THE TV TUBE EXPLAINED—BY F.J. CAMM

Practical Television

1'3

AUGUST: 1958

AND TELEVISION TIMES

EDITOR: F.J. CAMM

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1N5GT	11/-	6BJ6	7/6	6SG7GT	8/-	12E1	30/-	50C5	12/6	DH63	10/-	EF36	6/-	HL23	10/6	PM12	6/6	UF85	10/6
1R5	8/-	6BR7	11/6	6SH7	8/-	12J5GT	4/6	50L6GT	9/6	DH76	7/6	EF37A	8/-	HL41	12/6	PM12M	6/6	UF89	10/6
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3B7	12/6	6CH6	12/6	6V6GTG	8/-	12SK7	8/6	956	3/-	DL96	10/-	EF85	8/-	KT63	7/-	R2	10/-	VP4(7)	15/-
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3Q5GT	9/6	6F6G	7/-	6Z4/84	12/6	12Y4	10/6	5763	12/6	EA50	2/-	EF91	7/6	KTW63	8/-	SP4(7)	15/-	VR105/30	
3S4	7/6	6F6GTM	8/-	6Z5	12/6	14R7	10/6	7193	5/-	EA76	9/6	EF92	5/6	KTZ41	8/-	SP41	3/6		9/-
3V4	9/-	6F8	12/6	6/30L2	10/-	14S7	17/-	7475	7/6	EABC80	9/-	EL32	5/6	KTZ63	10/6	SP42	12/6	VR150/30	9/-
5U4G	8/6	6F12	7/6	7A7	12/6	19AQ5	11/-	9002	5/6	EAC91	7/6	EL41	11/-	L63	6/-	SP61	3/6	VT61A	5/-
5V4G	12/6	6F13	12/6	7B7	8/6	19H1	10/-	9003	5/6	EAF42	10/6	EL42	11/6	LN152	14/-	SU61	10/6	VT501	5/-
5X4G	12/6	6F17	12/6	7C5	8/-	20D1	16/-	9006	6/-	EB34	2/6	EL81	15/-	LZ319	9/-	TP22	15/-	W76	7/6
5Y3G	8/-	6F32	10/6	7C6	8/-	25L6GT	10/-	AC6PEN	7/6	EB41	8/6	EL84	10/6	MH4	7/-	U16	12/-	W77	5/6
5Y3GT	8/6	6F33	7/6	7H7	8/-	25Y5	10/6	AC/HL/		EB91	6/6	EL91	5/-	MHL4	7/6	U18/20	10/-	W81M	6/-
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6AC7	6/6	6J7G	6/-	10C1	15/-	30F5	8/-	BL63	7/6	ECC31	15/-	(Large)	12/6	OC72	30/-	U76	7/6	XH(1.5)	6/6
6AG5	6/6	6J7GT	10/6	10F1	19/6	30FL1	10/-	CK506	6/6	ECC32	10/6	EY86	14/6	P61	3/6	U78	7/-	XSG(1.5)	6/6
6AJ8	9/-			10F9	11/6	30L1	9/-	CK523	6/6	ECC33	8/6	EZ35	6/6	P215	10/6	U251	15/-		
6AK5	8/-	6K6GT	8/-	10F18	12/6	30P12	13/6	CV63	10/6	ECC35	8/6	EZ40	8/-	PABC80	15/-	U404	10/6	Y63	7/6
6AK8	9/-	6K7G	5/-	10LD3	8/6	30P16	10/-	CV85	12/6	ECC81	8/-	EZ41	10/6	PCC84	9/-	UABC80		Z63	10/6
6AL5	6/6	6K7GT	6/-	10LD11	16/9	30PL1	12/6	CV271	10/6	ECC82	7/6	EZ80	9/6	PCC85	12/6		10/6	Z66	20/-
6AM5	5/-	6K8G	8/-	10P13	17/6	31	7/6	CV428	30/-	ECC83	9/-	EZ81	9/-	PCF80	9/-	UAF42	10/6	Z77	7/6
6AM6	7/6	6K8GT/G		11E3	15/-	33A/158M		D1	3/-	ECC84	10/-	FW4/800		PCF82	12/6	UB41	12/7	Z719	8/-
6AQ5	8/6		11/-	12A6	6/6		30/-	D42	10/6	ECC85	9/6		10/-	PCL82	12/6	UBC41	8/6	Z729	17/6

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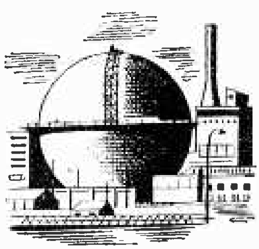

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CONTENTS:

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Owing to the rapid progress in the design of radio and television 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.

TELEVIEWS

RECEIVERS WITH SEPARATE SCREENS

A RECENT American development in the design of TV receivers is the separation of the screen from the chassis, which is made possible by a new picture tube which is two inches shorter than standard tubes. One of these new models has a 21in. screen which swivels on the top of a pedestal base containing the chassis and an 8in. speaker. A further model has a very small chassis which can easily be accommodated on a coffee table, or shelf. The 21in. screen can be placed anywhere within 25ft. The shallow tube has been made possible by changing the shape of the cathode from cylindrical to flat, thus permitting a shortening of the tube neck. The chassis is 6in. deep, as compared with from 12in. to 16in. of the orthodox receiver, and only 8in. high instead of 18in. The separation of the screen from the receiver enables it to be stowed away inconspicuously.

RECONDITIONED TUBES

UNDER the law, Purchase Tax becomes due on all goods subject to tax when they are sold by a registered person or firm under taxable conditions. The fact that the goods may be reconditioned goods does not affect the position, but as a concession, tax is not required to be paid on secondhand goods even if they are sold under taxable conditions provided that they have not been subjected to more than minor repairs and are kept segregated from new ones, both in stock and in trade at the counter. Thus, where only a minor reconditioning process has been carried out, the tax concessions apply. Where reconditioning, however, involves the opening of a tube, liability to tax is incurred. For example, in the case where the reconditioning virtually amounts to the production of a fresh tube, and the replacement of the electron gun, not necessarily by a new one. Where a dealer retains an old tube after he has replaced it with a new one, he must pay tax if he has it reconditioned.

There can be no doubt also that the price of tubes is excessive. One can understand that in the early days of TV, when overheads had to be covered by a comparatively small output, the price of an individual tube would be high. Millions of tubes are now sold where only a few thousand were required. Prices have remained fairly static and indeed in some cases have been increased.

"A BEGINNER'S GUIDE TO TELEVISION"

OUR recent series of articles entitled "A Beginner's Guide to Television" is now available in book form at 7s. 6d. from all booksellers or 8s. 3d. by post from the Book Department, address as on this page. A demand for back issues containing the series no longer available, resulted in the production of the articles in this more permanent book form.—F. J. C.

Our next issue, dated September, will be published on August 22nd

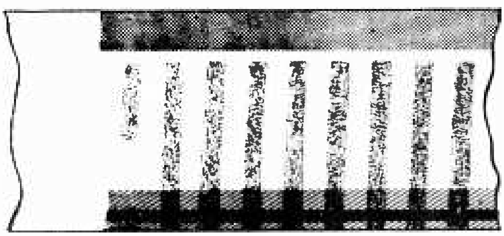
RECORDING TV ON TAPE

RECENTLY DEMONSTRATED IN THE STUDIOS OF ASSOCIATED REDIFFUSION LTD.

WE were recently invited to the studios of Associated-Rediffusion Ltd., to witness a recent demonstration in this country of taped television. First we saw a "live" show recorded on tape which was played back from the tape within a matter of minutes without any loss in picture quality. This achievement will have as much impact on television as ordinary tape had on sound radio. It opens the way to a whole new field of operational techniques and promises the viewer an even more comprehensive programme coverage than he already enjoys.

In 1928 the then Baird Television Company made the first recording of a 30-line definition television signal on a 78 r.p.m. gramophone record. Now Rank Cintel Ltd., in association with Ampex Corporation, have modified their Videotape Recorder, which is already in use in television stations throughout the world, for the 405 system.

Taped television will enable each hour of programme time to be planned for maximum audience viewing. For example, when an event of national importance takes place at 5 p.m. it can be taped and relayed later to reach a larger and more representative audience.



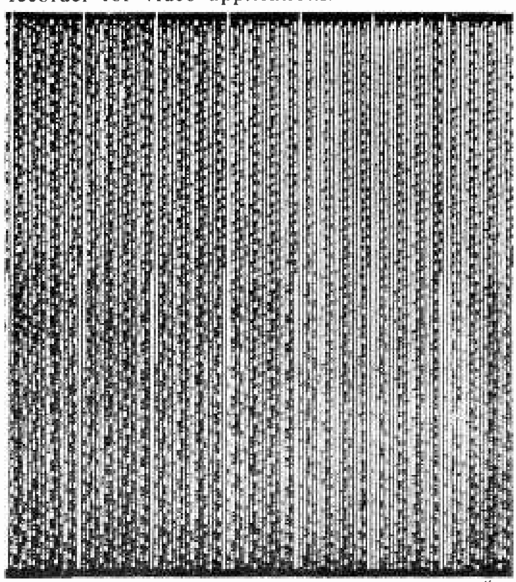
A magnified view of a piece of developed video tape. Editing pulses appear on the control track at the bottom.

Unlike conventional film telerecordings taped television is cheap. It costs only one-quarter as much as 16mm. film and less than one-tenth as much as 35mm. film. It combines such facilities as immediate playback, immediate availability for re-use and faithfulness of original picture quality.

Like most ideas magnetic recording on tape is no new theory and this paper has been an advocate of it for many years. But it is only in the last decade that theory, technique and materials have developed to the stage where taped television becomes a practical possibility.

Videotape Recorder

There were three basic problems which needed to be solved in designing a practical magnetic tape recorder for video applications.



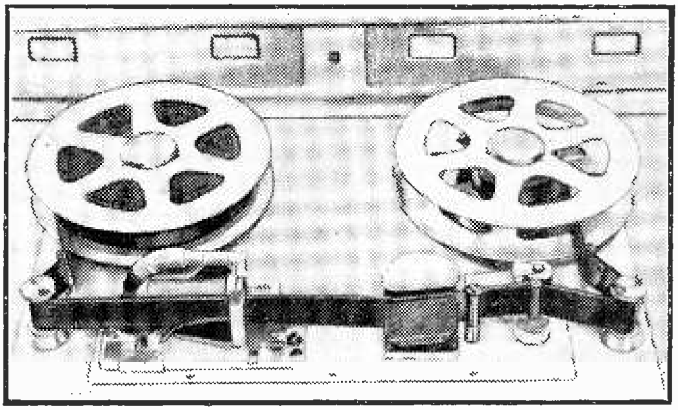
A typical view of signal pattern showing audio track at top, video pattern running vertically across tape, and cue track superimposed on control track at bottom.

1. High head-to-tape velocity was required to record the high frequency components of the video signal.

2. Adequate playing time using reels of reasonable size was necessary.

3. A means had to be found whereby the entire video signal from direct current to the high frequency of 4 megacycles could be recorded and reproduced.

To solve the first two problems, the Ampex recorder has four heads mounted at the outer circumference of a rotating disc with their gaps parallel to the disc axis, and the video signal is then recorded vertically rather than horizontally on the tape. The third problem was solved by a special modulation process which will be described later.



