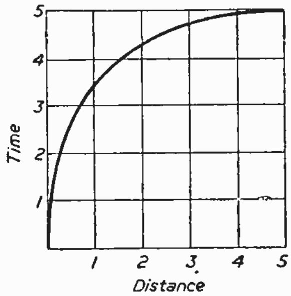


Fig. 3.—Curvature in the opposite direction, as shown here, could be introduced by distortion of the curve of Fig. 1.

Line Scan

Most constructors now know that the scan, in either the frame or line direction, is caused by a "saw tooth" impulse in the anode circuit of a valve, the rate of change in the line direction being the greatest. In most circuits there is an oscillator stage which produces the original "saw tooth," and as this is very small an amplifying stage is added to provide sufficient output to actuate the deflection coil. The term "saw tooth" is used here as it is one commonly employed, but too much importance should not be attached to the term, which is merely used to indicate that the current rises a certain amount, then drops back to rise again, and so on, producing, if plotted against time, an up and down line very similar to the toothed edge of a saw.

Now the usual type of oscillator which is used does not produce the correct waveform which must increase and drop back at a definite regular rate and at a definitely regular speed. The incoming sync pulses should fire the time base at correct intervals and this will bring the right- and left-hand edges of the picture at the correct point, but between the edges the spot must travel across the screen at a rate corresponding with that in the camera which is carrying the transmission.

Characteristic Curves

Look at the characteristic curve of a good amplifying valve used for L.F. purposes, and you will find that it resembles something like that shown in Fig. 2. Here, for the purposes of explanation, the graph has been drawn with distances along the bottom and time up the side, so that later we can compare the trace on the picture tube. In Fig. 1 we have a line drawn with equal time and distance measurements, or in other words for every distance along the bottom we will find an equal distance up the time track. In Fig. 3 we have a curve which is the reverse of that shown in Fig. 2. Now the usual curve which would be found if we plotted the output

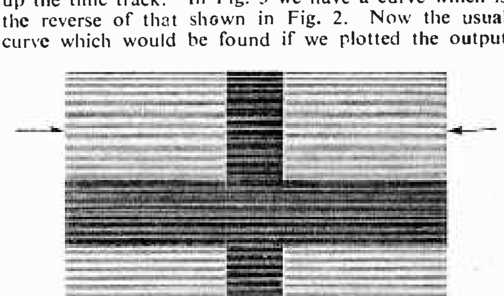


Fig. 4.—The "artificial bars" signal as seen on the screen. The scanning line indicated by the arrows is used to illustrate the points raised in this article.

of the oscillator would probably be like a saw tooth, as already explained, but with curved teeth, the curvature varying according to the type of oscillator and the manner in which it was driven. The actual output which is employed may not be the current in an anode circuit, but a charging impulse or discharging impulse across a condenser, but whatever it is we are not too concerned with it at the moment, except to bear in mind that it will not have the required straight-toothed form which we require.

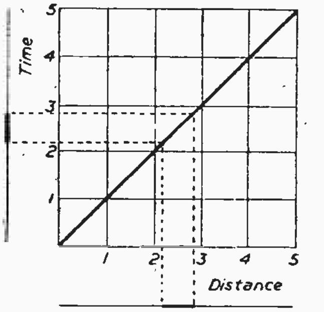


Fig. 5.—The curve of Fig. 1 with the line of Fig. 4 shown as transmitted (" time ") and as reproduced on the picture tube (" distance ").

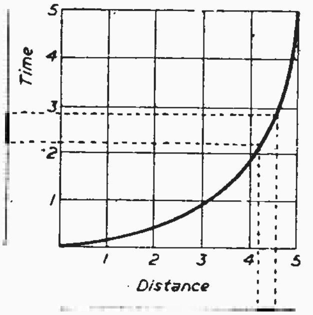


Fig. 6.—The effect of an output similar to that shown in Fig. 2—a " stretched left " or " cramped right."

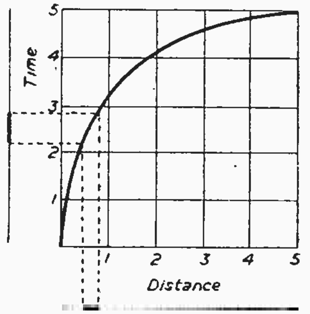


Fig. 7.—An output similar to that shown in Fig. 3 produces this effect on the line of Fig. 4.

It has been pointed out that an amplifying stage has to be employed to provide sufficient drive for the coils, and thus we can employ this stage as a corrector as well as a driver and this is, in fact, how the majority of line amplifying valves are employed. If the output from our oscillator stage had a form similar to the curve in Fig. 3, and it were passed into a stage which had an output similar to Fig. 2, the two curvatures should correct each other and produce a straight line, as in Fig. 1, and this is how the line (and frame) amplifying stage is generally operated. An examination of the time bases of your circuit will show that the amplifier is provided with heavy negative feedback or some other arrangement to " distort " the incoming waveform and deliver the substantially straight saw tooth which is required. In most circuits the linearity control which is fitted will be found to consist of an adjustable negative feedback control and, therefore, if there is any unwanted distortion of the waveform the obvious point to look for the trouble is in the manner in which the amplifier is operated. If, for instance, you use a valve different from that specified in a circuit you would undoubtedly have to change the feedback or bias components unless the characteristic curves of the two valves were absolutely identical. Similarly, a change in anything in the oscillator stage may produce some change in the waveform which cannot be corrected by the amplifying circuit, and thus it is essential to adhere to specified valves and component valves when adopting any particular line time-base circuit, unless you are able to know what change will occur and make a corresponding compensation in the amplifier stage.

An Example

In order that the effect of the poor waveform may be more clearly understood, Fig. 4 shows the " artificial bars " signal which is transmitted before a programme comes on the air, and which is used by the BBC for certain test purposes. If we take one line of the complete raster, as shown by the arrow, this will consist of a certain length of white, then a sudden fall to black for a period, and a return to white for the rest of the picture width. Notice that the short black line occupies a certain distance in the exact centre of the transmitted picture. Now in Fig. 5 we show the line at the side of the graph with the straight line output, and it will be seen that if we connect the various points on our scan across to the " curve " and take them down to the bottom (the distance travelled by the spot on the screen) we will get an exact replica of the scanned line. Now look at Fig. 6. Here we have the same scanned line whose time is constant in the transmission, but if our spot is travelling according to the curve shown it will have travelled past the centre before the dark line arrives and thus we shall have a " stretched left " picture, or the line appearing well over to the right. In such a picture, of course, all objects on the right of the picture will be cramped or closed up and such a picture might also be referred to as a cramped right picture. Where the curve is of the opposite shape we have the opposite effect on our screen, as shown in Fig. 7, the line now appearing well over to the left of the screen.

Briefly, then, an attempt has been made to simplify the action of the time base and show that any cramping or stretching in the line time base is likely to be due to the particular waveform at the anode, and changes in bias components, values of linearity circuit components or even in the oscillator output will correct it, and usually the substitution of a single item in any of these circuits will indicate just in what direction such change should be made. Thus, if the amplifying valve is operated with a bias resistor lower than would be used in a normal L.F. amplifier, and it is shunted with a high resistor temporarily (which has the effect of reducing its value slightly) and the distortion from which the picture is suffering is increased, then obviously a higher resistor should be used, and if this is gradually increased and only corrects to a certain stage beyond which any further increase has no effect, or introduces some other form of distortion, then attention should be paid to some other part of the circuit.

In all cases where the trouble arises after a circuit has been working correctly for some time, attention should be paid to fixed condensers in the time base as these may have become leaky and, as shown, will affect the results.

E.H.T. Power Supplies

METHODS OF OBTAINING HIGH VOLTAGE

By P. Dodson

THE necessary anode voltage (Extra High Tension) for the C.R. tube may be obtained by step-up transformer from the mains supply, line fly-back, or R.F. oscillator and rectifier.

The most popular method of obtaining a modest E.H.T. voltage is by the use of a transformer and half-wave rectifier, Fig. 1. The mains voltage may be stepped up by this means to a maximum of 6 to 7 kV. It is simple to build and reliable. Output is ample and the regulation is good. Unlike the fly-back method, it is not affected by a varying load. The high cost of the transformer, especially for outputs over 5 kV, and the danger of shock are the chief disadvantages. A bleeder network connected between the rectifier output and earth will discharge the condenser " C " after the receiver has been switched off. It will also allow the correct operating voltage for the tube to be taken from a point on the network. The bleeder resistors should be rated at 1 watt as, being longer than the ½ watt type, they are not so liable to " flash-over." The smoothing resistor " R " will safeguard the rectifier in the event of a short circuit developing in the tube network. Fuses rated at 500 mA should be inserted in both primary leads.

As a precaution against shock it is best to insert a plug and socket arrangement in the mains leads to transformer, so that the E.H.T. may be removed without cutting off all the valve heaters.. This is useful when adjustments have to be made to the receiver.

Voltage Multipliers

Outputs up to 5 kV may be obtained from the normal 350-0-350 volt H.T. transformer, using Westinghouse miniature metal rectifiers in a voltage multiplier circuit. The regulation is excellent and the drain on the transformer is very small, less than 1 mA. The circuit arrangement for a 5 kV output is shown in Fig. 2.

For outputs exceeding 7 kV voltage doubling may be adopted. It is likely to be rather costly, as the transformer must be a really high-class job. The windings need to be well insulated from one another, and from the core, to withstand the very high voltages present. It is, perhaps, better to use either the line fly-back or the R.F. method.

Line Fly-back

In a magnetically deflected receiver E.H.T. can be obtained quite easily and cheaply from the high voltage pulses generated at the anode of the line output valve. These pulses can be increased to a maximum by voltage doubling or by an extended winding on the line transformer. The ordinary line output transformer, having no auto-wound primary or heater winding, is suitable for outputs up to 6 kV if miniature metal rectifiers, such as 36 EHT 35, are used. Circuit diagrams of various methods of obtaining E.H.T. from the line fly-back appeared in the June issue.

R.F. Oscillator

Where an E.H.T. voltage in excess of 7 kV is required, the R.F. oscillator and rectifier is often specified. Unlike the transformer or fly-back methods, it is free from the danger of severe shock. The current output is quite small, being about 150 microamps. Regulation is satisfactory. The unit, which must be thoroughly screened to prevent interference, needs some 30 mA to 300 v H.T. and the necessary heater supply for the oscillator valve. Usually the existing receiver is called upon to meet these demands. This is the main disadvantage of the R.F. oscillator.

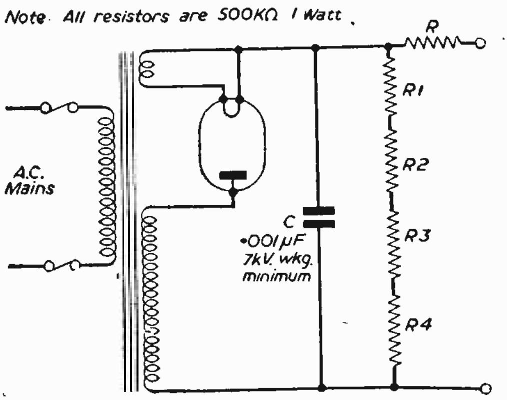


Fig. 1.—The simplest E.H.T. generating circuit.

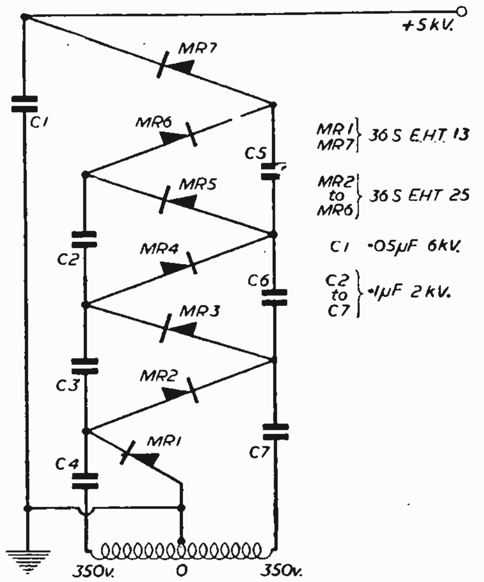


Fig. 2.—Obtaining up to 5 kV from a 350-0-350 mains transformer.

It is possible, however, to make the unit entirely self-contained. Fig. 3 shows how this can be achieved by adopting the "Universal" system. V1 is the oscillator valve, V2 the E.H.T. rectifier and V3 the H.T. rectifier. Like all "universals" no earth connection can be made to the chassis. In fact, the whole of the equipment of which this unit forms part is in connection with one side of the mains supply and the usual precautions should be taken. VR will vary the E.H.T. output from about 3.5 kV to 8 kV. The heater supply to the EY51, E.H.T. rectifier, is taken from L1 on the R.F. transformer, and the voltage will depend on the power in the primary circuit. Being R.F., the heater voltage is difficult to measure. A rough check on the voltage can be made by connecting a 6-volt torch bulb in place of the EY51 in the first instance. Correct heater temperature can be judged by comparing the brilliance of the EY51 with that of an EA50. If insufficient brilliance is obtained then the heater coil should be moved closer to the other coils. Any adjustment of VR will, of course, affect the heater volts of the E.H.T. rectifier, and due regard should be taken of this fact.