Tape transport mechanism of the VR-1000 with the head covers removed.

In the head assembly, each head is spaced with microscopic precision at 90 deg. from the next on the disc. With a disc diameter of about 2in., and a rotational rate of 14,400 r.p.m. (240 r.p.s.), the writing speed or relative head-to-tape velocity is about 1,500 i.p.s.

The reel-to-reel tape velocity depends upon the width of the tracks which are to be laid down, one after another, transversely on the tape, and upon the necessary space between them. These tracks are 10 mils. wide, with an edge-to-edge separation of $5\frac{2}{3}$ mils. and a centre-to-centre spacing of $15\frac{2}{3}$ mils. It is thus possible to obtain a great reduction in tape speed and to operate at the familiar 15-ips velocity. Using thin tape, 64 minutes of recording are obtained on a $12\frac{5}{8}$in. diameter reel of 2in. wide tape.

A 120 deg. arc is described during the complete sweep of a head transversely across the tape.

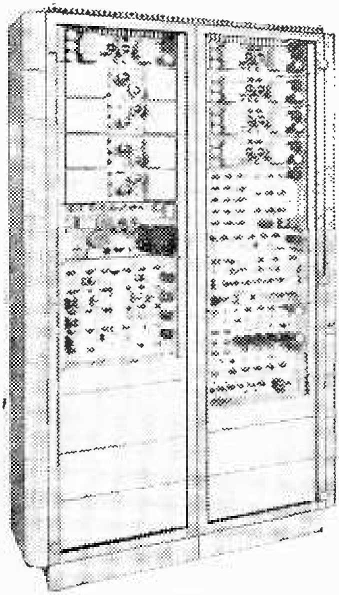
Since all four heads are fed the same currents during recording, there is a duplication of information towards the end of one track on the tape and at the beginning of the succeeding one. Advantage is taken of this duplication in the switching system used to deliver continuous transient-free signals during replay.

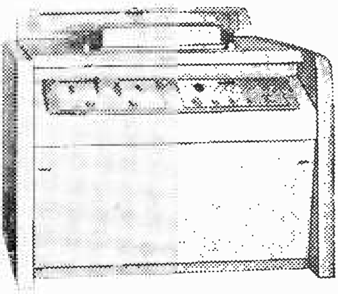
With four heads performing 960 sweeps transverse to the tape each second or each 15in. of tape, one frame occupies $\frac{1}{2}$in. of tape longitudinally and the 525 horizontal lines which make up one full TV frame are recorded on 32 successive sweeps or tracks on the tape. Each track carries 16 or 17 horizontal lines of television information.

Four Tracks

The recorded tape has four separate but synchronised magnetic tracks. The first is the series of transverse video tracks; the second is the sound track that accompanies the picture, which is impressed at the top of the tape; the third is the control track which comprises a record of the alternating currents which fed the rotating head motor during that recording. Also on the control track is an edit pulse used as a reference point in editing and splicing. The fourth is a cueing track to aid operators in the production of programmes and commercials.

During recording the sound track is wiped clean by a preceding erase head, for maximum signal-to-noise ratio.





The Ampex VR-1000 equipment for recording television on tape.

Erasure has proved to be unnecessary on the control and cue track. Even after erasure of the top 90 mils. of the tape (for the sound track) and the destruction of the lower 50 mils. of the recording by the control-track and cue track recording head, more than 90 deg. of arc are still recorded on each transverse track. The overlap of information is approximately two TV picture lines, or around 130 micro-seconds. During replay this allows a generous time interval during which electronic switching from head-to-head can take place.

Tape Transport

The transport mechanism used

is similar to that found in many professional magnetic audio recorders. The tape is supplied from a reel on the left; it passes around an idler and then by the rotating video head assembly which also contains the stationary control track head. The tape then goes on to two stationary stacks of heads. On the first stack is an erase head (which clears a 90 mil. strip at the upper edge of the tape), and the cue track record-replay head at the bottom edge of the tape. The second stationary head stack contains only the audio record-playback head at the upper edge of the tape.

The tape next passes between a drive capstan and its pressure idler; contacts a takeup tension arm, and on to a tape takeup reel at the right. The erase, audio, cue and control track magnetic heads are stationary.

Guiding of the tape past the rotating disc is accurately, yet delicately controlled by the concave guide, which is used to cup the tape around the disc. The relation of tape to rotating heads must necessarily be intimate, and good head contact at nearly constant pressure is required. This is acomplished by maintaining the fit of the concave guide within small tolerances to the exact path of the rotating heads and through the use of vacuum applied from the guide side of the tape.

System Operation

During both recording and replay, an intimate relation must exist between the rotation of the revolving heads and that of the capstan. This process begins at the time the signal is recorded.

While recording, the 60-cps power-line frequency is first applied to a frequency multiplier, which produces a 240-cps signal. The signal drives a three-phase power amplifier during the original recording which in turn supplies 240-cps power to the synchronous motor which drives the rotating disc.

A portion of the revolving mechanism is coated half black and half white. A light source is focused on this revolving black and white disc and reflected into a photo cell to produce a 240-cps square-wave output. This is passed through a frequency divider, coming out at 60 cycles. The signal is then passed through a filter, whose output is a clean 60-cps sine wave, which in turn is fed to a power amplifier whose output drives the capstan motor.

The whole chain is electrically analogous to a mechanical gear train, coupling the rotation of the capstan firmly to the rotation of the head disc. In playback, neither the head disc motor nor the capstan motor are driven directly by the 60-cps power line frequency. During record only the power supplied to the rotating head motor is derived from the incoming 60-cps line. In the playback mode, a phase comparator acts on the difference between the photocell signal and the signal recorded on the tape. Any difference causes a Wein bridge oscillator to change, which in turn causes the capstan motor to speed up or slow down as required.

The power supplied to the capstan is generated from the actual motion of the revolving heads, enslaving the capstan to the head disc. Thus, during the recording process, the tape is moved precisely 62.59 mils. longitudinally during each complete revolution of the head disc. During this period, four lateral tracks are recorded, one for each head, each track being separated from the next by a centre-to-centre space of 15⅔ mils.

Control Track

During the process, the 240-cps output of the photocell is also fed, through a bandpass filter and a series of amplifiers, to the control track head, which records the signal longitudinally on the control track at the bottom of the tape. This control track becomes the magnetic equivalent of the sprocket-holes of a sprocketed film machine. Since the 240-cps signal is derived directly from the revolving heads, the signal on the control track bears a direct relation to the spacing of the lateral tracks on the tape and this information is available as a reference to control the relative positions of the head disc and capstan shaft during replay. Also on the control track, superimposed over the control signal are the editing pulses, and the cue track.

When the recorded video tape is to be played back, power line frequency is again multiplied to 240-cps synchronised through a phase comparator and Wein bridge oscillator, amplified and fed to the capstan motor, driving it at a rate which is at least approximately correct, for the purpose of tracing the previously recorded magnetic tracks. Again, the photocell produces a signal corresponding to the revolutions of the disc, this signal once more being fed through a 240-cps bandpass filter and then to a phase comparator in the capstan servo-amplifier chassis.

Another 240-cps signal is derived from the recorded control track, amplified, and fed to the phase comparator. The resultant signal is a function of the phase difference between the control track signal and the signal from the photocell. This is applied to a low-pass filter and then to the grid of a reactance tube which is one of the frequency determining elements of a conventional Wein bridge oscillator.

The oscillator functions nominally at 60-cps, but is slightly modified, up or down, by the correction-signal from the phase comparator. This signal is then fed to the power amplifier which drives the capstan in the same relation to the rotating disc, within narrow limits, as it did during the recording process.

Once the disc is adjusted on centre to the tracks at the beginning of replay the servo system holds the relation constant and the revolving heads indefinitely trace accurately the recorded video tracks.

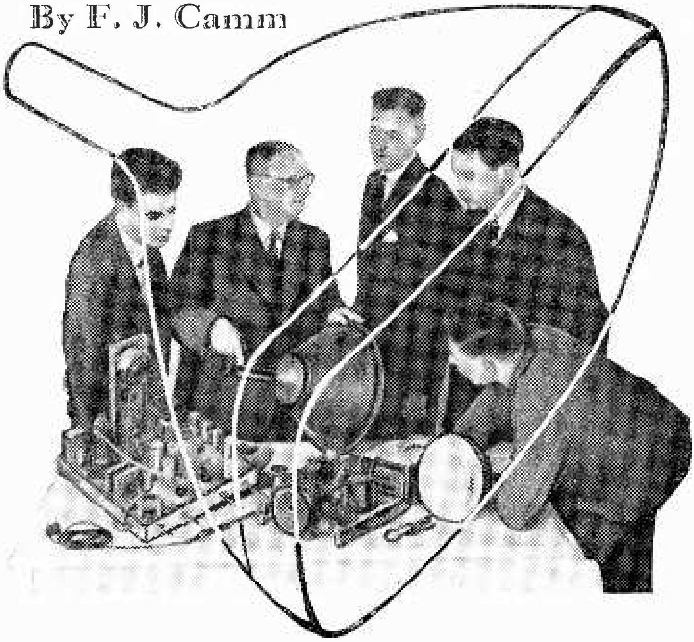
The output of the photocell can also be used to determine, in advance, the approximate moment during playback when it will be necessary to switch from one playback head to the next.

Superimposed over the control track 10 mils. above the bottom edge of the tape is a track 10 mils. wide. Since the cue track serves only as a guide for operators and directors, it has comparatively low performance qualities. A single head, located at bottom of the erase head stack performs both the record and playback functions.

(To be continued)

The Television Tube Explained

By F. J. Camm



THIS ARTICLE DEALS WITH THE PRINCIPLES OF THE HEART OF THE TELEVISION SET

THE cathode ray tube, like a wireless valve, is a device for emitting electrons, but with this important difference: the stream of electrons is controlled so that it is directed on to the fluorescent screen on the viewing end of the tube in an orderly sequence, so that it traces out the picture. The stream appears on the end of the tube as a tiny spot, and when the receiver is tuned in to vision, the spot is made to trace out the picture on the viewing end of the tube. This spot of light traverses the screen from side to side, 405 times in one fiftieth of a second, at a speed, in the case of a 12in. tube, of over 7,000 miles an hour, and at a correspondingly higher speed in the case of larger tubes.

Persistence of Vision

When you are viewing a picture, therefore, on a television screen you are merely viewing a spot of light which by persistence of vision gives the illusion of a picture. When you visit the cinema, what you see on the screen as a moving picture is in reality a series of "stills" which are jerked in front of the lens in the projector and remain stationary for a fraction of a second. The eye sees as a continuous moving picture any series of pictures which are moved at a constant speed and brought to a standstill, provided that the frequency is 16 frames a second or more. The eye cannot detect the stops in between. The frequency of cinematograph pictures is 24 frames a second and the eye will not respond to a frequency in excess of 16 per second. This is what is meant by persistence of vision. When light rays impinge upon the retina of the eye, the impression they make does not immediately cease. It persists for an appreciable time afterwards. In the case of the film, one picture follows the previous one before its image has ceased.

The same thing applies to a television tube. The spot of light is travelling so fast that it builds up a rectangular raster on which the picture appears. Persistence of vision as a fact lasts for approximately 1/12th of a second. A television picture, however, differs from a photograph in that the whole of the photograph is seen, whereas with a television picture the scene is scanned, or broken up into a series of tiny pieces and reassembled on the screen.