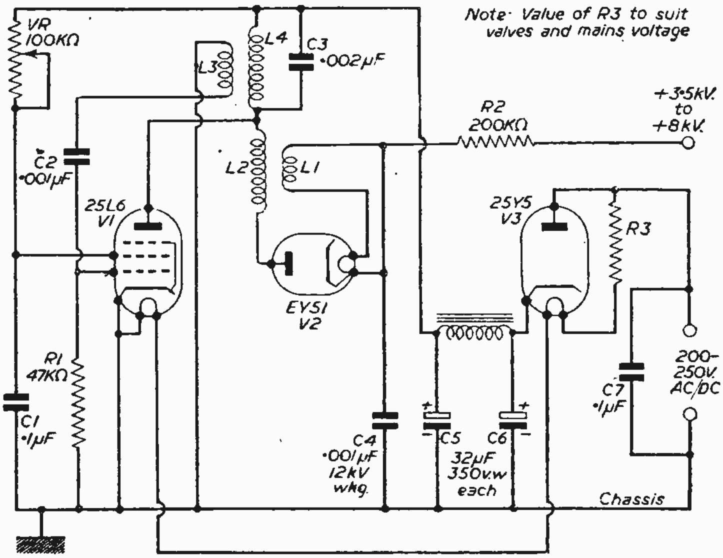


Fig. 3.—Circuit suggested by the author for obtaining 3.5 to 8 kV.

American News

R.C.A.

NEW radio-electronic developments holding "great promise for new business in the future" were revealed recently by Brig.-general David Sarnoff, chairman of the Board of the Radio Corporation of America, at the 33rd annual meeting of R.C.A. stockholders in a studio of the National Broadcasting Company in Radio City, New York.

General Sarnoff listed nine new projects which R.C.A. scientists and engineers are presently developing for business, industry and communications. Amongst these were:

A portable one-man television station called the "Walkie-Lookie," for use by reporters and broadcasters covering news and special events in the field. This visual counterpart of the war-time "Walkie-Talkie" weighs only 46 lb.

A closed-circuit type of industrial television for use as a "remote eye" for industry through hundreds of applications including observation of dangerous processes, the transmission of pictorial information, and mass training in industry and the military services.

Transistors—tiny electronic devices which function like certain types of electron tubes—are being developed by R.C.A. for mass production as a new key that opens vast possibilities for new designs of radio, television and electronic instruments for civilian and military use.

International television as a regular service to be realised within the next five years.

General Sarnoff announced that in the first quarter of 1952 R.C.A. Victor manufactured all the television receivers permitted under Government allocation of materials.

BELL

The following interesting summary of network television stations has been produced by the Bell Laboratories.

Year ending	Cities with TV stations on the air	TV stations on the air	Cities served by Bell System TV Network	Number of stations Bell System Network TV Service available to	Channel miles of inter-city TV facilities
1946	4	7	2	4	476
1947	10	14	5	8	696
1948	29	48	13	29	2,584
1949	60	98	25	50	8,954
1950	66	107	42	72	18,094
1951	66	108	46	86	23,969
1952	66 (1)	108 (1)	54 (2)	96 (2)	28,500 (3)

(1) Exclusive of any new stations which may be authorised by F.C.C.
(2) In addition there are eight stations in eight cities served by facilities operated by broadcasting companies.
(3) Planned for by end of 1952.

THE NATIONAL RADIO SHOW

List of Exhibitors in Alphabetical Order, with Stand Numbers

Name	*Address*	*Stand No.*
Aerialite, Ltd.	Castle Wks., Stalybridge, Cheshire	50
Amplion (1932), Ltd.	230, Tottenham Ct. Rd., London, W.1	54
Antiference, Ltd.	67, Bryanston St., Marble Arch, W.1	22
Automatic Coil Winder & Elec. Equip. Co., Ltd.	Winder House, Douglas St., S.W.1	46
Balcombe Ltd., A. J.	52, Tabernacle St., London, E.C.2	35
Belling & Lee, Ltd.	Cambridge Arterial Rd., Enfield, Middx	25
Bulgin & Co., Ltd., A. F.	By-Pass Rd., Barking, Essex	1
Bush Radio, Ltd.	Power Rd., Chiswick, W.4	16
Chloride Batteries, Ltd.	Publicity Dept., 6/10, Whitfield St., W.1	94
Cole, Ltd., E. K.	Ekco Works, Southend-on-Sea, Essex	24
Collaro, Ltd.	Ripple Wks., By-pass Rd., Barking, Essex	91
Co-operative Wholesale Society, Ltd.	1, Balloon St., Manchester, 4	12
Cossor, Ltd., A.C.	Cossor House, Highbury Grove, N.5	37
Decca Record Co., Ltd.	1/3, Brixton Rd., London, S.W.9	61
Dubilier Condenser Co. (1925), Ltd.	Ducon Wks., Victoria Rd., North Acton, W.3	79
Dynatron Radio, Ltd.	Perfecta Wks., Ray Lea Rd., Maidenhead, Berks	40
Econasign Co., Ltd.	92, Victoria St., London, S.W.1	21
Edison Swan Elec. Co., Ltd.	155, Charing Cross Rd., W.C.2	62
E.M.I. Sales & Service, Ltd.	Hayes, Middx	68
English Elec. Co., Ltd.,	Queens House, Kingsway, W.C.2	67
Ever Ready Co. (G.B.), Ltd.	Hercules Place, Holloway, N.7	57
Felgate Radio, Ltd.	6, Studland St., London, W.6	7
Ferguson Radio Corporation, Ltd.	105, Judd St., London, W.C.1	88
Ferranti, Ltd.	Hollinwood, Lancs	14
Garrard Eng. & Mfg. Co., Ltd.	Newcastle St., Swindon, Wilts	92
General Elec. Co., Ltd.	Magnet House, Kingsway, W.C.2	26 & 78
Goodmans Industries, Ltd.	Lancelot Rd., Wembley, Middx	41
Gramophone Co., Ltd.	Head Office, Hayes, Middx	89
Hunt (Capacitors), Ltd., A. H.	Bendon Valley, Garratt Lane, S.W.18	56
Imhof, Ltd., Alfred	112, New Oxford St., W.C.1	19
Invicta Radio, Ltd.	Parkhurst Rd., Holloway, N.7	71
J.B. Mfg. Co. (Cabinets), Ltd.	86, Palmerston Rd., Walthamstow, E.17	9
Kolster-Brandes, Ltd.	Footscray, Sidcup, Kent	28
Lee Products (G.B.), Ltd.	90, Gt. Eastern St., E.C.2	77
Linguaphone Institute, Ltd.	207/209, Regent St., W.1	96
Livingston Laboratories, Ltd.	Retcar St., Dartmouth Park Hill, N.19	93
McMichael Radio, Ltd.	190, Strand, W.C.2	69
Marconiphone Co., Ltd.	Hayes, Middx	87
Masteradio, Ltd.	10/20, Fitzroy Pl., N.W.1	63
Mullard, Ltd.	Century Hse., Shaftesbury Ave., W.C.2	17
Multicore Solders, Ltd.	Maylands Ave., Hemel Hempstead, Herts	32
Murphy Radio, Ltd.	Welwyn Garden City, Herts	15
Newnes Ltd., Geo.	**Tower House, Southampton St., W.C.2**	**52**
Pamphonic Reproducers, Ltd.	Westmoreland Rd., Queensbury, London, N.W.9	85
Peto-Scott Elec. Instruments, Ltd.	Addlestone Rd., Weybridge, Surrey	23
Philco (Overseas), Ltd.	Lion House, Richmond, Surrey	38
Philips Electrical, Ltd.	Century Hse., Shaftesbury Ave., W.C.2	59 & 60
Pilot Radio, Ltd.	31/37, Park Royal Rd., N.W.10	58
Plessey Co., Ltd.	Vicarage Lane, Ilford, Essex	80
Portogram Radio Elec. Industries, Ltd.	"Preil Works," St. Rule St., S.W.8	20

STAND NO. 52
"PRACTICAL TELEVISION" & "PRACTICAL WIRELESS"

Name	*Address*	*Stand No.*
Pye, Ltd.	Radio Works, Cambridge	36 & 84
Radio Gramophone Dev. Co., Ltd.	Pale Meadow Print Works, Bridgnorth, Shropshire	29
Roberts' Radio Co., Ltd.	Creek Rd., East Molesey, Surrey	39
Rola Celestion Ltd.	Ferry Wks., Summer Rd., Thames Ditton, Surrey	73
Regentone Products, Ltd.	Eastern Avenue, Romford, Essex	13
Scophony Baird, Ltd.	Lancelot Rd., Wembley, Middx	33
Sculptured Sound-Sali, Ltd.	79a, St. Leonard's Rd., Windsor, Berks	121
Selmer & Co., Ltd., Henri	114/116, Charing Cross Rd., W.C.2	10
Simon Sound Service, Ltd.	48, George St., London, W.1	47
Sobell Industries, Ltd.	Langley Park, nr. Slough, Bucks	34
Standard Telephone & Cables, Ltd. (BRIMAR)	Footscray, Sidcup, Kent	6

Name	Address	Stand No.
Standard Telephone & Cables, Ltd. (SenTerCel)	Connaught House, Aldwych, W.C.2	55
Stella Radio & T/V Co., Ltd.	Oxford Hse., 9/15, Oxford St., W.1	27
Stratton & Co., Ltd.	Eddystone Wks., Alvechurch Rd., West Heath, Birmingham, 31	124
Skarsten Mfg. Co., Ltd.	21, Hyde Way, Welwyn Garden City, Herts	48
Taylor Elec. Inst., Ltd.	419, Montrose Ave., Slough, Bucks	53
Telegraph Condenser Co., Ltd.	North Acton, W.3	72
Telegraph Con. & Maintenance Co., Ltd.	Telcon Wks., Greenwich, S.E.10	42
Telequipment Electronic, Ltd.	73a, Beresford Rd., Hornsey, N.8	83
Telerection, Ltd. ..	Antenna Wks., St. Pauls, Cheltenham, Glos	11
Ultra Electric, Ltd.	Western Ave., Acton, W.3	70
Valradio, Ltd. ..	New Chapel Rd., Feltham, Middx	122
Vidor, Ltd. ..	West Street, Erith, Kent	90
Westinghouse Brake & Signal Co., Ltd.	82, York Way, King's Cross, N.1	49
Whiteley Elec. Radio Co., Ltd.	Victoria St., Mansfield, Notts	95
Wolsey Television, Ltd.	75, Gresham Rd., Brixton, S.W.9	76

THE R.I.C. CONTROL ROOM

ENCOURAGED by the interest which centred round the Radio Industry Council's Control Room at the 1951 Radio Show at Earls Court, the Council this year is again making this a feature of the Exhibition. The exhibit has been enlarged and contains several new features.

The Control Room, which is designed by members of the Exhibition Technical Committee, contains all the apparatus for the regulation and distribution of the sound and television programmes which are used for demonstration throughout the Show. It is on the first floor on the way to the BBC studio from the escalator at the Warwick Road entrance.

Glass windows along both sides of the Control Room give an excellent view of the equipment, and the Programme Officer can be seen at the control position at which the television programmes are selected and fed to the receivers in the Show.

The announcer's studio has been designed to allow as many visitors as possible to look in through windows. It contains the control console from which the announcer can play gramophone records—including long-playing—or make her announcements. Facing her is the television camera, which will enable her to be seen as well as heard throughout the exhibition hall.

The two wings on either side are devoted respectively to television and sound equipment. The main television control racks are on view with the three monitor cathode-ray tubes on which the programmes are set up before being passed to the cable distribution system.

Behind this position, at which the vision programme is controlled, are situated the main television amplifier racks which raise the signal to the required level for distribution. An intercommunication system enables the Programme Officer, the television engineer on duty, and the announcer to be in touch with each other.

Except for two short breaks the television programme will be virtually continuous during the day, the Programme Officer having a number of sources from which he may choose material:

(1) The normal BBC television programme which is relayed to the Exhibition over a micro-wave link from Alexandra Palace to ensure that as far as possible it is free from local interference which might mar the pictures.

(2) The film scanner which can be seen in the Control Room near the television control racks and from which standard 35 mm. films are scanned.

(3) Live programmes picked up by the cameras in the BBC television studio within the Show.

(4) The output from the adjoining announcer's studio.

(5) The output from another television camera covering the celebrity dais on the ground floor of the Exhibition.

Each of these programmes feeds into the television control racks and is available at will. The programme is monitored, passed through faders and then fed to the main amplifiers for distribution by cable to the receivers operating throughout the Show. From previous experience it is known that the internal television circuit can pick up the Alexandra Palace signal, which results in interference on the picture when the distributed programme is being taken from one of the other available sources. For this reason the sets in use are those for Birmingham (Channel 4) using 61.75 Mc/s for vision and 58.25 Mc/s for sound, at which the internal circuit operates.

The waveform conforms to standard BBC practice and each outlet in the Show feeds only one receiver with a signal level of 1 mV. $\pm$ 3 db. into 70 ohms unbalanced. All television distribution is on a closed circuit so that no external radiation takes place. A comprehensive range of test equipment ensures that the standard and level of signal is maintained.

The public address equipment is also regulated from the R.I.C. Control Room and the input amplifiers can be seen on the other side. Apart from announcements, the system will be used for relaying BBC programmes or gramophone record programmes.

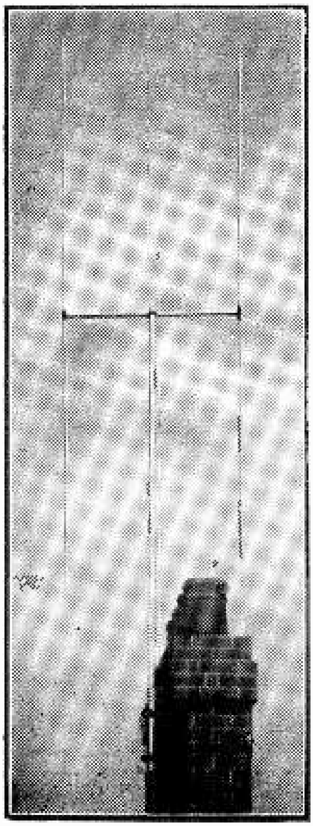
The main amplifiers are on the top floor of Earls Court under the roof and feed a large number of speakers which are part of the permanent installation of the hall. A new feature is that the announcer, if desired, can be heard on the television sound programme as well as on the public address equipment.

A small automatic telephone exchange in the Control Room keeps the technical staff in touch with key points throughout the Exhibition.

TELEVISION AT EARLS COURT

A PREVIEW OF SOME OF THE PRINCIPAL EXHIBITS AT THIS YEAR'S NATIONAL RADIO SHOW

THE television exhibits at Earls Court may be roughly divided into three sections—aerial arrays, complete receivers and individual components. Among the latter are those which are used in conjunction with an existing receiver, such as magnifiers, pre-amplifiers, etc., as well as those which are employed in the construction of a home-built receiver. Taking the aerials first the most notable point is the large variety of designs which are now available. At one time the "H" aerial was regarded as *the* television aerial, but to-day in order to cater for the fringe area viewer and those who are unable to erect multiple arrays, special types of aerial have been designed. Wolsey Television, Ltd., for instance, are showing for the first time two new types of aerial. Both are novel in their own way, and one is for use outdoors and the other indoors. The outdoor model has been designed to meet the demand for a more or less inconspicuous aerial and it is known as the "Sky-wand." It consists in appearance of a single tapering rod which is secured to a chimney stack, and is, in fact, a single dipole made from duralumin and is centre-fed in the usual way, the feeder passing down through the lower section. The indoor or loft aerial is a "Switched All-Ways" type, having a bakelite unit into which are fitted three aerial lengths, and by means of the screwed movable centre the array may be made into a T, L, V or dipole aerial with these letters embossed to give the non-technical user an indication as to the arrangement which is set up.



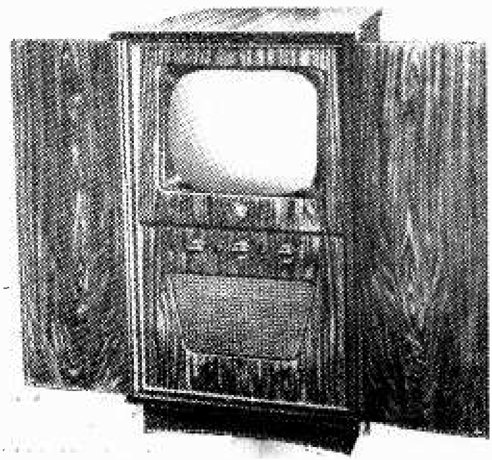
In the Belling-Lee range of aerials will be a new "Junior" model which is shown on the left. The introduction of a 9ft. light alloy mast with this array increases the effective height of the aerial by approximately 5ft.

Aerialite are showing a double-four-element folded dipole for outer fringe areas, an "Aerbeam," an "Aerfringe," and other designs, including a new model of which details are not available at the time of going to press.

In addition to the aerials themselves, Telegraph Construction and Maintenance Co. are showing the various cables which are used, not only for aerials, but also for the transmitters and associated equipment.

Receivers

In the wide range of receivers which are on show the most outstanding point is probably the size of the picture. Hitherto, viewers have been content with the small 9in. or 10in. screen, but improved techniques have enabled first-class pictures to be obtained with really good contrast under almost all conditions which are met with, and the 12in. screen is now regarded by most viewers as the minimum. The new "big screen" models in which the 16in. or 17in. all-metal tubes are employed produce a really first-class picture, comparable with the average home-cinema, with high brilliancy and a practically flat surface, thus avoiding the awkward bent uprights which are seen by some viewers when a large gathering is looking at a single receiver. Projection, too, seems to be on the increase and opinions are divided on the merits of the pictures produced by the two systems. The direct-view tube end is probably brighter overall than the projection models, but there is the cost of replacement should the tube fail. Furthermore, it is not such a simple matter to replace the tube in the projection model as in the big-tube model, but again this is a matter of individual preference, and viewers have ample chance of comparing the two types in Television Avenue. As an example of a large screen (direct-view) receiver, there is the Ekcovision Model TC174 shown at the foot of this page. This has a 16in. tube, providing a picture area of 13¼in. by 10in.



On the left is the popular "Junior" Belling-Lee aerial which now has a 9ft. light alloy mast, giving an increase in overall height of approximately 5ft. On the right is the Ekco 16 in. tube Model TC174 which incorporates "spot-wobble."

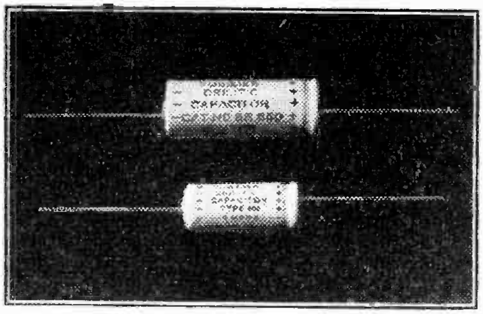
(132 sq. in.), and the circuit incorporates spot-wobble. By comparison we show at the foot of this page the Valradio wall projection equipment which gives a picture 4ft. by 3ft. The Ekco Model TC174 costs 140 gns., tax paid, and the Valradio £146 15s., complete with screen and speaker.

Another Ecko model is Model TC185 shown on the right. This is a 12in. aluminised tube model and is fitted with a rubber seal to prevent dust settling between the filter and tube face.

The other model illustrated is Pilot Model TM54. In this model, which utilises a 12in. tube, special circuits and mask are employed to provide a picture larger than is normally associated with the 12in. tube. It will be noted also at this year's show that the American-style "double-D" picture is more in evidence. This provides a slightly larger picture with some corner cutting, but in general this does not detract from the picture as there is little of detail in the corners as a rule.

Circuit Features

It will have been seen from the illustrations and from what has been said so far, that there is not a great deal of change in the outward appearance of this year's model. It is mainly in the circuitry that changes have taken place, and in the majority of models now the superhet circuit has been standardised. The reason for this is, of course, that by using this arrangement it is a comparatively simple matter to arrange for changes to be made to adapt such a circuit for the reception of any

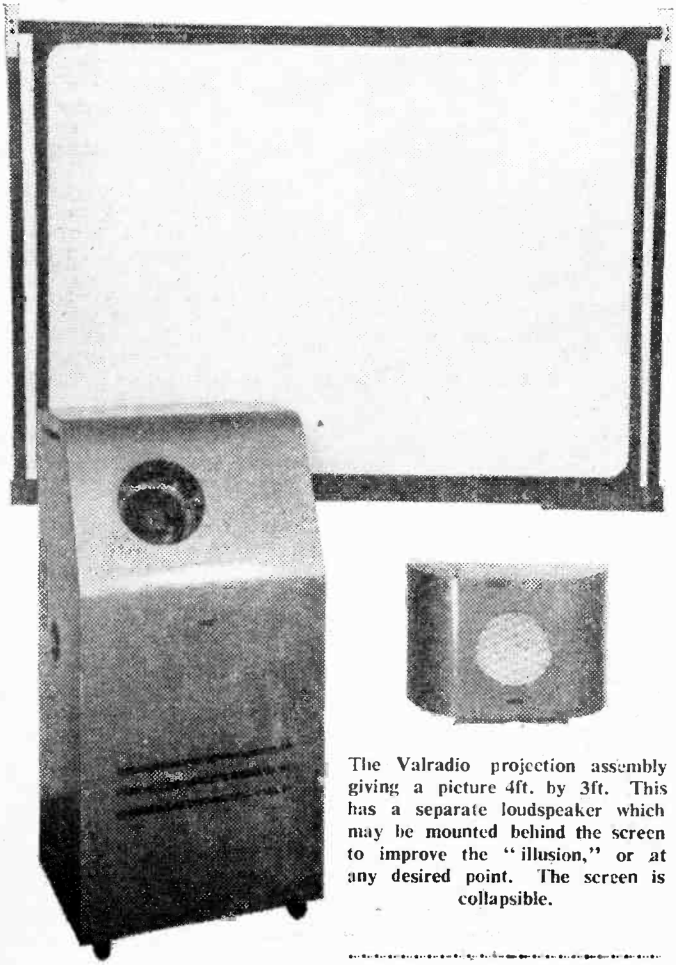


The popular Dubilier electrolytics are now reduced in size, with the same high standard and working voltages.

of the five BBC stations. Probably the majority of modern models have a switching or plug-in device incorporated so that the dealer, and in some cases, the user, may easily change over from one channel to another, and in some areas it is thus possible to have a choice of two stations, and select that which gives best results. Many manufacturers supply two types of receiver, one of greater sensitivity than the other so that those in fringe or outer fringe areas have a suitable model to meet their requirements. In other models there is some form of built-in circuit which may be cut out in "local" areas and a single model thus serves for practically all localities.

For those who are keenly interested in the insides of the modern receiver, the exhibit on the Mullard stand should be of great interest. This is a cut-away model of a 14in. rectangular tube set three times actual size and will reveal many interesting features to the home-constructor.

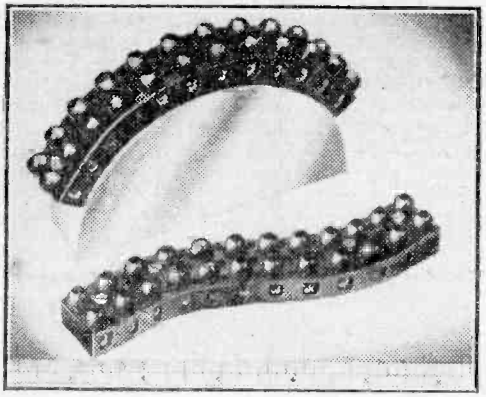
The array of colours found in the "tinted screen" is another point of interest, these ranging from a faint pinkish-grey to quite a deep purple, and again personal preference will be called in, in making a choice.



The Valradio projection assembly giving a picture 4ft. by 3ft. This has a separate loudspeaker which may be mounted behind the screen to improve the "illusion," or at any desired point. The screen is collapsible.

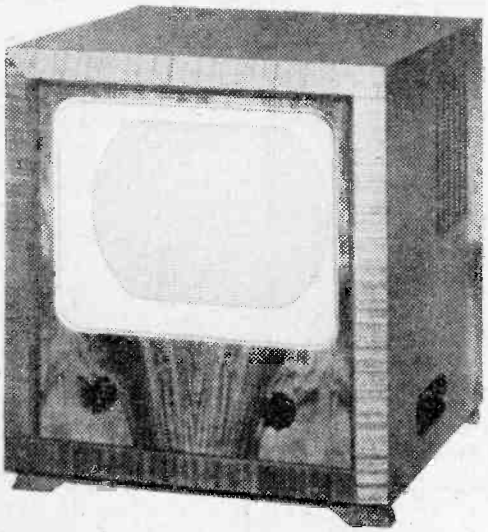
Components

Finally, we come to the individual components which go to make up the ready-made or the home-built receiver, and it is noteworthy that one or two home-constructor firms are not this year present at the show. Government restrictions have, of course, hampered many manufacturers in the choice of materials, and in spite of the very large demand for components by the home-constructor it is rather surprising to note the paucity of certain items. Belling-Lee are, of course, concerned not only with the larger items used commercially but also with many small incidental items, among which may be mentioned the coaxial plugs and sockets which are now practically standard in most receivers and home-



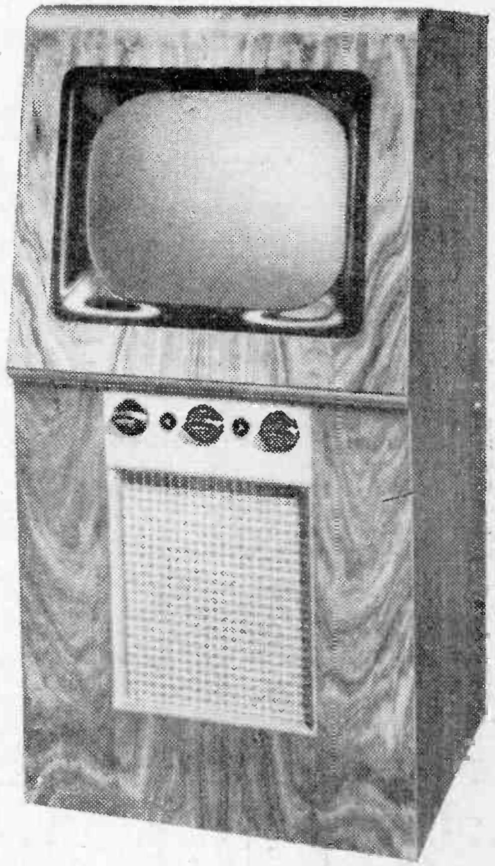
Flexible terminal mounts in the Belling-Lee range.

equipment, and a new line is illustrated on this page. It is a flexible terminal mount which the constructor will no doubt find invaluable for use in inter-connecting units and experimental use. Condensers are, of course, a major item and again T.C.C., Dubilier, Hunts and similar firms are showing a most interesting range. Overall sizes seem to have been reduced and higher-voltage working ratings are found, to ensure reliability in time-base and similar circuits. The new Dubilier BR electrolytics are smaller in physical size than has been possible before, and these reductions, in conjunction with the miniature types of valve, enable either smaller chassis



The Pilot Model TM54 which gives an enlarged picture on a 12in. tube.

to be constructed, or more stages to be included in a given size of chassis, although general reductions are offset when it comes to using the larger tubes. The rectangular shape does, however, assist in keeping down



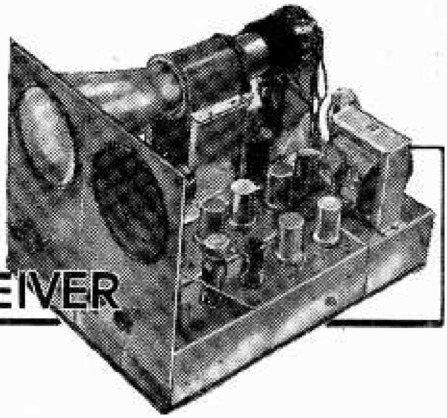
Ekco Model TC185—a 12in. aluminised tube model costing 81 gns.

the overall dimensions, and the majority of these large tubes operate with wider angle scanning and this enables the overall length to be kept down also. Mullard, Brimar, Cossor, G.E.C. and Ediswan are exhibiting their range of tubes, as well as the various types of valves which go with them. In the Ediswan range may be mentioned the CRM 152B, a 15in. round tube with a grey-tinted face—thus avoiding the use of an external filter.