The Scanning Spot

The spot of light is known as the scanning spot, and it sweeps continuously over every part of the picture being televised, and the smaller the scanning spot, the finer in detail will be the televised image, for it will enable the light and shade of the picture to be picked up with greater precision. The light spot varies in intensity according to the magnitude of the received signal, which varies according to the light and shade of the picture being transmitted. The position of the spot on the front of the tube is always in the same relative position as the picture element being scanned by the television camera.

Tube Size

The size of a cathode ray tube (12in., 17in., 21in., etc.) is a somewhat misleading expression. It does not mean that the rectangle or raster has 17in. sides. The dimension refers to the diameter of the circle in which the raster is inscribed. Thus, when we speak of a 21in. screen, it should be understood that this is the length of the diagonal of the rectangle traced out by the spot. It is important also to remember that the aspect ratio of the picture area is always the same, irrespective of the size of the tube, namely 4:3. That is to say, if the width of the rectangle is 8in., the height will be 6in. Projection television receivers use a very small cathode ray tube, about $2\frac{1}{2}$in. in diameter. It is employed in conjunction with an optical system which enlarges the picture, which is thus viewed indirectly.

The Components of a Tube

The diagram at the bottom of this page shows the various parts of a cathode ray tube. The cathode is made of nickel in the form of a cylinder, and it is coated with material which readily emits electrons. A coating commonly used is barium strontium carbonate. The screen and the tube envelope are manufactured separately and then welded together. Surrounding the cathode is the grid and in front of it is the gun, the location of which decides the angle of scan, and this in turn decides the length of the tube. In the end of the gun is a small hole through which the stream of electrons pass on their way to the screen. When the stream of electrons hits the screen it appears as the small spot which, as already stated, is known as the scanning spot. This is guided over the screen by means of the scanning coils.

Afterglow

Directly the electrons hit the screen, they cause the fluorescent material on it to glow at that point. This glow persists for a fraction of a second after the spot has moved to another point. This is known as afterglow. No doubt you have observed that after you have switched off your receiver there is an afterglow before the screen becomes inert. The wide-angled tubes used today give a scanning angle of 70 degrees, which allows of a much shorter tube than hitherto.

Deflector Plates

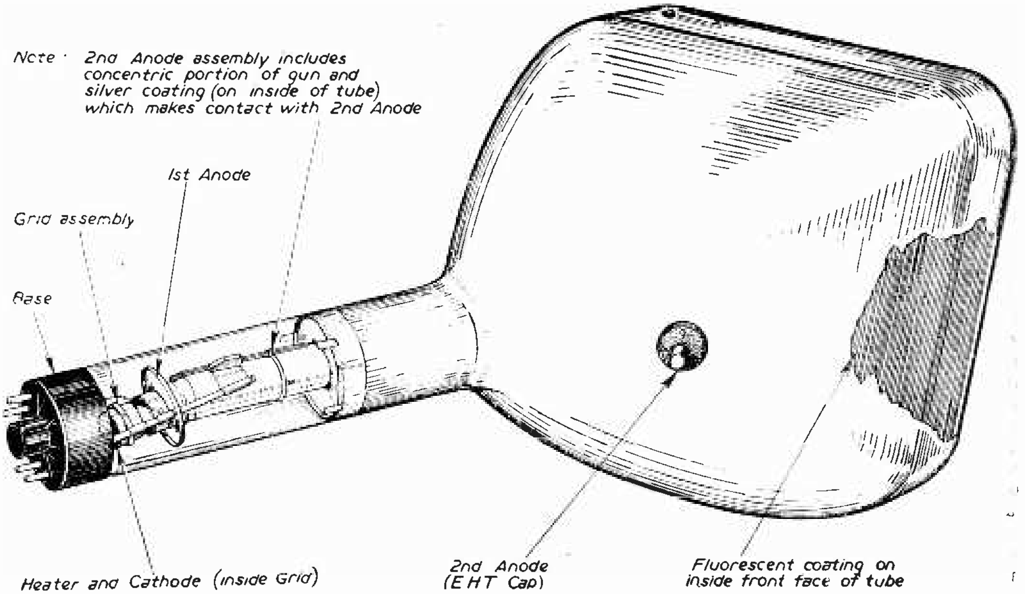
Two pairs of deflector plates are placed at right-angles to each other and alongside the path of the electron stream, between the anode and the screen. When an electric charge is given to either or both pairs of these deflector plates the electron stream is deflected, and hence they strike the screen at another point. The electrical charge, of course, varies throughout the picture trace. All modern receivers make use of electro-magnetic tubes, the electrostatic type now being obsolete. We thus see how the visual spot on the screen will move so that it may describe any definite path within the space area of the raster.

The number of lines in a television picture is constant at 405, at 50 frames per second. With all scanning processes, there is a primary and secondary movement, the primary movement depending upon the number of strips dividing the picture and the picture frequency per second, and the secondary movement simply upon the picture frequency per second. In the primary movement the spot has sufficient velocity to carry it from top to bottom of the raster when a quick return or flyback is made, and then the process is repeated, the picture being scanned horizontally.

The Timebase

Associated with the tube is the timebase and this operates in such a way that a uniform increasing voltage is applied to one pair of the deflector plates in the tube. The electron stream is thus deflected in a uniform manner, so that the spot can describe a line on the screen. A triggering action is incorporated in the circuit, so that when the electron stream is being diverted over the required scanning distance, the voltage suddenly drops. This cycle of operation is repeated. The triggering action is brought about by the charge and discharge of the condenser, in which the slow rise of voltage across the plates is made use of to attract the line spot on the screen. The sudden discharge of the condenser allows the spot to return to its initial position in readiness for the following sweep.

(*Continued on page 20*)



Showing the components of a modern television tube.

TELEVISION TROUBLES

Their Symptoms and How They May be Cured

By G. J. King

ARTICLES appearing under this title will deal with the host of symptoms exhibited periodically on television receivers of popular make and series. Details of the symptom will be given. its cause will be fully described and the action required for its removal will be discussed.

In order to ensure that these articles will be of maximum value to the service mechanic as well as to the enthusiastic amateur. and to allow rapid reference. the general aspect of the particular fault under discussion will be examined, and then the symptom will be considered in greater detail in relation to the various makes and series of receiver. which will be listed alphabetically.

Faults Affecting the Frame Scan

Symptoms caused by faults associated with the frame circuits are fairly easy to recognise, since they affect the vertical build-up and stability of the picture on the screen. The essential symptoms are: (1) lack of height; (2) vertical cramping of some part of the picture; (3) rolling of the picture; (4) vertical jitter. and (5) lack of vertical hold.

If any of these symptoms are experienced it will. of course. first be ascertained that the appropriate pre-set controls are adjusted correctly. For example. lack of height may simply be corrected by adjusting the height control, while a rolling picture may be steadied by adjustment of the frame (vertical) hold control and cramping of the picture may simply require careful adjustment of the vertical linearity (form) and height controls. It is assumed that these adjustments will be tried before going to greater lengths to remove the symptom.

Alba Models T394, T484 and TR9874

Insufficient height.—A check should first be made on the emission of the ECL80 frame oscillator valve and the PL82 frame amplifier valve. These are situated on the left-hand side of the neck of the tube when viewing from the rear of the chassis.

If the valves are in good order. attention should be directed towards the frame amplifier stage. the circuit of which is shown in Fig. 1. It often happens that C51 becomes leaky or reduces in value. Since this is located in the negative feedback frame linearising network. the symptom may be accompanied by cramping at the bottom of the picture. It has been known for this component progressively to become leaky as the temperature inside the receiver rises. in which case the frame scan will just fill the screen with the height control at maximum when the receiver is first switched on, but will gradually decrease in amplitude after an hour or so.

It should be noted. however. that a symptom of this nature may also be caused by characteristic change of the PL82 or an increase in resistance of the frame transformer or coils as the temperature of their windings increases.

A check should also be made on the 100 mF electrolytic capacitor in the cathode circuit of the PL82. This has a habit of drying up and losing its value by some marked degree. This is best checked by the quick connection of a 50 mF or 100 mF capacitor while observing the effect on the picture.

A severe decrease in height. resulting in a frame scan of an inch or so, is sometimes caused by section A of the frame output transformer becom-

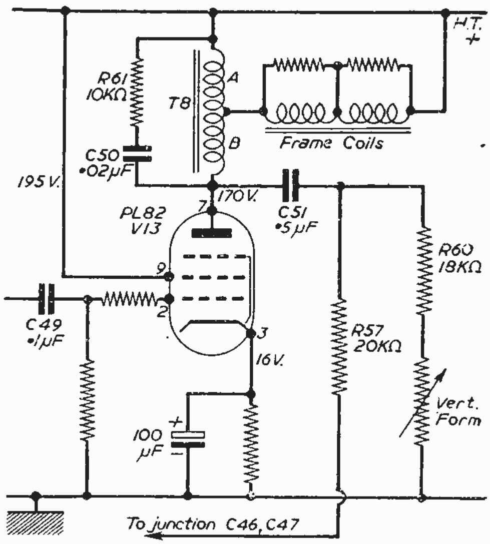


Fig. 1.—Alba frame amplifier circuit.

ing open-circuit. This may prove rather a bewildering fault. since a voltage check on the anode of the PL82 will prove pretty well normal owing to continuity of circuit being maintained through the frame coils themselves. The quickest check is by disconnecting one side of the frame coils. keeping the brightness control turned well back to avoid burning the screen, and then checking for PL82 anode volts. If they are now lacking. the transformer is due for replacement.

Total failure of frame scan.—Check valves as for previous symptom. and if normal check the voltage on the cathode of the PL82. If this is much less than the 16 volts expected. a check for continuity of screen and anode circuits should be performed. which is best done by checking the voltage on the appropriate tags on the valve holder.

If cathode voltage is normal. check the frame amplifier stage by disconnecting the frame amplifier coupling capacitor (C49) at the generator. and applying a mains ripple voltage from the heater line to the amplifier through the capacitor. A normal amplifier stage will produce a somewhat distorted frame scan on the screen when such a signal is applied. If this happens. and it undoubtedly will if the PL82 cathode voltage is reasonably accurate. the trouble should be sought in the frame oscillator stage, the circuit of which is given in Fig. 2.

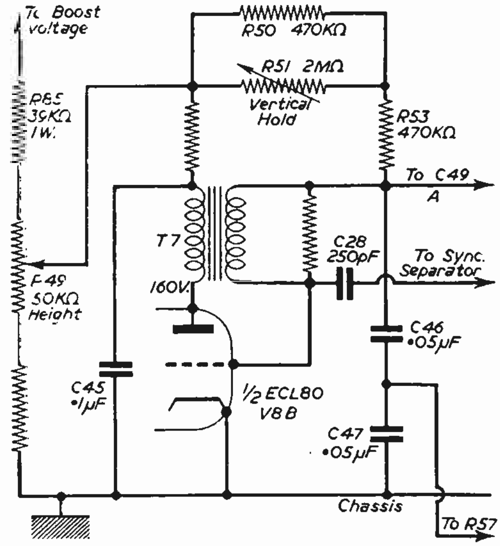


Fig. 2.—Alba frame oscillator circuit.