Another interesting point regarding the picture tubes is the division of opinion in the form taken by the tube, i.e., whether aluminised or not, and whether it is used with an ion trap. Some manufacturers only supply aluminised tubes, whilst others supply them either plain or aluminised. Similarly, some tubes are designed for use without the ion trap and the aluminising is claimed to avoid the need for the trap as ion burn cannot occur. So far as we can trace, the American modern tube utilising electrostatic scanning is not being introduced here yet.

Some Queries Answered, relating to—

THE "ARGUS" TELEVISION RECEIVER



SOME READERS' DIFFICULTIES OVERCOME

(Continued from August issue)

Power Pack Troubles

THE electrolytic condensers are rated at 450 volt working. This is their *working* voltage and not the *peak* voltage. When first switching on peak voltages are developed which depend to some extent upon the regulation of the transformer ; in some cases this voltage will reach 600 volts. As a precautionary measure, if trouble with electrolytics is experienced a resistance of 60-100 ohms can be inserted in the lead to each electrolytic.

Never run the power pack without its load.

C.R.T. Network Troubles

VCR97s vary in their characteristics. In this circuit we have earthed the positive and thus the total E.H.T. applied to the tube is the time base H.T. plus E.H.T. Fig. 4 shows how this is accomplished, supposing batteries were used for the supply.

With a minimum of 425 volts on the time base it should be possible fully to scan the tube. Now the higher the E.H.T. then the "heavier" is the beam and consequently more power will be needed to move it. The E.H.T. should be of such value that the raster can be blacked out by reducing the brilliance control, when the raster is correctly focused. If you cannot do this then the characteristics of the tube require a higher negative potential on the grid. The simplest way of obtaining this is to make the cathode more positive.

The E.H.T. can be reduced by increasing the smoothing resistor R66 by 1 to 2 megohms, but this throws a higher peak voltage across V20. A better method is to shift the brilliance control farther down

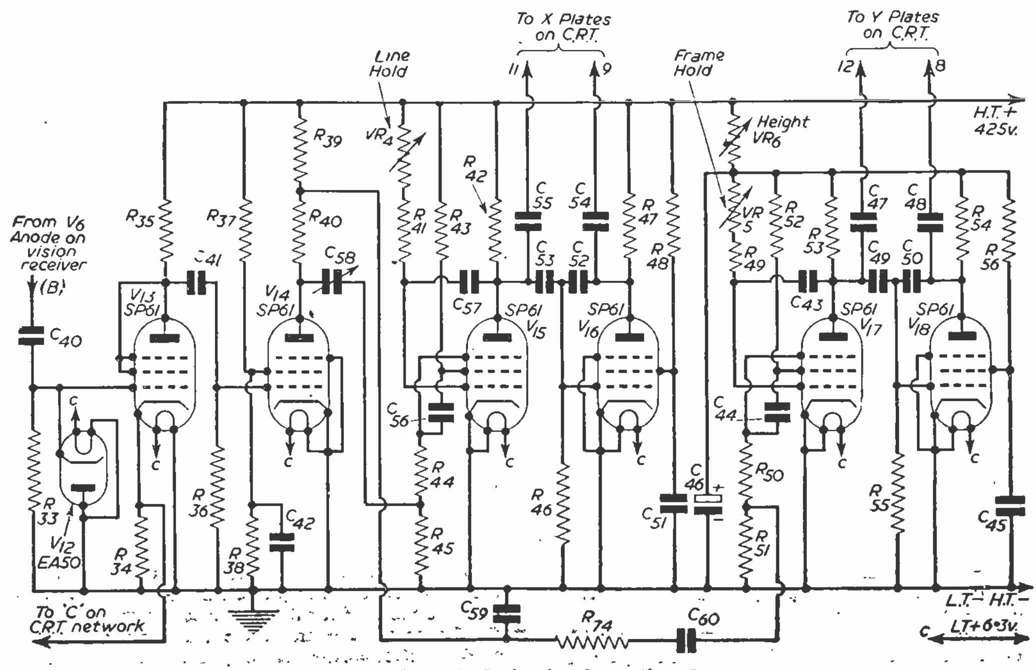


Fig. 5.—Theoretical circuit of the time base.

the bleeder network. This can be done by inserting a 47 K Ω 1-watt resistor between the junction of R66/65 and VR9. If it is found that this prevents the raster from being accurately focused, then change R67 to 470 K Ω 1 watt.

Timebase Troubles

It is here that most trouble seems to be caused. The main thing to bear in mind is that actually the timebase can be separated into four fairly easy circuits; they are the D.C. restorer and phase splitter, the sync. separator, the line timebase and the frame timebase.

Now the D.C. restorer only functions under signal conditions and has nothing whatever to do with the raster. It has, however, a lot to do with the picture because if it is not functioning the background of the picture will tend to accept a mean between extreme white and black. A shift from a very light scene to a very dark one will, under these circumstances, tend to have the same background value. Lack of D.C. restoration also plays havoc with the sync. circuits.

However, the point here is that it will not affect the raster, and if trouble is being experienced with the raster then the D.C. restorer can be ignored.

The phase splitter V13 has also nothing to do with the raster and only functions under picture conditions so as to obtain correctly-phased picture and sync. signals. It can therefore be ignored at this stage.

V14 is the sync. separator. It has no function on the raster and only comes into operation when receiving a picture. If poor synchronisation is the trouble then this valve and its associated components should be inspected.

It will be seen that V12, 13 and 14 can be taken out without affecting the raster.

The line timebase starts from C58. The timebase consists of two valves, the first one V15 providing the sawtooth oscillations and the second (V16) amplifying the output.

The line timebase can function independently from the frame timebase and V17 and 18 can be disconnected. The result here is that the raster will appear as a horizontal line only. The brilliance control should be turned down so that the line is not brilliant enough to burn the tube.

V15 can function independently from V16. It is the oscillator and without V16 it will produce a line across the tube about 1½in to 2in. long. V16 working without V15 will not produce any form of scan.

Treating V15 as an independent unit it should be noted that C57 with R41 and VR4 produce the forward scan and C56 with R44 and R45 the flyback. Fig. 5 shows the circuit which is reproduced here for the sake of convenience and is exactly the same as Fig. 6 of the original article. It is the time constants (C × R) of the two circuits which produce the correct waveform. The time constant of the forward stroke is made variable by VR4, which is labelled "line hold."

It should be noted that all condensers in the time base circuit should be in tip-top condition; slight leaks which would be unnoticed in a broadcast receiver play havoc in timebases.

When it is found that the line hold control will not resolve the picture, then the forward scan part of the circuit should be suspected. Variation of the values of R41 or C57 will alter the time constant of the circuit and hence the frequency of the sawtooth oscillation.

Where foldover is experienced it indicates that the flyback time constant is incorrect. (Foldover is where the left-hand edge of the picture seems to be folded back on itself like a curtain.) If the spot has not reached the beginning of the line before the receipt of picture intelligence for that line, then the picture will commence before the beginning of the line is reached. If trouble from foldover is experienced, then R44, 45 and C56 should be examined.

V15 is unable, by itself, fully to scan the tube when an E.H.T. of 2,900 is used. It is therefore assisted by V16, which is merely an amplifying valve. A small portion of the output of the sawtooth oscillator is taken from its anode, and applied to the grid of V16. Therefore at the anode of V16 will appear a signal of phase *opposite* to that in the anode of V15. The two deflector plates being fed, one from each valve, therefore work in push-pull.

The width of the scan is controlled by two main factors;

(a) the value of the E.H.T.

(b) The output power of V15 and 16.

Increase in scan can be obtained by either (a) increasing timebase H.T.; (b) increasing output from V15 and V16, or (c) reducing E.H.T.

The simplest method for the constructor is to increase the output from V15 and V16. This can be accomplished by increasing the value of C57, but a maximum value of 100 pF cannot be exceeded without introducing serious non-linearity.

Due to the variations in the characteristics of the VCR97, even this may be found to give insufficient width when the timebase H.T. is at 425 volts maximum. A simple cure is to rotate the tube through an angle of 90 degrees so that the key comes on the right (looking at the tube from the rear). Now change over the wire on pin 11 with that on pin 8, and the wire on pin 9 with that on pin 12. Should this result in over-scan horizontally, then fit a width control by wiring a 25 K Ω 2-watt potentiometer between H.T. common and the H.T. supply to V15 and V16, and insert an 8 μF. condenser between the valve side of the potentiometer and earth. Some improvement can be effected by increasing the value of C53, but trouble from non-linearity will have to be watched. Some correction can be obtained by adjusting the value of C52.

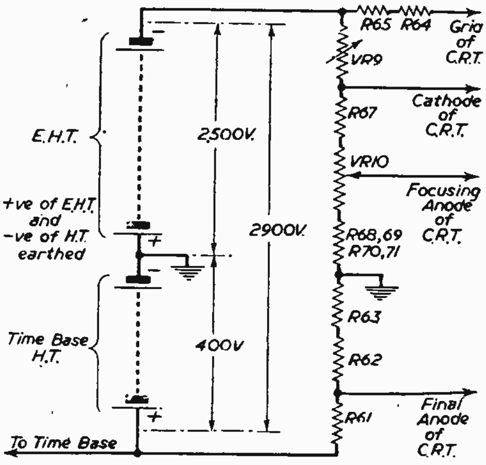


Fig. 4.—Using batteries to illustrate potentials applied to tube circuits.

The output from a timebase of this sort is not perfectly linear, though it is near enough for average conditions. To obtain a perfectly linear scan would make the circuit unnecessarily complicated.

To decrease the width of the scan the voltage to the anodes of V15 and 16 should be reduced. This can be done quite simply by inserting a dropping resistor in the H.T. supply, which is decoupled in a similar manner to VR6 and C46 in the frame circuit.

Much of what has been said about the line timebase applies equally to the frame timebase. It, too, can function independently of the line timebase, and in this case a vertical line only is produced. C43 (note :—misprinted as 0.5 μF. instead of 0.005 μF.) with R49 and VR5 produce the downward scan, while C44, R50 and R51 produce the flyback. V18 is an amplifier and functions in a manner similar to V16. If trouble with foldover is experienced, the value of C44 can be varied starting with a figure of 0.025 μF.

The main troubles here are too big a scan, or too small a scan. The same remedies as suggested in the line timebase can be applied here. If too much scan is obtained, then a 25 KΩ 2-watt resistor can be connected in series with VR6.

Insufficient scan can be improved by reducing R53, 54 to 100 KΩ, increasing the overall H.T. supply to the timebase, or by increasing C49 and C50 up to a maximum determined by the appearance of the raster. This maximum is reached when the lines at the top of the raster start opening out.

Voltage checks on the valve-pins are likely to be misleading, and will depend greatly upon the type of voltmeter being used. This is why actual voltage readings were not given.

In general you will find that the anode voltages of the oscillators will be between 40-80 volts and the screens 200-300 according to the type of voltmeter used and the voltage on the H.T. line. A difference will be found between voltages on the actual oscillators and their paraphase amplifiers.

It is a good plan, once the circuit has been got working, to take anode and screen voltage readings with whatever instrument you have, together with current readings, and record them in a book. If this is done for the whole of the televisor, then a very useful record will be to hand for possible faults at a later time.

Do not attempt to measure the E.H.T. voltage. The current through the bleeder network can, however, be checked by inserting a milliammeter at the earthy end of R71, between this resistor and earth. The actual voltage can then be calculated from Ohm's Law. The reading should be entered in the book.

As a final refinement an additional condenser can be added in series with C61. Should C61 break down, practically full E.H.T. will be applied to the grid of the tube; this is not very good for the life of the tube. A condenser of value 0.1 μF. 2,500 volts working can be inserted between C61 and R31. This provides an excellent safety margin.

Altering the Circuits

A query often raised by the beginner is "What liberties can I take with the published design?" Well, the short answer to that is "NONE," and the reader's attention is drawn to the italicised paragraph at the heading of "Your Problems Solved." However, there is no reason why those of an experimental turn of mind should not try alternative arrangements, and it was with this point in mind that a rigid specification of components was not given for the Argus. Constructors can use near equivalents when they have these available.

The power pack is one of the most expensive parts of the televisor. The specifications given for the transformer were the minimum and must be adhered to. A transformer providing larger outputs can be used if the surplus H.T. current is taken care of by the use of load resistors. The maximum voltage applied to the timebase should not exceed 500 volts and it is preferable to keep it down to not more than 450 volts. Where higher H.T. voltages are used, the working figure of the condensers must be increased accordingly.

Vision and sound receivers should have a maximum of 300 volts on their H.T. lines.

In some cases it will be found that a transformer slightly underloaded will cause an increase in the maximum H.T. in the smoothing circuits. For example, if 450 volts output is obtained from the rectifier it is best to cater for a higher figure and the smoothing condensers should have a working voltage of 500 volts. If the condensers are liable to warm up, then they are being overworked and should be replaced with condensers of a higher rating.

The transformer handles quite a heavy load and will get quite warm. It should not, however, get so hot that the bare hand cannot be rested on it. If this happens, then check the total current drawn from the transformer, and if it is within the stated capacity of the transformer then the item is faulty and should be replaced.