It is assumed that the associated ECL80 valve has been checked and found to be normal, in which case a quick check should be made to find out whether or not the stage is oscillating. An oscilloscope is an ideal instrument for this, of course, but they are not always at hand. However, a pair of headphones connected between point A on the circuit and chassis will emit a rough 50 c/s note which will alter slightly in pitch when the vertical hold control is adjusted if the stage is oscillating. Another fair test for oscillation is by the negative voltage which is indicated on a high-resistance voltmeter connected between point A and chassis.

If the stage is oscillating, and the amplifier stage has been checked normal as hitherto described, the trouble is caused either by R57 increasing in value or by open-circuit of C49 (Fig. 1).

Lack of Oscillation

Lack of oscillation. however, is invariably caused by failure of one of the windings of T7, the blocking oscillator transformer. The anode voltage of V8B has a fairly wide angle as indicated, depending upon the precise settings of the height and vertical hold control, so it is not a point representative of a conclusive test of the condition of the primary winding of the transformer, for example. The transformer should be disconnected from the circuit and a check made for continuity and resistance of the windings. Open-circuit is obvious. but if the primary deviates greatly from 820 ohms and the secondary from 515 ohms, then the transformer should be checked by substitution.

If the frame scan jumps to life when the height control is turned to maximum, the control should be replaced. since it is open-circuit at one end of its track. If the transformer appears to be free from defect and the stage obstinately refuses to oscillate, check the voltage at the top of the height control. The voltage here is obtained from the boost diode in the line output stage, and is dropped to a suitable value by R85. and this component sometimes goes open-circuit (always replace with a 1 watt component).

No frame hold: Nearly always this symptom is caused by trouble in the frame sync coupling capacitor—the 250 pF C28 in Fig. 2. Partial failure of this component. however, may not kill the frame lock completely. but may weaken it with the accompanying symptom of poor vertical linearity.

Poor Frame Lock

A poor frame lock. sometimes accompanied by impaired linearity, may also be caused by an insulation defect in the frame blocking oscillator transformer, but this is not a common fault.

If the frame tends to lock only when the vertical hold control is set to the extreme end of its travel. the 470k resistor R53. in series with the vertical hold control. should be checked for value. and should be replaced if off value by an amount exceeding 20 per cent. If the vertical hold control is critical in terms of locking the picture, the parallel-connected 470k resistor R50 is probably high in value.

Unbalance of the frame hold control may also be incited by characteristic alteration of the ECL80 (V8B). but to save a valve change, the circuit can be brought back into balance by adjusting the value of R53 slightly by the inclusion of a padding resistor. If the picture locks when the control is adjusted in the minimum resistance direction. a 1 megohm resistor should be connected in parallel with R53. while if the picture locks only when the control is adjusted for maximum resistance, a 50-100k resistor should be wired in series with R53.

Picture jitter: This symptom is invariably caused by unstable emission of V8B, and can usually be proved only by valve substitution. Also check C45 and the frame blocking oscillator transformer.

Impaired linearity: In addition to this symptom accompanying the faults previously described. it may also appear by itself owing to failure or poor insulation of one of the following capacitors. C49. C51 (Fig. 1), C46, C47 and C45 (Fig. 2), or alteration in value of R57 or R60 (Fig. 1). If necessary, a check should also be made on R61 and C50 (Fig 1).

ITV in Difficult Areas

SOME PRACTICAL HINTS ON COPING WITH DIFFICULT RECEPTION By B. L. Morley

(Concluded from page 573 July issue)

IT is by moving the dipole to obtain the best signal that the amateur stands a better chance than the dealer, as the dealer could not afford to spend a great deal of time with each installation looking for the best signal. The costs of the search would soon swallow up any profits on the aerial—especially if it was found that a simple aerial in a certain position produced a stronger signal than a more elaborate array on the chimney.

The conditions we have outlined are likely to become even more to the fore when Band V is opened. The higher the frequency, the more nearly like light do the radio waves behave.

The Lone Worker

The lone worker has his own special difficulties. It is not practicable, for instance, to note the strength of the picture, dash up on to the roof, adjust the aerial, and dash down again trying to observe the difference in signal level.

Several methods can be employed to note the difference in signal strength while remote from the televisor.

Perhaps the simplest is to tune the televisor so that the vision signal appears on the sound, giving the well-known hum. A pair of phones can be connected to the loudspeaker output taking great care to ensure that at no point is a connection made to a high-voltage point. The safest method is to use a pair of low-resistance phones across the speech coil of the loudspeaker.

Results are not entirely satisfactory because noises at roof level are inclined to mask the variations in signal strength; further, variations in picture content will vary the pitch of the signal heard. It is best to employ the time when Test Card "C" is being radiated.

It is very important not to be deceived by variations in signal strength caused by fading and not by manipulation of the aerial.

An alternative method is to use a visual signal. The sound of the vision signal can be tuned in as before and the output at the loudspeaker measured on a similar A.C. voltmeter. The voltmeter can be fitted with a long lead and taken on to the roof.

A more satisfactory method is to employ the A.V.C. voltage now available in the sound receivers of most modern televisors. This voltage can be checked on a good class voltmeter and the variations in signal strength noted. This method is very satisfactory. A visual signal is much easier to cope with than an audio one.

The same method can be employed indoors when checking for an aerial position—and up in the attic as well! When fitting an indoor aerial in the attic it often pays to try different positions so as to get the best signal.

Low-loss Cables

In most cases where signal strength is weak the use of low-loss cables is well worth while. This is especially true where cables are of some length. For average situations their expense is probably not worth the gain; in good-signal areas the loss of two or three db is not very important.

Where interference is troublesome, low-loss cables can be an advantage in order to maintain as high a signal-to-noise ratio at the receiver as possible.

Losses Due to Mismatch

A certain amount of tolerance is allowable in the matching between aerial and feeder, and feeder and televisor but too great a mismatch will result in losses which cannot be tolerated.

It is a simple matter to overcome some mismatch at the televisor end by use of a stub. Whether or not the benefit gained is of real value will depend upon the amount of mismatch and the strength of the signal.

The method is simply to connect a short length of feeder cable in parallel with the existing cable at the aerial socket. The cable should be no more than 2ft. 6in. long and the end left free. Now, by cutting an inch from the end of the cable, the effect on the screen should be noted and if successive cuts are made it is possible to arrive at a point where the best signal is produced, see Fig. 6.

The stub acts as a resonant circuit and "tunes out" the inaccuracies caused by the mismatch.

Aerial Combiners

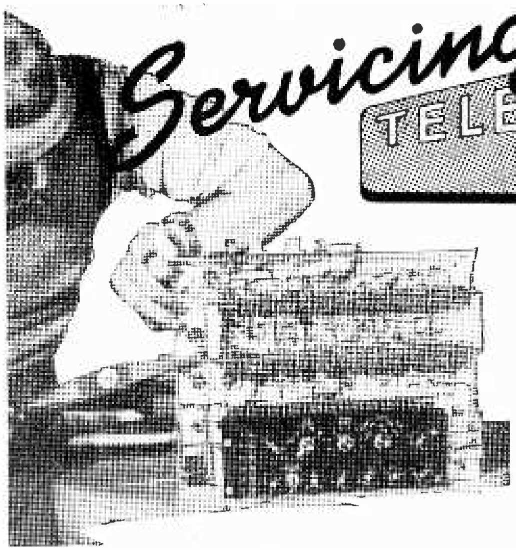
Most modern television receivers are equipped with a single aerial socket to take both Band I and Band III transmissions. The usual method is to fit a combining unit of some description at some point where the two feeders from the separate Band I and Band III aerials combine together and feed into a single feeder cable going to the televisor. The feeders are connected to the unit which is actually a high-pass/low-pass filter and operate as blocks in each aerial circuit, see Fig. 7 (July issue).

As will be seen from the diagram the high-pass filter inserted in the Band III aerial feeder allows the Band III signal to pass through but acts as a bar to the Band I signal. Similarly the low-pass filter in the Band I aerial ciruit allows the Band I signal to pass but blocks the Band III.

The use of such combiner units is very convenient, but in difficult areas, where signal strength is really low, it is worth while to connect the Band III aerial directly to the televisor and to put up with the trouble of changing over the aerial connections when moving from one band to the other.

An alternative arrangement is to use a pre-amplifier at the televisor end solely for the Band III signal and then to fit the combiner unit on the output side.

Servicing TELEVISION RECEIVERS



No. 40.—THE PYE V54C

By L. Lawry-Johns

WE propose to deal with this receiver for several reasons. First and foremost because it persistently crops up in readers' letters as being a somewhat mysterious set of doubtful origin and even when it is identified, service sheets seem very hard to come by. Therefore we have no doubt that many readers will find the subject matter both interesting and useful. Another reason for its presentation is that it provides an interesting study of the occasional complete breakaway from an established trend of design.

However to proceed with the circuit description, the receiver chassis is very nearly a modified FV1 as far as the vision and sound stages up to the detector circuit in each case is concerned and the frame timebase is almost identical. The line output stage, video and sound output and the power pack are the sections which differ mainly and these are described in detail and the circuit diagrams are shown as complete as can be arranged. Readers possessing these receivers who are unable to obtain a sheet should obtain one for the Pye FV1 which together with the subject matter of this article will provide complete coverage. Owners of the Radio and Television Servicing volumes will, of course, already have the FV1 circuit to hand. As it stands the receiver is tunable to any of the five BBC channels and the I.F. circuits are tuned to 38.5 Mc/s sound and 35 Mc/s vision. The Pye type 124 tuner unit was originally intended for conversion to 12 channel operation but as these are no longer generally available a Cyldon or Brayhead tuner may be used with series connected valves and a 35-38 Mc/s output.

The power supply is a separate unit housed in the bottom of the cabinet and is connected to the timebase and receiver unit by means of a 12-pin plug and socket (P1-S1). Two full wave rectifiers (V6A-V6B) are used for the two H.T. supplies as shown in the power pack diagram. Apart from the two H.T. rectifiers and the C.R.T., all valve heaters (except the EY51 of course) are series connected across a winding on the mains transformer and a thermistor (R26A) is connected in series with this heater chain to limit the initial flow of current when the receiver is first switched on.

Full fuse protection is provided, F1 A-B being wired in the mains input circuit and F2 A-B in the mains transformer H.T. windings.

The rear view of the tube assembly shows the various adjusting points. The tilt control rotates the scanning coils on the tube neck and these are correctly positioned when the top edge of the picture is level with the mask (reduce frame amplitude to obtain a staight edge). The centring plates consists of two plates which are located in front of the focus magnet which may be rotated in order to centre the picture square in the mask. One plate shifts the picture in a vertical direction more than horizontal whilst the other moves the picture more horizontally.

The alignment magnets should not be confused

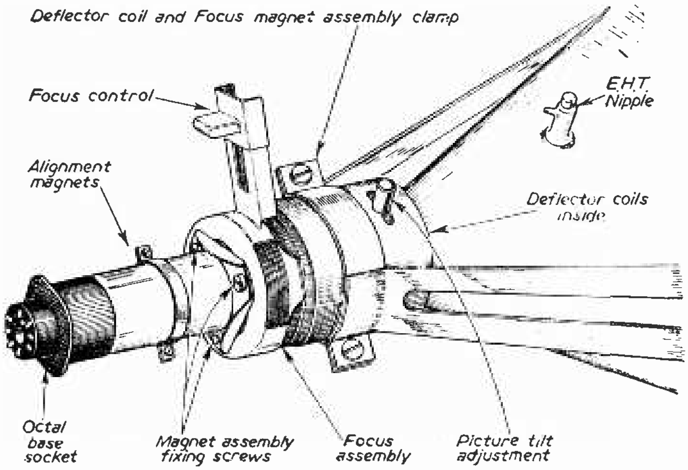


Fig. 1.—Rear view of tube assembly.

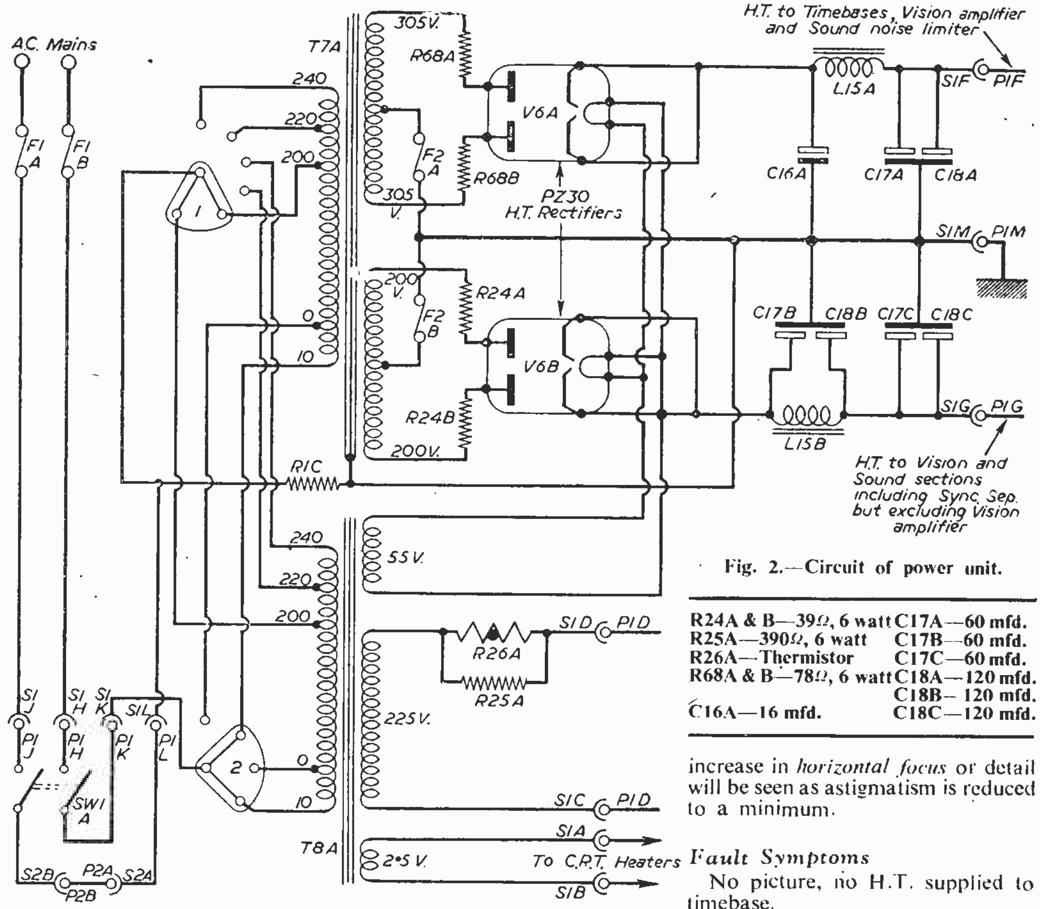


Fig. 2.—Circuit of power unit.

R24A & B—39Ω, 6 watt	C17A—60 mfd.
R25A—390Ω, 6 watt	C17B—60 mfd.
R26A—Thermistor	C17C—60 mfd.
R68A & B—78Ω, 6 watt	C18A—120 mfd.
	C18B—120 mfd.
C16A—16 mfd.	C18C—120 mfd.

with an Ion Trap Magnet. The tube, having a straight gun assembly does not require an Ion Trap Magnet. The alignment magnets should be adjusted in relation to the tube neck to a position which gives the best overall focus, i.e. adjust the focus lever to its optimum position and then adjust the alignment magnets to spread the focus evenly and reduce astigmatism. Test card C is the best display on which to align and a real increase in *horizontal focus* or detail will be seen as astigmatism is reduced to a minimum.

Fault Symptoms

No picture, no H.T. supplied to timebase.

Check H.T. fuse F2A and resistors R68A-B. If either or both are open circuit check PZ30 V6A, then C16A, C17A and C18A for shorts. If these capacitors are in order, check V7C (line oscillator) for screen-to-grid short and also V6C—efficiency diode PZ30.

If the timebase H.T. is in order but there is no sound or vision, check fuse F2B, R24A-B, V6B, etc. If the fuse persistently blows, check H.T.

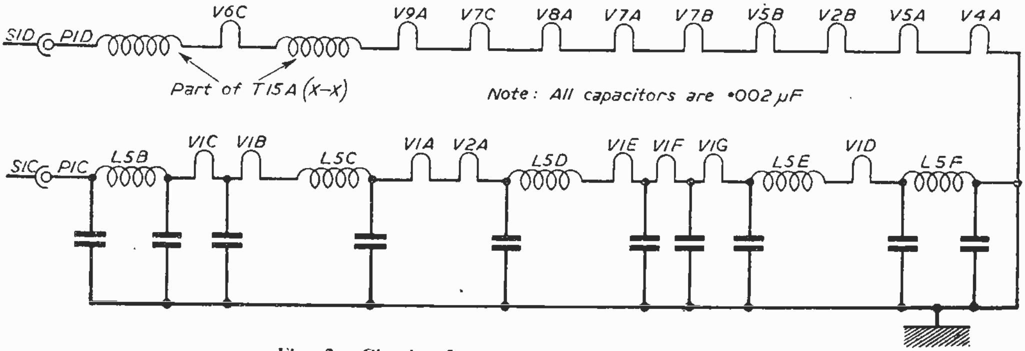


Fig. 3.—Circuit of series heaters receiver chassis.

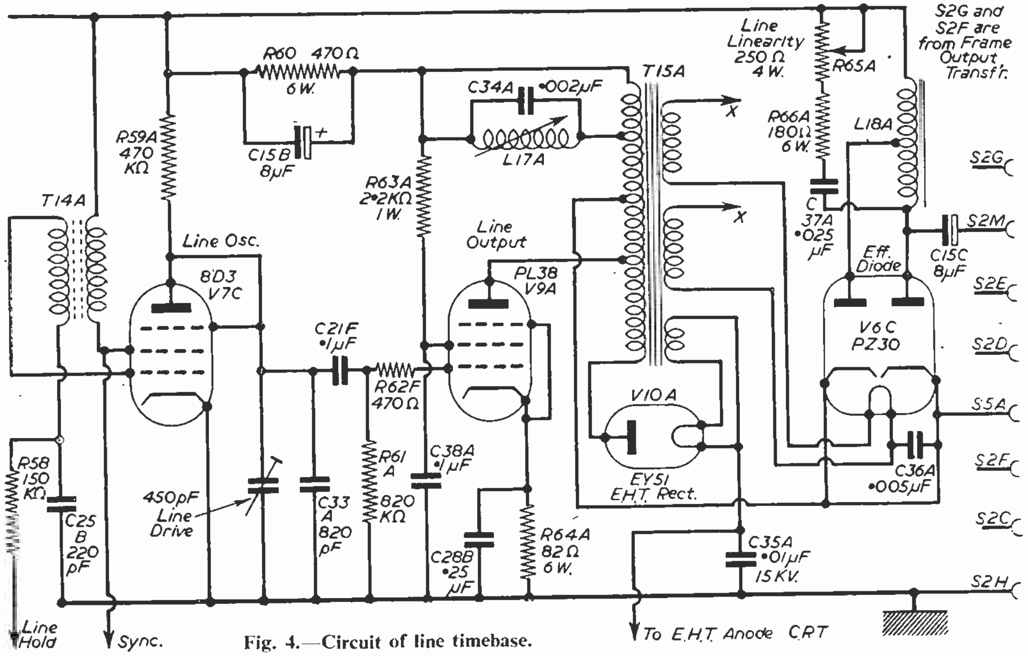


Fig. 4.—Circuit of line timebase.

line for shorts, including V7A (8D3) and V8A (25L6GT) in the sound circuit. The mains fuses will seldom blow (although they may fail due to age, etc.), unless the H.T. fuses are overrated. They should be 500 mA each, whilst the mains fuses are 3 amp.

Low H.T. leading to poor focus and reduced picture size. Check V6A for emission and then suspect C16A (reservoir capacitor) of being open-circuited.

Series Heater Chain Not Lighting Up

Check thermistor then continuity of valve heaters. Note, this fault will leave the V6A-B PZ30 valves alight and also the C.R.T.

No EHT

H.T. to timebase in order, line timebase whistle can be heard. Check EY51 EHT rectifier (on line output transformer). Also check C35A for leakage (not likely but possible). If there is no line whistle, check V7C, V9A and V6C. If only a blur is visible on the screen, due to very low EHT, check C15B and C15C. Then check V6C, C28B, C38A.

Excessive Width

No line amplitude control check L17A, this may be o.c. or disconnected.

Frame Timebase

Horizontal white line across screen—no height. Check ECL80, V2B. If in order check frame oscillator transformer, continuity of controls, etc.

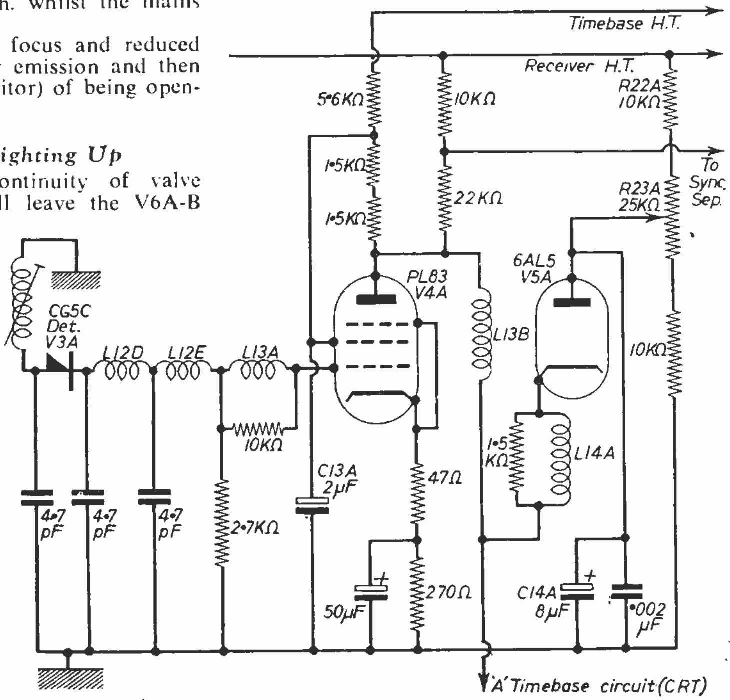
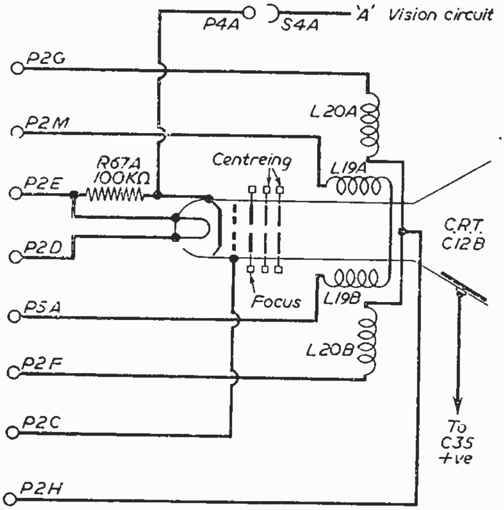


Fig. 5.—Circuit of video amplifier.