The smoothing choke should be capable of handling the total current drawn, which will be up to 200 mA. The minimum inductance should be 3 henries, but a higher inductance can be used if this is to hand.

Dropping resistors are rated at 10 watt and 15 watt. There is no reason why higher-rated resistors cannot be used beyond consideration of space.

C.R.T. Network

It will be noted that the EA50 has a heater rated at 6.3 volts and it is in parallel with the C.R.T. heater fed with 4 volts. This means that it is a little underrated, but it will perform its function as D.C. restorer under these conditions. However, a D1 valve can be used in lieu if desired.

The total E.H.T. supplied to the final anode of the C.R.T. is the E.H.T. from the rectifier plus the H.T. of the timebase. This allows a brilliant picture with a small spot to be obtained. The rated output of the E.H.T. transformer should not exceed 2,500 volts.

The C.R.T. heater takes 4 volts at about 1A. The rectifier valve can be a 2X2 or VU120A, or equivalent. Where the rectifier heater winding is 2-0-2volts, then the centre tap and one outside lead is used to supply the heater with 2 volts. If a 4 volt rectifier is used, then the two outer leads are used, the centre lead being left free and clear of earth.

Timebase

V12 is a *must*, but V13 can be almost any 6.3 volts valve. Its function is merely to correct the phase of the signals to timebase and C.R.T., and a simple triode can be used if desired. It is not necessary to earth the metallising of the valves, though this can be carried out if desired. Pin 6 is connected to the metallising.

(*Concluded on page* 188)

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5Y3GT	9/6	7B7	9/-	EL41	11/6	DDL4	4/6
5Z4G	10/-	7B8	9/-	E1148	2/-	EF8	7/6
5Z4M	9/6	7C5	9/-	FW4/500	9/9	VR136	6/-
6AC7	7/3	7C6	9/-	HL23DD	8/6	VR137	5/9
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6C6	7/6	77	7/9	KT33C	11/6	MU12/14	9/6
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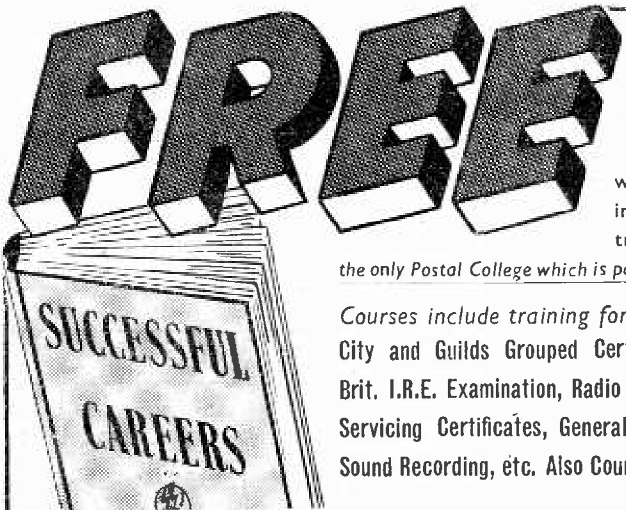

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THE "SYNCHROLOCK"

DETAILS OF A POPULAR AMERICAN A.F.C. CIRCUIT

By H. B. Schofield

MANY readers have become very interested in the type of line-scan oscillator, generally known as the " flywheel " or automatic frequency control circuit, of American origin (having been developed by the R.C.A. Co.) and officially called the " Synchrolock."

There are, as readers are aware, innumerable circuits for the generation of sawtooth waveforms, all (including many which are " trick " circuits, and a constant worry as to reliability) falling into the categories of Thyratron, multivibrator, blocking and sine-wave oscillators. It has become practically standard practice in this country to employ variants of the multivibrator, blocking and transitron oscillator circuits, not only among experimenters but also with commercial manufacturing firms, to the exclusion of others, and it is hoped a full description of the synchrolock " flywheel " circuit, which by practical application has stood the test of time, will afford to readers a new avenue of interest.

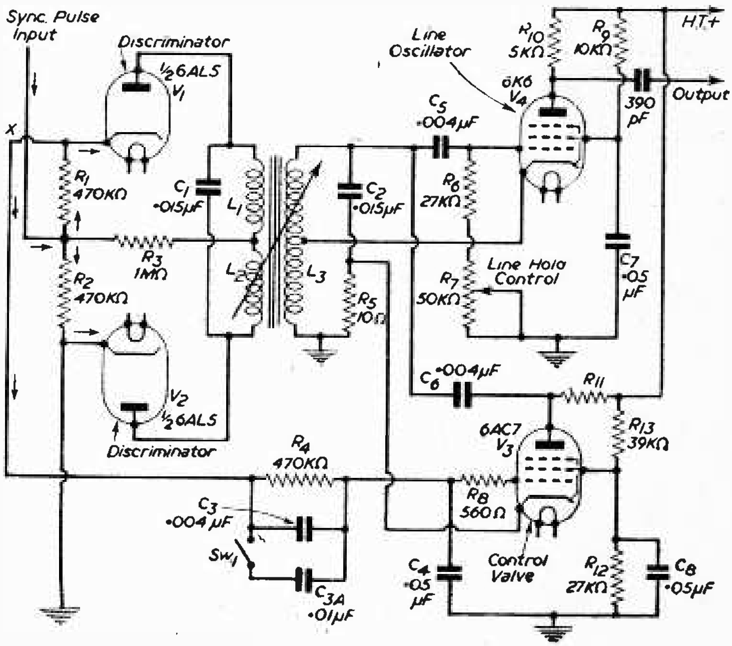
The combination of circuit elements, consisting of a sine-wave oscillator (the sync pulse controlling the oscillator through a valve operating as a reactance control), together with pulse-shaping circuits, is the basis of the A.F.C. (as shown in Fig. 1), the output feeding into the usual type of line-output stage. The operation of the circuit is as follows.

A very stable electron-coupled Hartley oscillator generates a sine wave of 10,125 cycles per second, this frequency being determined by the inductance of L3 and the paralleled capacity of C2 together with V4. Adjustment of the free-running frequency is by pre-setting the iron core of the inductor L3 together with the line hold control R7 set in mid-position. The secondary winding of the oscillator transformer L1-L2 is centre-tapped, being as tightly coupled as possible to L3 and is tuned slightly off resonance in relation to the tuned primary winding L3-C2 resonant circuit.

Voltages developed across L1-L2 are applied to a phase detector or discriminator of the Seeley-Foster type as used for frequency modulation detection. Its use in this circuit is to compare the repetition rate of the sync pulses with the frequency of the line oscillator, and to produce a D.C. output voltage for the control of the reactance valve V3. This valve automatically adjusts the frequency of the line oscillator and keeps it in step with the line scanning. This action will be discussed more fully later on. The oscillator voltages across L1-L2 are applied to the anodes of V1 and V2, being 180 deg. out of phase with each other.

The separated sync pulses from the video signal, whether amplified or not, are fed to each diode of the discriminator in phase across R3 and are of the same amplitude. The diode load resistors R1-R2 are connected so that from the earth point of connection to point X the voltage between these points is the difference between the rectified output of diodes V1-V2. The direction of electron flow due to anode current is shown by arrows on the diagram. Each half-wave rectifier produces a D.C. output voltage equal to the peak value of the signal input so that the rectified output of V1 is positive with respect to point X and earth, and negative with respect to point X and earth when V2 is rectifying. In the absence of sync pulses, equal and opposite voltages appear across the diodes V1-V2, and the total rectified voltage appearing between point X and earth is zero over the complete cycle. When the condition of stable operation occurs with the sync pulses, the rectified voltages of V1-V2 oppose each other, due to the method of connection of the diodes to the series load resistors R1-R2, reducing to zero any charge across the filter network, C3, R4 and C4.

When the line oscillator is running faster than the repetition rate of the sync pulses, the output voltage from diode V1 will be greater than the output diode V2, which after smoothing through the filter network will appear as a positive voltage at the grid of the reactance control valve, V3. In a similar manner, if the oscillator is running slower than the sync pulse repetition rate, diode



Circuit of the " Synchrolock "

V2 output voltage will be greater than V1, which after being filtered will be a negative voltage at the grid of V3.

Reactance Valve

We must now consider the action of the reactance control valve in relation to the conditions just described and its general application.

The manner in which the valve V3 can control the instantaneous frequency of the oscillator is very interesting. It has become standard practice to use in the position of V3 a type 6AC7, a high-gain, sharp cut-off pentode with a mutual conductance of 9 mA/V, due to the fact that operated as a control valve it has outperformed other valves in performance and reliability. The anode current versus anode voltage curves of the 6AC7 exhibit a long range of anode voltage over which there is substantially no change of anode current, the anode current being under the control of the grid voltage, and it will be observed on examination of the circuit that the anode of V3 is connected to the oscillator turned circuit, comprising L3 and C2. Appearing across V3 is the alternating voltage from the oscillator which is swinging over the flat position of the curve, no anode change of current occurring. An alternating voltage on the other hand, if applied between grid and cathode will cause the amplitude of the anode current to change, which will be in phase with the alternating grid voltage.

If the alternating voltages applied to the grid and anode are 90 deg. out of phase, then the anode current alternating component will also be 90 deg. out of phase with respect to the anode voltage, but will be in phase with the grid voltage. Circuits in which current flowing is not in phase with the applied voltage become reactive, either inductive or capacitive, the reactance as already stated being V3, connected across the oscillator circuit L3-C2. The network C2-R5 produces a phase shift of the alternating grid voltage with respect to the alternating anode current, the voltage across R5 leading the tank circuit voltage by nearly 90 deg. On account of the capacitor reactance, at the oscillator frequency of 10,125 cycles, being very low, the applied voltage between cathode and grid is approximately 90 deg. out of phase with that applied between anode and earth. The control grid is returned to earth via capacitor C4, while the D.C. return path of the grid passes through the resistors of the discriminator diode circuit R1-R2.

As the alternating grid voltage is applied between the cathode and earthed grid, rather than between grid and earth, there is a phase difference of 180 deg. with respect to the anode, which would not be so if the cathode had been earthed and the grid voltage made variable. In this case the anode current will lag the anode voltage and V3 will appear as an inductance to the tuned circuit.

The transconductance (ratio of anode current change to change in grid voltage) of V3 is varied by the bias voltage on the grid, thus the amplitude of the alternating anode current can be changed by varying the bias voltage on the control grid. An increase in the A.C. anode current will occur when the bias is low or positive, while an increase in negative bias will reduce A.C. anode current. At the same time as the A.C. anode voltage is fixed by the oscillator output, any bias change will alter the ratio of voltage to current and also the apparent inductance value across the oscillator circuit. Should the line oscillator frequency shift with respect to the sync pulse rate, due to mains voltage fluctuation or other causes, a change in the D.C. output of the discriminator occurs, causing the transconductance of control valve V3 to change, which instantaneously changes the oscillator frequency thereby restoring the equilibrium condition.

Stabiliser

It will be seen on reference to the circuit diagram that a network of resistors and capacitors (R4-C3 or C3A-C4 and R8) connect the output of the discriminator to the grid of V4. R4 provides a D.C. return path for the grid of V3, while the prevention of any possible ultra-high-frequency oscillation which might occur in high mutual conductance valves of the 6AC7 type is taken care of by the resistor R8 acting as a parasitic suppressor. It is necessary to provide a voltage divider and a filter to smooth the rectified D.C. voltage from the discriminator diodes V1-V2. This is accomplished by the capacitors C3 and C4. As the reactance of the smaller capacitor C3 is on the top side of the divider and the larger capacitor C4 on the bottom side, the grid voltage of V3 is unaffected by bursts of noise or serrations of the frame sync signal due to the rejection action of the voltage divider. The ratio of the voltage divider can be changed by switching in an additional capacitor C3A, in parallel with C3 and is provided to take care of " phase " modulation of the line sync pulse which sometimes occurs in certain types of transmitters. When this condition exists it is necessary to have the control valve V3 follow this modulation and a faster response circuit is required, which is provided by increasing the capacity of C3 by paralleling the additional capacity of C3A. The effect of phase modulation of the line pulses if suppressed by the original capacity ratio is to cause line displacement of part of the picture with respect to the raster, and the use of the higher capacity C3A will result in a certain amount of loss of immunity from line " tearing " by noise, so that in setting up this circuit the experimenter must determine whether the " fast " circuit with its greater immunity from noise, having regard to his own particular location and signal strength reception, is necessary.

Variations of this circuit in the way of circuit values are found, but the operation of the circuit is the same. For super-fringe and fringe reception, the application of this circuit is far superior to any other, which is easily proved by practical test, although this may be hotly contested by the adherents of more conventional circuits. Other advantages are its immunity from triggering by noise. It can take advantage of the entire line pulse time for the discriminator control, at the same time allowing the line trace return time to be slower than triggered sync operation. Its immunity from the effects of static, man-made interference, and the input-circuit noise of the receiver is due to the fact that the frequency distribution of such noise energy is approximately the same both above and below the sine wave oscillator frequency, the average D.C. contribution of the two diodes V1-V2, due to the interference conditions described, tends to equal and cancel out at point X in the circuit.

Now that we have available such materials as Ferroxcube and Caslam moulded cores, possibly some enterprising manufacturer will place on the market suitable oscillator transformers for this circuit, the basic requirement being that the off resonance tuning of the tapped winding L1/2 is no more than 200/250 cycles when L3/C2 is resonanting at 10,125 cycles and that in winding, tight coupling is ensured between L/12 and L3 plus first-class insulation.

TELENEWS

Mr. E. D. Hart Joins Mullard

MR. E. D. HART, M.A., A.Inst.P., A.M.I.E.E., has joined the Equipment Division of Mullard, Ltd., where, as head of the Technical Department, he is responsible for market surveys, technical publications and other technical commercial activities.

Prior to joining Mullard, Mr. Hart was for many years with Marconi Instruments, Ltd., in an engineering capacity and later on the commercial side, where he was well known as the technical editor of "Marconi Instrumentation."