Picture crushed at bottom. check V2B and frame timebase electrolytic capacitors 50 mfd. and 12 mfd.

Picture jitters vertically. replace 220 pfd. capacitor wired from V5B cathodes to chassis (across 220 KΩ resistor).



Picture rolls up or down but does not lock. check V5B (6AL5) and above components.

Picture scrambled horizontally and vertically, check V7B (8D3).

Very weak lock. contrast over-accentuated, check C13A.

Weak lock and weak contrast—faint picture difficult to hold. Check V4A (PL83). C14A and vision detector V3A (CG5C): which is a crystal diode.

Weak picture. hold good. Picture blurs and tends to go negative on advancing contrast. sensitivity or brilliance. Suspect weak C.R.T. (Brimar C12B). but check video amplifier and load resistors. etc.

VALVE FUNCTIONS

V1A—R.F. amplifier—EF80 Mullard.
B—1st I.F. amp-vision—EF80 Mullard.
C—2nd I.F. amp-vision—EF80 Mullard.
D—3rd I.F. amp-vision—EF80 Mullard.
E—1st I.F. amp-sound—EF80 Mullard.
F—2nd I.F. amp-sound—EF80 Mullard.
G—3rd I.F. amp-sound—EF80 Mullard.
V2A—Frequency changer—ECL80 Mullard.
B—Frame Osc/output—ECL80 Mullard.
V4A—Video amplifier—PL83 Mullard.
V5A—Vision and sound limiter—6AL5 Brimar.
B—Interlace filter—6AL5 Brimar.
V6A—H.T. rectifier—PZ30 Mullard.
B—H.T. rectifier—PZ30 Mullard.
C—Efficiency diode—PZ30 Mullard.
V7A—Sound A.F. amp—8D3 Brimar.
B—Sync separator—8D3 Brimar.
C—Line oscillator—8D3 Brimar.
V8A—Sound output—25L6GT Brimar.
V9A—Line output—PL38 Mullard.
V10A—EHT rectifier—EY51 Mullard.
CRT—Brimar C12B.
V6A—Anodes 305 v. A.C. Cathodes 345 v. D.C.
V6B—Anodes 200 v. A.C. Cathodes 225 v. D.C.
V10A—Cathode 12 Kv. (EHT).

New Midget Diode

WEIGHING less than three-quarters of an ounce. a tiny new silicon power diode that can handle up to 45 amperes has been produced by the International Rectifier Corporation.

Less than an inch and a half long. the miniature silicon device is expected to find wide application in military and industrial electronics.

Utilizing the latest techniques in ceramic-to-metal hermetic sealing. the new diodes can withstand great extremes of temperature. shock and vibration. They are capable of operation to 200 degrees Centigrade.

They have a maximum one-second half-wave overload rating of 500 amps peak and 150 amps average.

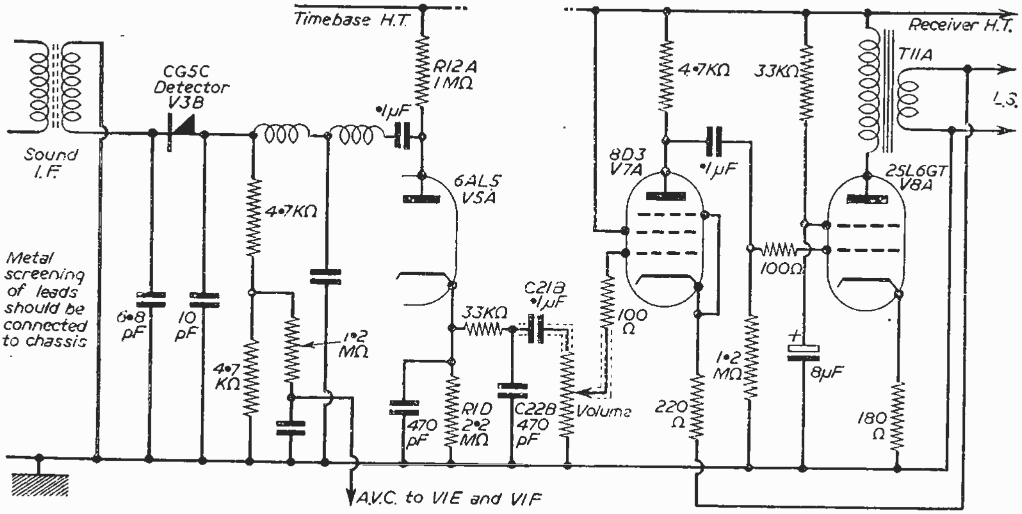


Fig. 6.—Sound detector A.F. and output stages.

Heater-cathode Tube Shorts

OVERCOMING A COMMON FAULT, OR NEW TUBES FOR OLD

By T. Deakin

(Concluded from page 575, July issue)

AS a result the grid base of the pentode is often exceeded and although the positive excursions at the grid, corresponding to peak white levels, are within a fraction of zero volts, the negative extreme is below cut-off. This is of no consequence because the negative extreme is a pulse anyway and the shape will be faithfully reproduced at the anode as a positive-going pulse, albeit of somewhat greater amplitude than the gain would predict.

However, if the video output grid waveform is inverted then it is the peaks of the video signal which are at the extreme negative level and consequently some "clipping" of peak whites will result as the signal is cut-off.

Now this is not likely to worry sets with tube sizes up to say 14in., but in certain cases could conceivably cause trouble in video stages feeding 17in. or 21in. tubes.

In such cases the video stage is best left as it stands, an extra stage of phase inversion being incorporated between video output and the tube. The only penalty paid, apart from the extra circuitry involved, is a slight loss in bandwidth, and hence picture definition.

Phase Inverter

Fig. 5 shows the circuit diagram for a phase inverter suitable for use in this connection. The output from the video stage is taken from the tap on the divider to which the cathode of the tube is normally connected. The potential at this point will be in the neighbourhood of 100v.

It will be noted that the valve recommended is a 12AU7. This valve is a double triode on a B9A base. Only one triode of course is used as the phase inverter in which equal anode and cathode loads are used.

The other triode is connected as a diode being wired across the 1M grid leak of the tube. This diode is used for D.C. restoration. The necessity for this arises as a result of the high D.C. potential appearing at the anode from which the inverted waveform is obtained. To couple the signal from this high D.C. level to the grid, which is some 40v. or 50v. negative with respect to earth, obviously requires an A.C. coupling. The latter is provided here by the 0.25 μF coupling capacitor.

The sync signal may be left as shown connected in Fig. 3, or alternatively may be connected to the cathode of the phase inverter where the phase of the signal is the same as that at the anode of the video stage.

It was mentioned earlier that some loss of definition arises as a result of including this

(Continued on page 25)

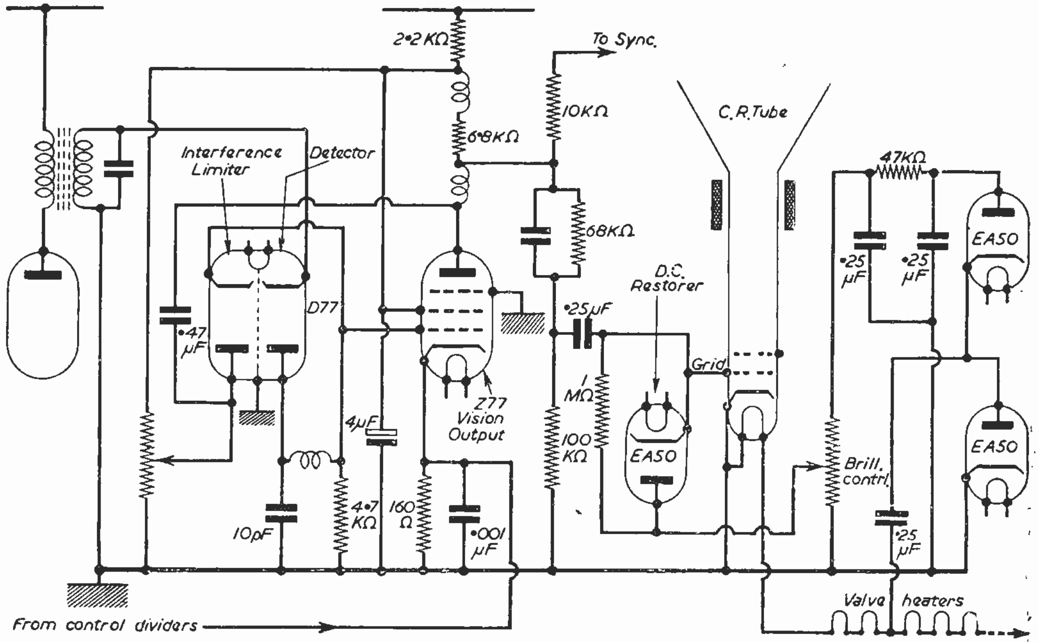


Fig. 4.—Phase inversion by reversing the limiter and detector diodes.

A Universal Alignment Method

A FORM OF ALIGNMENT PROCEDURE SUITABLE FOR THE MAJORITY OF SETS

By H. Peters

(*Concluded from page 581, July issue*)

IT is then only necessary to move the resistor from anode to grid. etc. This can be tricky enough with commercial crocodile clips whilst the set is running and that is the reason for the home-made clip shown in Fig. 1 (a).

Rejectors.—Without altering the signal generator frequency turn the volume control down. transfer the meter to read vision output. increase the signal generator output until the modulation shows on the screen and the meter. Adjust rejector 2 and rejector 1 for minimum indication on the tube or meter. This adjustment is very critical, and should there not be sufficient signal available from the generator to determine the precise position of each it is advisable to short one out whilst trimming the other. In fringe areas of weak sound the first rejector can be tuned to maximum sound instead of minimum picture.

Vision.—With the signal generator injected at the same place but tuned to nearly midband. i.e.. at 1.25 megacycles from the vision carrier on the same side as the sound (depending on whether local oscillator beats high or low) damp T3 primary and adjust T3 secondary for maximum vision. then damp T3 secondary and adjust T3 primary for maximum vision. Carry this procedure on to T2 and T1. damping primary and adjusting secondary. etc. When complete. swing the signal generator slowly through the vision band and note the response curve. If the circuits are of the damped or bandpass types the response curve will normally be satisfactory but if the original alignment of the set was "stagger-tuned" there will be a pronounced peak at the alignment frequency. and the sensitivity will be abnormally high. To correct this type of circuit. screw in all the secondaries half a turn and screw out all the primaries a similar amount. If this does not broaden the bandwidth sufficiently repeat the process. These instructions relate to iron cored coils; for brass cores screw in the primaries and screw out the secondaries. the idea being to make the anode circuit less inductive than the preceding grid coil and thus reduce the chance of oscillation.

R.F. Stages.—Where the conventional single R.F. buffer stage is employed the alignment of the R.F. and local oscillator stages is easiest done on a test card. The local oscillator is adjusted for minimum sound on vision, preferably using the steady tone. the aerial coil (which can be regarded as a bit of the aerial left inside the set) to maximum picture, and the R.F. transformer for best compromise between sound and picture.

Receivers with two R.F. stages need the same treatment as the I.F. stages. i.e.. damp primary, tune secondary, etc. The bandwidth has. however, to encompass the sound and vision channels so that the signal generator has to be set 1.75 megacycles below the vision frequency for midband. If the bandwidth is somewhat restricted when aligned the strip can then be staggered the same as the I.F.'s.

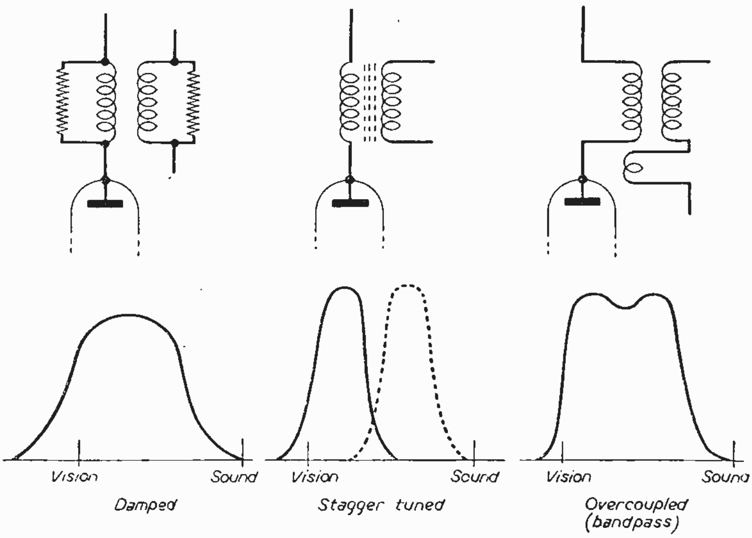


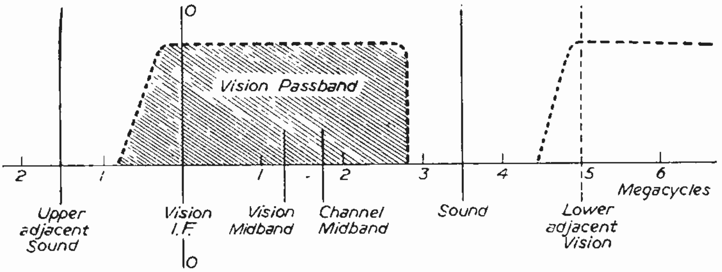
Fig. 3a.—Diagrammatic form of three common types of I.F. transformer.

Exceptions

By now it will be noticed that the particular set that you want to align has some annoying feature which precludes the use of the above method. Some of these can be disposed of as follows:

A.G.C.—Receivers with vision A.G.C. need to have the control line tied down to a fixed negative value. This is simply done with the grid bias battery and control shown in Fig. 1 (b), which is of low enough impedance to nullify the effect of the control voltage. Since the A.G.C. voltage has a small effect on the input capacity of various valves, the alignment alters slightly with signal strength, and in fact this feature is sometimes used to provide automatic bandwidth control. It is therefore advisable to do the alignment with between 2 to 3 volts bias on the line rather than short it down and if possible to set the battery voltage to represent the general level of bias conditions in the area in which the set is used. Do this by running the set prior to alignment giving a normally contrasted picture, connect in the battery and resistor and adjust the latter to the same degree of contrast.

Dead Sets.—Receivers with extremely low gain, faulty coils, or where some thoughtful user has "tightened up all the little screws" need to be roughly tuned before the final alignment. Apply the vision carrier to point "X" in Fig. 2 at full strength, when a faint modulation should be observed. T3 secondary will not tune properly but the test will give an indication that the detector is working. Transfer to point Y, tune up T3, transfer to point 2, tune up T2, transfer to the mixer and tune up T1. The gain of each stage will be round about the same and any stage which does not tune correctly or which shows very little gain should be checked for faults. Adopt a similar procedure for the sound channel and then re-align as in "Method."



Note. If local oscillator beats LOW the higher frequency on the diagram is on the LEFT. If local oscillator beats HIGH the higher frequency on diagram is on the RIGHT

Fig. 3b.—Rejector plus channel spacings relative to vision I.F.

Double Peaks.—Sometimes two peaks can be obtained when tuning and the outer one is normally correct. If in doubt unscrew the core until the top is flush with the can and then tune it up, using the first peak you come upon.

Combined V.H.F. Receivers are relatively simple. Align the sound I.F.'s on TV for maximum as previously described, using the damping unit, as the strip is almost sure to be of the bandpass type. Switch to F.M. and check that the voltage across the limiting electrolytic is at a maximum. Then tune T6 sec. for minimum sound in the speaker. This should be quite a sharp adjustment and not far off the existing setting. On some models a small compensating condenser is fitted and this should be used to tune the sharp minimum in preference to the coil itself.

Extra Rejectors.—It has become common practice to fit adjacent vision and sound rejectors and these are adjusted in the same way as the sound rejectors and after the latter but before the vision I.F. strip is lined up. The upper adjacent sound rejector is set for minimum output on the vision meter (or tube) at a frequency 1.5 megacycles away from the vision carrier on the other side from the sound carrier, e.g., if vision I.F. is 10 Mc/s and sound I.F. 13.5 Mc/s the adjacent sound rejector is 8.5 Mc/s.

The adjacent vision rejector which is 1.5 Mc/s outside the sound carrier is treated in the same way. If there is no chance of any interference from a station on a lower channel on either band it can be tuned to assist in rejecting your own sound channel.

Words of Warning

Many sets have their coils sealed in wax and this must be loosened with a hot screwdriver before attempting to tune the core. Once loosened it is suggested that a drop of oil be introduced to stop the wax setting again.

Recent introductions to be found in many sets are dust cores with hexagonal holes instead of screwdriver slots. These need a special polythene "Allen key" to trim and the insertion of the usual "screwdriver-ended" knitting needles result in an ominous crack followed by the descent of small grey chips. One manufacturer keeps field engineers on their toes by using a mixture of both types.

The use of the wobbulator-scope method is not recommended unless many sets of the same type have to be aligned, as results are very misleading. It has been demonstrated that almost any response curve in the service manual can be produced by leaving the receiver under test severely alone and altering the knobs on the wobbulator and oscilloscope.

THE TELEVISION TUBE EXPLAINED.

(*Concluded from page 10*)

The deflection of the electron beam of a cathode ray tube is dependent on the magnitude of the current flowing in the deflector coils, and for electro-magnetic scanning it is necessary, as we have seen, to produce a saw-tooth current waveform. Now the deflector coil possesses inductance as well as resistance, and therefore when a saw-tooth effect is destroyed by distortion, and to correct this, the waveform must be such that when it is applied to the deflector coils the required saw-tooth form is produced. Now consider how the scanning spot is caused to scan the fluorescent screen by a combination of horizontal and vertical time-base systems. Commencing with the spot in the top left-hand corner of the tube, a saw-tooth waveform is applied to the horizontal deflector plates, with a frequency equal to the number of lines required per frame, multiplied by the number of frames per second.

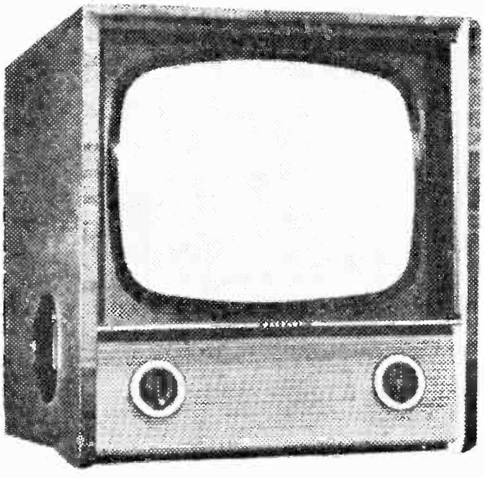
Now the image received on the end of a cathode ray tube is the counterpart of the pulses (line and frame synchronising) produced by the scanning system at the transmitting station. When received they control the scanning devices so that the spot on the frame of the received image is in precisely the same position as the picture element being scanner at the transmitter.

Buyers T.V. Guide

THE FIRST ARTICLE OF A SERIES REVIEWING THE LATEST SETS NOW AVAILABLE TO THE PUBLIC. WE SHALL COVER PRODUCTS OF EVERY MANUFACTURER. THIS MONTH WE DEAL WITH FERRANTI AND McMICHAEL RECEIVERS

Ferranti Model T1002

THIS 17in. model incorporates many advanced and unique features which will set a new high standard of viewing. It is housed in an attractive modern style cabinet finished in selected walnut veneers. The specification includes aluminised tube, automatic picture and



The Ferranti 17in. table model which costs 69 guineas.

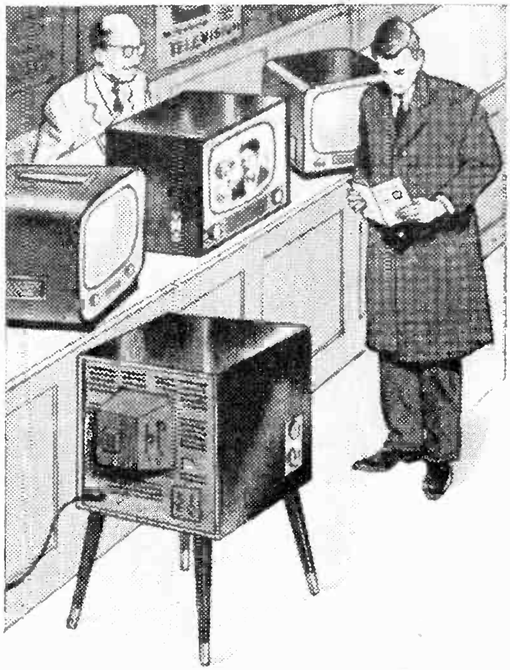
sound control, automatic bandwidth control, automatic picture interference inverter and a high-efficiency turret tuner. In addition, a high-grade speaker with an extended frequency response contributes to excellent sound reproduction.

Special Features.—Chassis of outstanding reliability with exceptional sensitivity.

Automatic interference inverter for the most effective interference reduction.

Turret tuning for easy, trouble-free tuning of all available programmes in Bands I and III.

Aluminised tube provides brighter pictures and sharper contrasts.

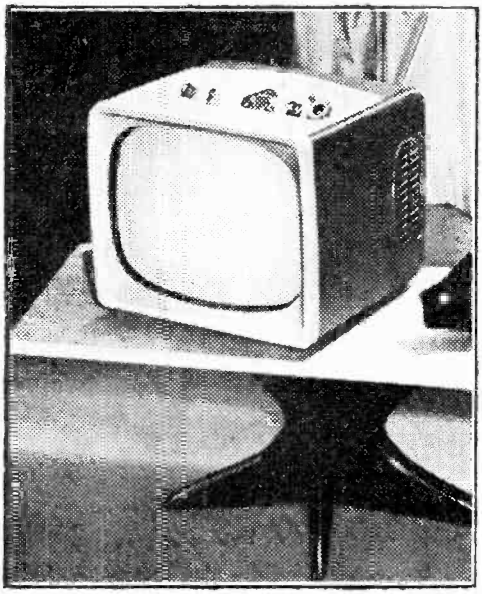


Attractive modern style cabinet finished in selected walnut veneers.