Cinema Television

THE closed-circuit demonstrations of large-screen cinema television given at the Odeon Cinema, Leicester Square, used the latest C.P.S. Emitron camera equipment of E.M.I.

These cameras provided an exceptionally high definition and thus enabled pictures of excellent photographic quality to be produced on the large screen.

Marconi Contract

THE illustrationon the right shows Dr. Rodriguez Jimenez, Venezuelan Consul-General in London, at the signing of a contract in the London consulate recently, to provide £100,000 of British equipment for a television service at the capital, Caracas.

Signing on behalf of Marconi's Wireless Telegraph Co., Ltd., the firm which will design, manufacture and instal the equipment, is Mr. L. J. King, the secretary. The order included a 5-kilowatt vision transmitter, 3-kilowatt sound transmitter, associated aerial system, a complete outside broadcasting unit with two camera channels and micro-wave links for relaying outside broadcasts back to the studio.

New N.E. Protest

ANOTHER big drive is beginning in the north-east in a bid to bring television to Tyneside by means of the transmitter at Pontop Pike which was originally intended to serve the area. The nation's defence programme caused work to be halted soon after commencement.

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 wireless 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.

In a circular letter which has been sent to local newspapers, Mr. W. E. Johnson, chairman of the North-east Television Advancement Committee, asks the public to press their M.P.s to support the move that work should be continued in order to have the station ready in time for the Coronation next year.

BBC Films for Export

THE BBC intends to make four films, each lasting approximately half an hour, for export to America and Commonwealth television companies.

The subject for the films will be the preparing of the Coronation and how a country lives under a monarchy. Film shots of the Royal family will be taken from library stock.

Although the BBC hopes that the films will mark the beginning of its own film service for overseas companies, no further plans will be made until the Coronation films have been shown and results have been studied.

Railway Vehicles Suppressed

TO cut down interference with television reception, suppressors have been fitted to 11,000 British Railways' road vehicles at a cost of £3,000. Meanwhile, Mr. Gammans, Assistant Postmaster-General, has stated that it is hoped to enforce a regulation requiring new cars to be suppressed as soon as they are bought.

Mr. A. Ricketts, notary public; Dr. Rodriguez; Mr. L. J. King; Mr. K. E. Owens, Marconi's; Mr. W. J. Richards, export manager, Marconi's; and Senor Mariano Fernandez, Venezuelan Vice-Consul, at the signing of the contract referred to above.

New Chairman for B.S.I.

AT the annual general meeting of the British Standards Institution, held at 24, Victoria Street, S.W.1, on Wednesday, July 23rd, it was announced that the General Council had elected Mr. John Ryan, C.B.E., M.C., as its chairman to succeed Sir Roger Duncalfe, who had completed his three years' term of office.

In the course of the meeting, the Rt. Hon. Viscount Waverley, P.C., G.C.B., G.C.S.I., G.C.I.E., F.R.S., was re-elected president of the Institution for the third year. Sir Roger Duncalfe was elected vice-president.

TV in Far East

CAMERAS and equipment manufactured by Pye, Ltd., were used to demonstrate television in Bangkok for Thai Prime Minister, Marshal Pibul Songgram, and other Government officials on the occasion of the Prime Minister's birthday, July 14th. The programme was put on by the Pye overseas demonstration team.

The equipment was flown at short notice by B.O.A.C. to Thailand by special request of Major-General Karb Kunjara, Secretary-General to the Prime Minister, as a result of the recent visit of Lt.-General Spiyanond Phao to Europe to investigate television possibilities.

Brit.I.R.E. President

MR. WILLIAM E. MILLER, M.A.(Cantab), M.Brit.I.R.E., has been unanimously nominated president-elect of the British Institution of Radio Engineers for 1952-3.

Mr. Miller, who has been an institution member for 20 years, was elected vice-president in 1948.

Few Early Wenvoe Events

NOW that the new transmitting station has been officially opened, it is unlikely that local events in Bristol and the surrounding districts will be televised for a time as the outside broadcast units that were used during the opening period are to be returned to their original regions.

The unit to be housed at Whitchurch Airport will not be available until the end of this year.

Suppression and Traders

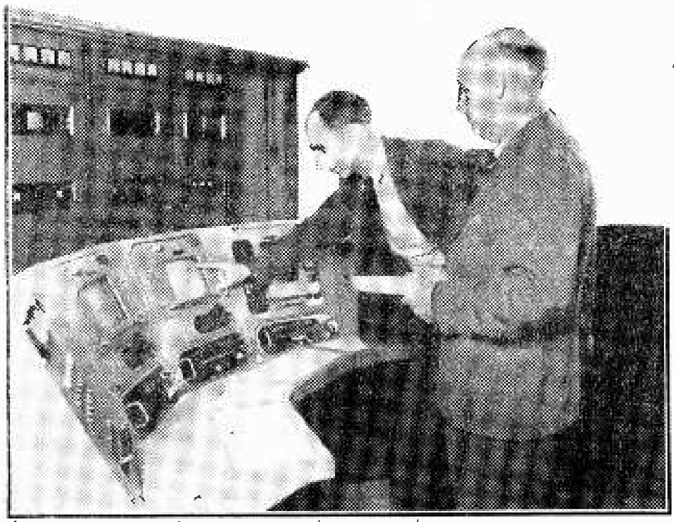
BECAUSE of their frequent stoppages in residential districts, often with engines left running, delivery vehicles can form a prolific source of interference to television.

Because of this, H. Garon, Ltd., the well-known firm of Southend-on-Sea caterers, after an approach by E. K. Cole, Ltd., have decided to fit suppressors to their entire fleet of delivery vehicles.

Ban to be Lifted ?

THE Cabinet is believed to be considering the possibility of lifting the ban on the building of five low-power television stations, one of them to serve Hampshire from the Isle of Wight.

Construction of the stations was halted last year when cuts in capital investment were made.



Engineers of Marconi's Wireless Telegraph Co., Ltd., check the contro panel of the medium-power Marconi television transmitter at the BBC station at Wenvoe.

Largest TV Screen

THE largest television screen in the world is believed to be one manufactured by a north-west London firm of radio engineers.

The screen, which measures 6ft. by $4\frac{1}{2}$ft., is produced from a $2\frac{1}{2}$in. cathode-ray tube and thus provides comfortable viewing for an audience of up to 200 people.

The prototype was completed in nine months and the first order, worth £150, was taken last month.

Television City

ALTHOUGH it will take some years to complete the building of the BBC's "television city" at Shepherd's Bush, progress has been made on the first block and this building should be ready for occupation by next year.

According to one estimate, the final cost of the whole city will be around the £10 million mark.

Service Across Atlantic

ALTHOUGH there is doubt as to whether the U.S. will televise the Coronation by means of "link-up" 'planes, Admiral Ellery Stone, president of the American Cable and Radio Corporation, has said that coaxial cables on the ocean bed will enable a trans-Atlantic television service to operate "before many years have passed."

Broadcast Receiving Licences

APPROXIMATELY 12,748,000 broadcast receiving licences, including 1,538,550 for television and 145,000 for receivers fitted in cars, were current in Great Britain and Northern Ireland at the end of June, 1952.

Motorists are again reminded that they need a separate broadcast receiving licence for a wireless set fitted in a car.

Ill-effects of TV ?

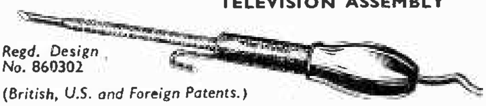
IN a school prize distribution day speech, the Burton assistant School Medical Officer of Health has said that it is possible to see in a short glance the number of children in a class that have spent the previous evening viewing television.

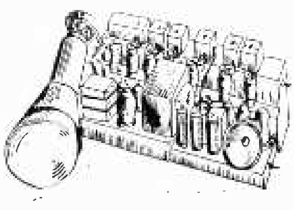
The points which give them away, he said, are "lassitude, lethargy and tired eyes."

TV's Own Films

IT is understood that BBC Television are to contract with Independent film companies to obtain full-length feature films, some starring established American players who also appear on television in the United States.

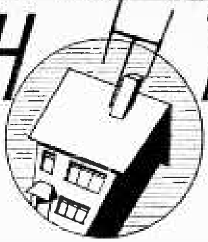
The cost of these films is estimated at £15,000 each.





TELEVISION PICK-UPS AND REFLECTIONS

UNDERNEATH THE DIPOLE



By Iconos

WENVOE !

WENVOE ! What a delightful name for a television station ! And what visions of future joys it conjures up for viewers in the Western Counties and South Wales. To me, it seems to suggest the yeoman pastures of Somerset rather than the rugged green valleys of South Wales ; the dignified stones of Bath rather than the busy industrial centres of Cardiff and Swansea. Perhaps this is because I happened to be in the West Country when the first signals were radiated from Wenvoe recently, comprising the usual test card and various tuning patterns. In the Yeovil area there are about a hundred viewers who have struggled to receive Sutton Coldfield through heavy interference from car ignition and other local man-made static. Those enthusiasts who were prepared to tune to the new station received a signal of shattering strength. At Weston-Super-Mare, with the channel only separating the resort from the new transmitter, about fifteen miles away, indoor aerial reception was possible, in spite of the fact that the station was working in quite low power. Indeed, one dealer picked up good signals, with a few feet of wire lying on the floor. Bristol should have perfect reception from the new station and a fresh crop of aerials will sprout with the autumn.

WHAT'S IN A NAME ?

THE names of the provincial television stations are descriptive and euphonious. If Wenvoe rolls nicely off the tongue and its very sound seems to breathe the soft air of the West Country, then Holme Moss has a Brontë-ish flavour, suggestive of high moorlands, stone walls and broad acres. Kirk o' Shotts has something of the swirl of the pipes about it, not to mention the waggle of the kilt and the rolling of the "r's". Sutton Coldfield alone has the civic dignity of an urban landmark, appropriate to its grandiose aerial system. Alexandra Palace—well—to me it brings memories of baking-hot bank holidays, hideous architecture and magnificent fireworks.

RECORDING FOR TV

THE sound recording on television films made by the BBC, including the newsreel, is of a fairly high standard, if somewhat variable in quality and frequency characteristic. Viewers may have noticed the disappearance from the main newsreel title caption of the trade mark of RCA, an American recording system. This does not mean that the RCA sound system is no longer used by the BBC ; as a matter of fact, it is being operated in its photographic and magnetic forms more than ever. But the expansion in recording requirements has been rapid and several other recording systems are now used for TV purposes ; GB-Kalee and Visatone are photographic systems, both British and both with variable-area sound tracks, and the latter system is used built-in to Vinten film cameras, specially allocated for "stop press" stories. These cameras were used, for instance, until quite a late hour in the afternoon at Wimbledon tennis and the resultant combined sound and picture negative rushed to the laboratories for development. There is no time for printing, but the processed negative is speedily transported to the cutting rooms at the Alexandra Palace for editing and within a few minutes is ready for transmitting. The negative is turned into positive electronically. Results do not compare with those obtained when separate sound and picture negatives are used, with normal printing and grading processes, but are quite adequate for news purposes, nevertheless. Indeed, they are sometimes remarkably good. The equipment is very portable and has been specially designed to BBC specifications. The greatest disadvantage, as I see it, is that preferential treatment is given to the picture, whilst the sound is left to take care of itself. This being the case, a variable density sound track might have given better results when subjected to the low-contrast development necessary under these circumstances for the picture. A few years ago the BBC did make use of a combined picture and sound camera with a variable-density sound track recorded by a glow tube. When it was good, it was excellent ; but its performance had all the unpredictable characteristics of trout fishing and women. And so the BBC decided to pin their faith in the less exciting (but more reliable) tracks of variable area, traced with a mirror galvanometer.

SYNCHRONOUS MAGNETIC SYSTEMS

MAGNETIC recording is mainly used for commentaries, and for the mixed result of combining music and effects with dialogue or commentary. Sometimes the editors, recordists and commentators are working on a story, recording up to fifteen minutes before the actual transmission is due. Magnetic-coated perforated film is mainly used for this purpose, but experiments have lately been made with unperforated ¼in. magnetic tape. In the Leevers-Rich tape system, now being tried out, twin sound tracks are recorded simultaneously and synchronously with the picture camera. One of the tracks records a pulse from the picture camera and the other records the sound of the scene being photographed. Later, the tape is played off and transferred to magnetic or photographic tracks on perforated film, play-off speed being adjusted so that the synchronous pulse remains steady on a C.R. tube. This is rather more complicated than recording the sound on the same film as the picture and developing them together, but it gives greater flexibility when the editing stage is reached and, of course, it can be used on aeroplanes, trains, moving cars or even on the Big Dipper at the Festival Gardens.

TEETH ON TV

THERE is no doubt that big screen TV was the high spot of the International Dental Congress at the Festival Hall. In the improvised studio in the basement, formerly the BBC control room, operations were carried out by dental specialists which were closely followed in close-up by the Cintel TV camera. The resultant picture came out surprisingly well on the screen in the nearby Telecinema, where 400 persons were viewing.

Some Common Faults Analysed

SOME MORE EVERYDAY DIFFICULTIES EXPLAINED

By G. T. Clack

THE defects that are to be described are limited to a few of the most common faults which can occur with different types of receivers after some considerable period of use. In instances where voltages are quoted they are not necessarily those that will be found in practice, but are only included as a guide to the order of the voltages that are employed.

Tube Faults

No Picture

The measured E.H.T. should be of the order of 7 to 9 Kv. and the grid voltage—if cathode modulation is employed—will vary between 0-100 volts or thereabouts over the range of the Brilliance control. The cathode potential will vary from about 40 to 100 volts according to the setting of the Contrast control when receiving a television signal. If a tetrode tube is used, the first anode voltage will be some value between 200 to 300 volts depending on the type of circuit.

If grid modulation is employed the Brilliance and Contrast controls will affect the cathode and grid potentials respectively over much the same ranges mentioned above, except that the cathode will be more positive than the grid.

If E.H.T., H.T., grid and cathode potentials are normal then check the tube heater for continuity or partial s/c. If less than the nominal heater voltage is measured across the tube heater pins then there may be an internal heater defect.

If a blue glow is detected around the tube electrodes, the tube is soft. Check this by noting that the E.H.T. voltage rises considerably when the lead to the final anode is disconnected from the tube.

A white deposit around the gettering within the glass envelope may be an indication that there is an air leak and the vacuum has been released.

No Control over Brilliance

In some receivers a partial grid/cathode s/c may produce an effect whereby the brilliance increases as the Brilliance control is turned towards minimum; in addition to this, a hum bar may appear on the raster. In the event of a complete s/c either video anode or brilliance voltage will be found to be very low, depending on the type of modulation circuit, i.e., grid or cathode. An intermittent grid/cathode short will produce sudden and erratic changes in brilliancy.

Screen Discoloration

A circular patch in the middle of the screen indicates a defect known as ion burn. This will worsen with use, but is not detrimental to the operation of the receiver. Patchy discoloration appearing after use may be due to chemical defects in the fluorescent powder introduced during the manufacturing processes.

Poor Contrast

Can be due to loss of emission as the tube ages. Adjustment of the Brilliance control to increase the highlights will turn the blacks to grey and bring about a "thin" picture in which there are neither peak-whites or true blacks. In some instances any attempt to increase brilliancy or contrast will actually result in "darkening" at those parts of the picture which should otherwise be brightest.

Poor Focus

Check H.T. supply to first anode; if this is much lower than about 200 volts the spot size is likely to be larger than necessary. If the focus varies from time to time, then check E.H.T. supply. A line valve output with an intermittent fault can produce variations or drift in focus with line flyback E.H.T. circuits. If all potentials are in order then check focusing components —magnetic or electro-magnetic—and finally the C.R. tube by substitution in case it possesses an internal defect.

E.H.T. and Timebase Faults

No E.H.T.

If the line timebase circuit is not operating, then neither raster nor spot will be obtained. First ascertain that the timebase is operating by examining the grid and anode potentials with an oscilloscope, or, simpler still, by listening for a high pitched whistle from the output transformer. If this can be heard, check E.H.T. diode heater by examination and according to circumstances proceed to check the appropriate windings on line output transformer, scanning coils, etc. (It is undesirable to carry out voltage checks in the anode circuit of the output valve in view of the high potentials developed by the transformer; meters can be damaged very easily unless they are suitable for high peak-voltage operation.)

Low E.H.T.

A defect in the line timebase affects both E.H.T. and scan width and it would be reasonable to expect a low E.H.T. voltage condition in one where there is more scan width than necessary, the overall brilliance is low and the focus is poor. Under such conditions the fault is most likely to be found outside the transformer, perhaps with the diode and reservoir capacitor. If the scan width is inadequate then the drop in E.H.T. might well be due to a transformer fault such as s/c turns or a heavy load on the E.H.T. circuit brought about by a defective tube or E.H.T. capacitor.

Finally, many of the defects in a picture can be reproduced by more than one fault, i.e., loss of detail in the highlights can be due to low emission C.R. or video amplifier tubes, incorrect setting of the interference limiting circuit or too high a contrast level. Before carrying out fault-finding all the control functions should be tried for smooth operation and then carefully set to produce the best picture detail. Correct observation of picture defects can serve as a reliable guide to those parts of the circuitry which may be at fault. There is rarely "one" fault for each picture defect—and the art of getting the best out of a television receiver requires that fair degree of skill which only comes with constant practice and observation.

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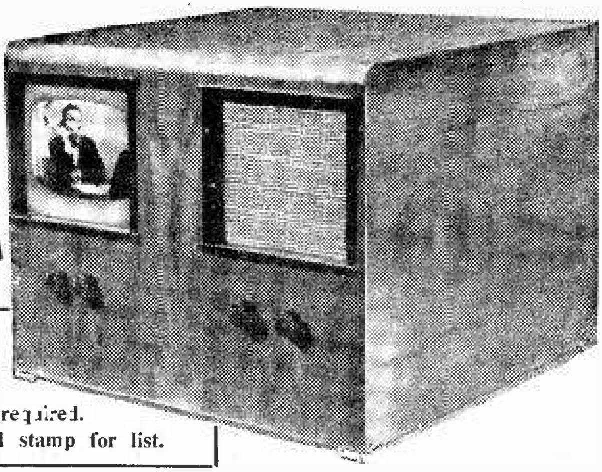

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FS150X. 350-0-350 v. 150 mA. 6.3 v. 2 amps. C.T. 6.3 v. 2 amps. C.T. 5 v. 3 amps. Fully shrouded, **34/9.**

F30X. 300-0-300 v. 80 mA., 6.3 v. 7 amps., 5 v. 2 amps. Framed, **31/9.**

The above have inputs of 200-250 v. C.W.O. (ADD **1/3** in £ for carriage.)

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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).

AERIAL PRE-AMPLIFIER

SIR,—I read with interest articles on "An Aerial Pre-amplifier," by B. L. Morley, in the May issue, and also by Spencer West, in the July issue, of your magazine, and being quite an amateur and novice, the subject (which is important to fringe-area users) has become confused, and should be definitely clarified.

In my way of thinking, Mr. Spencer West is in error in assuming that attenuation in an aerial conforms to a ratio, say (still wishful thinking) of 2 : 1, meaning that, no matter what the signal is at the aerial, the loss at the set is halved; surely this cannot be correct. To go to extremes in emphasising this point, it would appear that with 100-volt signal at the aerial, 50 volts would be lost before the set is reached, which to me doesn't seem feasible.

I would think that each aerial has its own loss value, which would remain constant for all inputs, and taking Mr. Spencer West's figures, assuming that there is a ½ volt loss in the aerial lead-in, the pre-amplifier would be better placed at the aerial, as illustrated by the following: 1 volt input at the aerial, amplified 10 times, and allowing ½ volt loss, would give 9½ volts at the set. Otherwise, with the pre-amp. at the set, we would have 1 volt at the aerial, and allowing ½ volt loss, the amplification would be 10 x ½ volt, giving 5 volts, a difference of 4½ volts.

On this reasoning I am inclined to favour Mr. B. L. Morley's article. As I stated before, I am just a novice, and the foregoing may be all wrong, but in the interests of fringe-area "would-be" viewers I should be glad to see further notes, say from an aerial designer, stating whether the loss in an aerial is constant or variable quantity. I'm sure it would save a lot of work, climbing up and down roofs, damaging "lead-ins," and running power cables through the roof. Though perhaps this is only another television snag which one must find out for one's self.—S. V. FLECK (Newcastle-on-Tyne).

SIR,—In the first part of his letter concerning aerial amplifiers, Mr. Morley has rectified his original omission of the real justification for employing such units, which omission prompted my criticisms.

He now gives the correct reason, but in doing so only repeats what I had already made clear in my original criticism in the July issue. My simple statement which dealt with the case when interference was present on the feeder said "when an aerial amplifier is employed it will amplify only the aerial signal, and thereby increase the signal/noise ratio." This concise statement is to my mind preferable to Mr. Morley's rather long dissertation.

Unfortunately, Mr. Morley is a little muddled in the latter part of his letter, and it appears desirable to deal with this once more. In describing the effects of attenuation in the line he couples these matters with his claim that a greater benefit is secured from an aerial amplifier than from one fitted at the receiving end. I have already shown, however, that it will make no difference whatever where the amplifier is fitted so far as this trouble is concerned. The statement that a long line will pick up more interference than a short line is a very vague one. I cannot quarrel with it, of course, but I can say "it all depends." I must, however, take exception to Mr. Morley's remark that "it is possible for the signal/noise ratio of a low aerial complete with its short feeder to be the same as for a high aerial." Those viewers who have taken the trouble to erect a good aerial will be most discouraged, but they may take heart from the knowledge that this statement is quite incorrect as they have doubtless, in any event, already established to their satisfaction.

Briefly, two facts can be stated regarding aerials.

1. A higher signal/noise ratio is realised as the aerial is elevated.

2. A higher signal/noise ratio can be expected if the aerial is moved an increased distance from the source of interference.—S. WEST (Gt. Yarmouth).

STEREOSCOPIC TELEVISION

SIR,—Reading Mr. Tomlinson's letter on "Stereoscopic Television" reminds me of an incident in the television programme "It's Magic" about a month back.

While watching Lind Joyce singing a number she was suddenly made to appear as if she were triplets. Apparently three cameras were used all from the front position. Two of the shots matched up as a pair, giving a perfect stereoscopic effect which was quite startling, and I had no difficulty in "fusing" these pictures.

I should perhaps mention that I had been reading a recently published book about a new system of stereoscopic viewing just prior to the programme.

In the usual way I would probably have overlooked the opportunity.

Is it possible that I am the first and only person to have seen a three-dimensional picture on the BBC television programme?

I should be very interested to know if any other viewers have had a similar experience.—L. R. HIRON (Upminster).

SIR,—I read with interest A. V. Tomlinson's suggestion for stereoscopic television in the July issue. The system would give an extremely poor picture due to the fact that when the lens is focused on one part of the object there would still be a blurred image of the rest and vice-versa. If we presume, for the sake of argument, that it would give a good picture, the only effect would be to give increased depth of focus, which has already been achieved by other methods.

To obtain a steroscopic effect one must have two views of the object from different angles as in the case of our own eyes. This could be obtained by rocking the lens from side to side instead of backwards and forwards. This would involve considerable mechanical and optical difficulties, since the image from all positions must be focused on the same part of the photo-electric screen. A far simpler procedure would be to use two cameras a small distance apart, which could conveniently be combined in a single case with dual controls. At the receiving end the two images could probably be presented by "interlacing."

Finally, I should like to correct the statement that a lens working at its highest speed has its largest "f number." A little thought will show that it is the reverse. —J. L. PETRIE (Burwell).

RADIO SHOW DISAPPOINTS

SIR,—I feel sure that Mr. G. F. Layton, in his letter published in your July issue, did not reason very deeply when he says that in "TV Avenue" just before the transmission started, when all the sets were switched on, he noticed that with practically no exception every set had from one to six bright lines shown on the screen.

To me the natural inference is that the transmission was at fault, not the sets; that this is probably the case can be proved by anyone using the Holme Moss station: if brightness is increased when an unmodulated but synchronised raster is being broadcast just prior to a transmission, on many occasions lines such as he describes will be noticed.

I have built TV sets and tried various time bases, but cannot get rid of these vertical bright lines on Holme Moss, although they are absent on the Sutton Coldfield raster.

They are normally undetectable on an actual picture transmission, but when the scene is a very dark one, frequently a dull red, vertical, ill-defined line is noticeable: this line may be anywhere from a quarter to halfway across the picture. and jump about as different cameras are switched into circuit.

This trouble is noticeable on all sets, commercial or home built, and I have come to the conclusion that it originates at Alexandra Palace, as for days on end it is completely absent, and varies with different cameras during the same evening. A fault in the receiver can produce a similar effect, but then the line is much brighter, a light vertical line in this position but movable when the line hold is varied can come from a signal frequency R.F. component in the anode circuit of the video amplifier, which beating with a component frequency of the line time base produces a pulse in synchrony with the line scan. I imagine that this is occurring at the transmitting end, and in my opinion ought to be rectified along with the abolition of "noisy" cameras, such as the one frequently used to give the weather chart at the end of the programme; once or twice it has been had enough to damage one's eyesight. Actually the modern commercial TV set is a very excellent instrument indeed, far in advance of the received transmission, and although I am an amateur and have no connection with the trade feel that much harm may have been done by Mr. Layton's "amusement," and I do want to make the facts clear.—CECIL HARPER (L.D.S.) (Bolton).

THE PYE STRIP

SIR,—A short time ago when in London I picked up a Pye 45 Mc/s. strip, minus valves, for 25s. It was in a dirty condition, but had all the essentials.

On arriving home I proceeded to modify it for Holme Moss. I had previously read in a certain publication (not yours) that this could be done by substituting brass cores for iron dust, so set about making the necessary brass cores with threaded spindles—no easy matter.

I found that the 11 coils in the unit were all screened with neat little cans which were well secured by being bent over underneath the bases of the formers. I therefore removed each coil, breaking several of the fine brittle wires in the process, but eventually released all the screening cans, extracted the iron cores, replaced them with my brass ones and reassembled. My next step was to make the necessary modifications to the video stage and connect up to the signal generator. I then discovered, to my complete astonishment, that my frequency coverage was too high and, replacing the iron cores, was able to tune on to the Holme Moss frequency. Would that I had carried out the video modification first and then gone to the signal generator to ascertain what frequency coverage the unit had!

In short, the coils required no modification whatever for Holme Moss.

The thought occurred to me that some coil alterations might have been made before the unit came into my possession, but this could not have been so, as the coil screens were obviously as originally built up and all the wiring had the joints sealed in the usual government fashion.

I feel I ought to pass my experience on in case any other readers may take a walk up the same garden path.

With sound rejectors now fitted, the unit is functioning beautifully and giving a splendid picture at a distance of approximately 75 miles from the transmitter.—WALTER MITCHELL (Grimsby).

SPORT

SIR,—We spent a good deal on our receiver and for the past few weeks have been treated to a considerable amount of cricket and tennis. Surely there should be some end to this endless sports quota, especially when other programme times are encroached upon. Who decides whether a programme such as a cricket match should continue and occupy time which has been earmarked for some other programme? It would be interesting to know what proportion of viewers make use of the sports relays (other, of course, than the sick and infirm, but even they must get tired of so much).—G. BIRCH (N.W.5).

ARGUS QUERIES

(Concluded from page 172)

Sound Receiver

The decoupling condensers except C34 and C38 can be as low as 230 pF. Reduction of the values of these condensers to below that specified may lead to instability troubles.

V10 can be substituted with a 6H6 or DD63.

V11 can be substituted by any equivalent valve such as the 7c5.

If it is intended to use the loudspeaker away from the televisor, then any type of loudspeaker with pentode output transformer can be used. It is essential, however, to use one of the special television types with restricted field in the position indicated in the Argus, otherwise the field will distort the raster.

When an external speaker is used, then it is a wise precaution to separate the transformer and wire it directly in the anode circuit of the output valve. Permanent damage may be done to the output valve if the anode is disconnected while the screen remains alive.

Vision Receiver

Beyond using decoupling condensers of minimum value of 230 pF, with the risks of instability, the specification should be adhered to. If balanced twin aerial input is desired instead of coaxial, then an additional winding can be made on L1 the same number of turns as L2a, and the two ends connected to the two ends of the balanced twin cable.

It must be borne in mind that we cannot enter into any correspondence on departures from the specified design. The suggestions given in the foregoing are a guide as to what can be done, and any untoward results accruing therefrom will have to be resolved by experimentation.

BARGAINS.—R1355 or R3132, chassis only, 15/-; carr. 6/-. RF Units, 3 Valves, Type 24, 22/6, Type 26, 42/6. I.F. Amp. with 5 IFTs (16.5 mcs), 7/VR55, 1/EA50, 32/6. Pre-amp. type 6048, 17/6, less valves, 8/6. IFTs, 10/13 mcs, or 7 mcs (R1355), new 1/6. Coil Formers, ⅜in. Aladdin, 9d.; Polystyrene ½in. 9d.; Pax., ½in. x 2in., 4 for 1/3 (all cored). R1155s, new, £10; carr. 7/6. R1124s with 6 valves, 13 volt, 25/-. Resistors, ¼w 4d., ½w 5d., 1w 6d., 2w 9d., over 1/-. Transformers, mains to 18v 3a, 7/6; LF for 2kV EHT, 7/6; Filament, 2v 2a, 6/-. Valves: 1S4, 1T4, 1R5, 1S5, 6V6G, 5Z4, 210VPT, 1C5, VR150, 6G6G, 6X5 at 9/-; VU39, 5U4G, 6SN7, 6SL7, 6F6, 35L6GT, ECL80, ECH42, 12AT7, OZ4, 6K8, ECH35, 6Q7, EF55 at 10/-; 6AK5, 6J6, Pen36C at 11/6; SP41, D1, 7193, EB34, P61, HL2 at 2/8; 954, 956, 9004, 9006, 12SK7, SP61, VR135, VU120A, VU111, 6H6, CV54, VS70, VS110A, 12H6, RK34, EA50 MS/pen, KTZ41, DDL4, KTW63, 9D2, 4D1 at 4/-; 6C4, 6J5G, 6SH7M, 9001, ARP12, ATP4, 12SH7, 955, 6AC7, KTW61, 6K7G, EF50, EF54, EC52, CV66, 12SR7, AC6Pen, 717A, 721A, NGT1, 12SJ7, 12A6 at 5/6. Postage extra. Everything for the radio/TV constructor; immediate delivery; c.w.o.; s.a.e. for list or queries. W. A. BENSON, 308, Rathbone Rd., Liverpool, 13.

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YOUR Problems SOLVED

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

SYNC SEPARATOR FAILING

A fault has developed in my set, the E.E. televisor. This fault appears when a bright picture is being received, and causes the raster to break into horizontal strips, which pull out to left and right. The trouble can be stopped by reducing the gain on the vision receiver, but this leaves a very weak picture.

Can you please let me know if there is any way I can trace this fault and effect a remedy.—H. Westwood (Wednesbury).

From your description it would appear that when the gain of your receiver is turned up, the sync separator is failing as vision signals are apparently getting into the sync circuits. We suspect the D.C. restoring diode has lost its emission; the grid leak connected to V8 has changed in value; or the first valve of the sync separator V12 has become faulty, or even the grid leak and condenser of this valve are faulty.

PICTURE DISPLACEMENT

Recently I completed the building of the Viewmaster and will be glad if you can help me in rectifying the following faults. The picture being received seems to be fairly good in proportions but will not pull up to the right of the screen by about 1in. The sound side has been set and sealed by an engineer with a signal generator, but with volume on sound at minimum, there's excessive hum. This disappears when the control is turned up to full, but sound is then too loud. I have managed to draw the picture a little by loosening and turning the rear CR tube support and magnet, but these are out of line with the neck of the tube. The tube fitted is the new 12in. Mazda, with operating EHT of 9,000v. Can it be that EHT is insufficient for this tube? Have stuck strictly to components values given in the charts. I mention that the signal is good on an indoor aerial without the pre-amp. When this is connected up contrast is nearly at minimum but being on a busy part of the Great North Road ignition interference is excessive. Can this interference be dispelled by an outdoor aerial? I might mention that I live in a third-storey flat.—J. Thompson (Retford).

Inability to shift the picture to the right may be due to the focus ring being faulty or badly mounted, and it is possible that some improvement may be obtained by mounting the focus ring on spacers about ½ in. thick so as to move it farther from the rear of the scanning coils; an extra shift will also be obtained by connecting a 50μF. 12v. electrolytic condenser in series with the line-scanning coils, so as to block any D.C. Occasionally it is found that this shift may be overcome by re-alignment of the receiver, if alignment has had the effect of delaying the sync pulses. There is no question of the EHT being insufficient as, in fact, by increasing the EHT the picture will be made smaller and would appear as if it had shifted even farther to the left.

Regarding the suppression of ignition interference, there is no doubt that it would be best to have an outdoor aerial, since in that way the signal pick-up would be greater, and if under these conditions the receiver tended to overload then an attenuator could be employed.

The excessive hum at minimum position of the volume control is probably due to a faulty volume control or insufficient screening of the wires.

VIEWMASTER—MAINS TRANSFORMER

I am building the Viewmaster and have got an auto transformer primary tapped 200, 230, 250, 280. Having read it requires 280v. H.T., could I miss M.R. No. 4 out and connect 280v. on to mains choke? If I can, shall I want a bigger choke than is in the Viewmaster? Also, I would like to know is 250v. tapping too big with specified rectifiers in? I have read it where 245v. is maximum.—R. Self (Barsnley).

The auto transformer you have may be used to feed 250v. to rectifier MR4, this being the maximum voltage at which MR4 will operate with safety. In no case can you miss out MR4 and feed your receiver directly from the 280v. tapping, since the Viewmaster will not operate on raw A.C. There is no necessity whatsoever to put in a bigger choke than is specified.

ARGUS TRANSFORMER

Will this transformer be O.K. for Argus?:

Type SP8 mains transformer. Primary, 250v. Secondary 350v./0/350 v. at 160 mA. max. Heaters: 0v.-6.3 v. at 8 A.; 0 v.- 4 v.-5 v. at 3 A., and screened. —M. G. Hunt (Birmingham).

The transformer could be used, though you would probably find that full width and height of the picture would not be obtained. This can be compensated for by the following modifications, though you may find that the width of the picture will not fully fill the screen.

Rotate the tube base through an angle of 90 degrees so that the key comes on the right, looking at the base from the rear. Change over pin 11 with pin 8. Change over pin 9 with pin 12. Make C43 0.005 μF and C44 0.025 μF. Make C57 100 pF. Insert 47 KΩ 1 watt between junction of R66/65 and VR9. Change R67 to 470 KΩ.

VRC97 PICTURE SIZE

I am contemplating building the Argus television receiver and should be glad if you could inform me of the size of the picture obtained from the VCR97. Also, can you recommend a magnifier which would increase the picture size and give the size of the magnified picture, please?—J. F. Goulding (Nr. Warrington).

The VCR97 gives a picture approximately 4in. by 5in. The popular oil-filled magnifiers on the market give a size appearing almost as large as a 9in. tube. The colour of the picture is green and black. You will find that the colour of the picture will not be noticeable after a very short time, and the size of the picture is quite suitable for a close family circle, though the writer has had as many as twelve people looking in on a VCR97 at one time.

VISION ON SOUND

I wonder if you can give me some help with a fault which I have never seen mentioned anywhere, and which is spoiling the otherwise good performance of my home-made televisor—the interference of vision on sound?

The set has four transformer coupled stages in the vision receiver, and a two-stage sound receiver, the first being tuned anode and the second transformer coupled, the sound receiver being connected to the common aerial input through a 68-ohm resistor.

The effect is a loud hum on the sound ; it is definitely the vision signal, as the hum is quite characteristic and is not there when there is no vision on. It is not due to the sound circuits being mistuned, as each stage has a sharp and quite definite tuning point where the sound is loudest and at this point the hum is also loudest.

It appears that the sound carrier must be getting modulated in some way by the vision signal, but I am at a loss to understand how, and should very much appreciate any advice you could give me.—B. J. Davis (Richmond).

If the fault does not lie in the tuning of the *first* vision *and* sound coils, the effect is due to cross modulation, and this can be caused by coupling via the H.T. or heater lines, assuming that the actual sound and vision strips are adequately screened off from each other. You should feed the heaters of the sound strip from a separate supply if possible, through a choke capacity filter system, and try a condenser (about 0.001 μF) across each heater on the valveholders themselves. The H.T. should be similarly decoupled separately with a smoothing resistance (about 1,000 ohms, 2 watts if the R.F. stages only are involved) and a 8 μF. condenser. You do not give details of your detector stage, but the double-diode-triode or 6H6 type of detector is sometimes responsible for this sort of trouble, and it might be as well to try an EA50 or a crystal type valve as sound detector.

If the trouble persists in spite of the above changes, try taking your sound off of the first vision valve anode through a 3 pF. condenser and a short length of coaxial cable to the present coupling coil.

USING LARGE TUBE

I would appreciate detailed information to modify the Electronic Engineering De Luxe Televisor, in order that I may use a 15in. normal angle C.R.T. I would like to add that my present E.H.T. is derived from a Brandenburg 6-9 kV. R.F. oscillator. Would you be good enough to suggest in your reply, manufacturer and type of C.R.T. to be used in the modified televisor referred to in the above query.—A. Clark (S.W.18).

We have received reports of 15in. cathode ray tubes being used with the Electronic Engineering Televisor and Mazda and Emitron tubes have been used successfully.

The choice of tubes must be left to individual users, though we would mention that in the Emitron range there is a narrow angle 15in. tube, which simplifies scanning and enables a high E.H.T. to be used. 9 kV. is a little on the low side for a 15in. tube, and 10 to 11 kV. would be preferable.

VIEWMASTER—R22 OVERHEATING

I have just built a Viewmaster. After switching on I noted that R22 (2,12 kΩ in parallel) was overheating. Two 12 kΩ, 1 watt resistors were inserted in place of those specified and they overheated. A 6k. 2 watt was tried and a 6k. 10 watt but even these overheated.

I have checked the wiring and this appears to be correct. As yet I have not had opportunity to align the set owing to this trouble. I should be very much obliged if you could offer any suggestion as to the likely fault.—G. Roebuck (Ashton-under-Lyne).

Overheating of R22 is caused by instability of the R.F. receiver. As this has not been aligned yet we suggest adjusting the coils as specified in the alignment instructions. We also suggest carefully checking the wiring of the vision receiver to make certain that it is identical with the wiring diagrams, particularly the coil leads and the earthing of EF50 valveholder spigots, which should be taken to the cross screens and not to the main chassis. Care should also be taken to ensure that the aerial lead, which must be a twin feeder, is not brought close to the output end of the receiver, i.e., V4, V5.

RIPPLE

A fault has developed with my home-built television set, Premier Electrostatic.

It takes the form of three or four shady black lines running from top to bottom of picture, I have tried a new tube, but without any improvement, could the trouble be in the H.T. ? I have tested smoothing chokes but these seem to be O.K.—W. M. Edwards (Caldicot).

If the lines are more or less stationary, the trouble is almost certainly due to the H.T. or E.H.T. ripple. The latter can be more or less discounted in the Premier design, and so you should check carefully on the smoothing, particularly the supply line to the line timebase, and vision receiver. The addition of extra smoothing across the points from which the brightness control is fed will probably cure the fault, and a capacity of at least 32 μF. of adequate working voltage is recommended.

CHANGING FROM CHANNEL 1 TO 2

Please can you assist me with my problem ?

A friend of mine has a pre-war G.E.C. television/radio for the London transmitter. He has moved to Sutton Coldfield and has asked me to convert this TV for him.

I have a service sheet for this TV and assume I will have to change the aerial and frequency changer coils and also the R.F. choke.

Please can you give me some information on the coils, i.e. size of former and number of turns, etc., and also inform me if any other mods. are required.

This is a double side-band receiver and the Sutton Coldfield only transmits one side-band. Will this matter ? —A. J. Perkins (Birmingham).

A superhet converter might be the best solution here, and several designs have appeared in past issues of PRACTICAL TELEVISION, general circuits being given in February, 1951, and December, 1951. Such a system will avoid extensive modifications to the set, which will not be as simple as at first supposed.

HEATER WIRING

I am constructing the Viewmaster TV, and have come across what I believe to be an error in stage 5. The 6.3 V. 7 A. terminal on the heater transformer is shown connected to the chassis, and the zero terminal to the valve heater pins. As this is my first attempt at any kind of receiver and I do not know very much about them, could you please tell me whether I am right by saying that the above connections should be reversed ?— J. M. Hemingway (Waitley Bridge).

It does not matter which side of the 6.3 V. 7 A. heater winding is connected to chassis and which to heaters, since it is only a voltage output which is required, therefore the most convenient method of wiring is adopted.

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