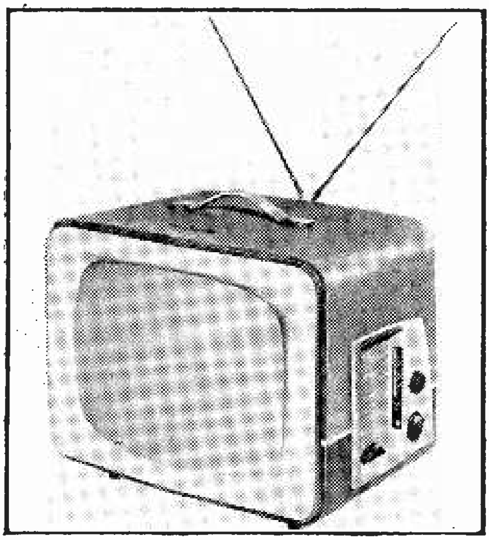
High-grade elliptical moving-coil speaker with a high flux magnet and an extended frequency response.

Circuit.—17 valve superhet receiver plus metal rectifier and crystal.

The input to the "cascode" R.F. stage is



The Ferranti transportable receiver with V.H.F. radio. It costs 59 guineas.



The McMichael 17in. portable receiver plus V.H.F. radio. It costs 66 guineas and aerial an additional 1 guinea.

designed to match an 80 ohm coaxial cable common to both Band I and III. A triode-pentode frequency-changer produces sound and vision I.F.'s of 38.15 Mc/s and 34.65 Mc/s respectively, the two signals each being amplified by a separate two-stage I.F. amplifier. The video amplifier is coupled to a cathode-follower output stage and a gating diode permits the black level to be sampled during the line blanking period, a further diode providing a proportional bias for vision A.G.C.

The cathode ray tube is cathode-modulated and is operated with an exceptionally well-regulated E.H.T. or approximately 16KV derived from the line fly-back. Frame fly-back suppression is provided to give increased latitude in the adjustment of viewing controls.

The vision interference limiter is of the "black spotter" type which can be adjusted to invert pulses which exceed the peak white level. Its bias is derived from the contrast control circuit in such a manner as to allow correct spot inversion at all normal settings of the contrast control without the need for re-adjustment.

Picture.—Aluminised tetrode cathode ray tube with ion trap gives brilliant high-definition pictures. A grey filter provides improved contrast under daylight viewing conditions.

Cabinet.—The attractive modern cabinet is of solid construction and beautifully finished in selected walnut veneers.

Speaker.—High-grade 8in. × 5 in. elliptical moving-coil speaker with a high flux magnet and an extended frequency response.

Mains Supply.—200-250 volts A.C. or D.C. Voltage adjustment on chassis must be set at installation to suit particular supply voltage.

Dimensions.—21in. high × 19in. wide × 22in. deep.

Ferranti Model TP1009 Transportable Television Receiver with V.H.F.

CHASSIS.—Vision and sound: Turret tuner embracing BBC and Commercial television stations as well as V.H.F. radio band. Input to the "cascode" R.F. stage designed to match an 80 ohm coaxial cable common to Bands I, II and III.

Vision: Two-stage I.F. amplifier followed by crystal detector, video amplifier and cathode follower output stage. Automatic picture control and self-adjusting interference limiter.

Sound: Two-stage I.F. amplifier followed by an A.M. sound detector and F.M. ratio detector. Automatic gain control and noise limiter.

Cathode Ray Tube.—14in. electrostatically-focused aluminised tetrode tube with ion trap and 90 deg. angle of deflection. Grey filter improves contrast under daylight conditions.

Mains Supply.—200-250 volts A.C. or D.C. Consumption: Approximately 150 watts.

Loudspeaker.—High-grade 7in. × 4in. elliptical moving-coil speaker with high flux magnet and extended frequency response.

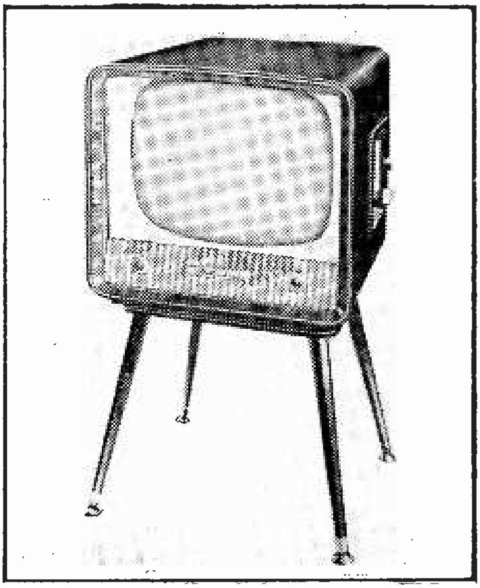
Aerial.—The high sensitivity of the receiver permits the use of an optional built-in telescopic aerial under many conditions where the directional properties of a more efficient aerial are not required. The V.H.F. radio input is via the TV aerial socket.

Case.—Press-formed in a lightweight material used in conjunction with plastic mouldings. In two-tone colour finish.

Overall Dimensions.—13 7/16in. high × 14¼in. wide × 16½in. deep. Weight.—33lb.

McMichael Model MP17

SPECIFICATION.—This is a 17in. fourteen channel transportable television receiver incorporating V.H.F./F.M. radio. A 90 deg.



The McMichael 17in. table model which costs 69 guineas.

Mullard electrostatic tube is employed and the valve and crystal diode types are all of Mullard manufacture.

Voltage range.—A.C. or D.C. 200/250 volts, adjustable in 10v. steps.

Aerial.—A special aerial is available consisting of a telescopic dipole (size extended approximately 31in.) for use in good signal areas of BBC/I.T.A. and F.M. sound stations. These arms are rotatable and can be adjusted to any position. An additional aerial socket will accept input from any standard aerial with 70 ohm coaxial lead.

Main controls.—These are housed in a recessed panel at the right-hand side of the cabinet, and are as follows:—

New 14 channel tuner providing for the reception of all 13 channels in use now and allocated for BBC or I.T.A. television. Channel 14 is for V.H.F./F.M. reception.

Four controls positioned vertically on the side of the control panel are: brightness, contrast, tone, volume.

The fine tuning control sited above the tuner also serves as a programme selector on V.H.F./F.M.

A separate fingertip on/off switch is provided below the speaker.

Preset controls.—These are readily accessible at the rear of the receiver.

Circuit features.—The new high-gain low-noise 14 channel tuner combines the advantage of a turret tuner with that of an incremental tuner. The F.M. band is in the 14th channel. I.F. rejectors form an integral part of the tuner and reduce the effects of I.F. interference. An efficient A.P.C. circuit is employed and the R.F. cascode stage has delayed A.P.C., giving an excellent signal-to-noise ratio on weak signals. The I.F. is 34.65 Mc/s (vision) and 38.15 (sound). The F.M. demodulation is achieved by ratio detector. During radio reception the television timebase and C.R. tube are out of circuit. The sound amplifier and output stage uses a PCL82 feeding a 7in. × 3½in. speaker.

The frame and line timebases are both multivibrators. An efficiency diode and flyback EHT is included in the line timebase. An efficient sound noise limiter is incorporated and the vision limiters can be preset to the desired level to suit local conditions.

New plated circuit techniques are employed for the first time in this country. Plated circuits, unlike conventional etched circuits, provide continuous conductive surfaces between the two sides of the panels. The conductors can therefore be shortened, the layout simplified and the use of cross-over or jumper wires eliminated. Greater flexibility in the insertion of components is also promoted. The laminated bases are specially treated for moisture resistance.

Picture tube.—The receiver has a Mullard 17in. auto-focus electrostatic tube with a 90 deg. deflection. An ion trap is incorporated.

McMichael Model M72T

THIS table model has a similar specification as the portable model MP17 with the exception that the speaker and controls are located in the front instead of the side.

HEATER-CATHODE TUBE SHORTS

(*Continued from page 18*)

extra stage. An artificial way of improving the highlights of the picture is to connect between cathode and earth of the tube a resistance of value of between 1 and 2K and to couple a capacitor value, say, .01 μF between the cathode of the phase inverter and the tube cathode.

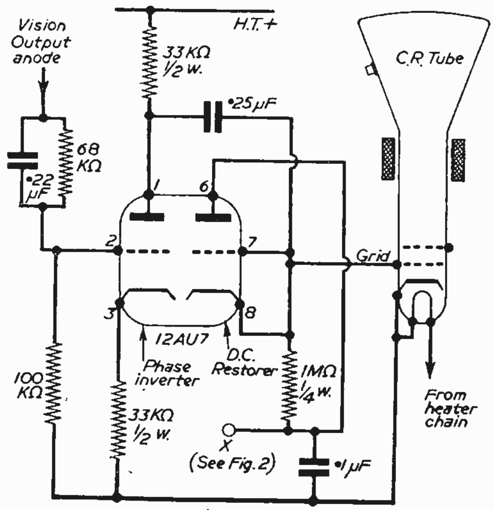


Fig. 5.—The phase inverter for grid modulation.

This addition will have little effect on tubes having a very low resistance between heater and cathode but in others will give rise to an apparent highlighting of sudden changes in picture level. In actual fact a differentiated pulse corresponding to the instantaneous change in picture level is fed to the cathode and produces, effectively, push-pull modulation to the tube.

It will be noted that a 12AU7 valve has been recommended. In practice a 12AT7 will serve equally well. Alternatively a single triode such as a 6C4 may be used for the inverter stage and a single diode—EA50—may be used for the D.C. restorer.

Whatever is used, however, in A.C./D.C. sets it must be remembered that the valve heaters to these extra stages must be connected in series with the existing set heater chain. The valves chosen for these extra changes, therefore, must have heater currents compatible with those already in use even though some series-paralleling of heaters may be necessary.

Final Circuits

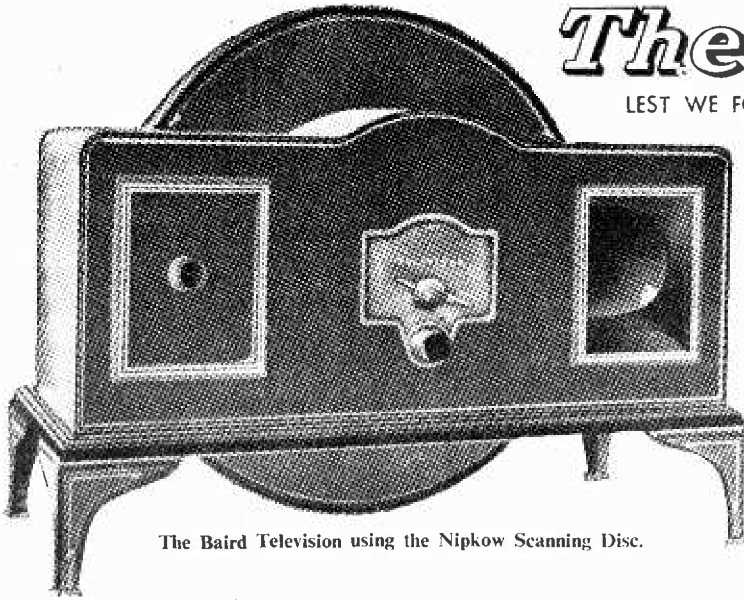
To complete the information on modifications, Fig. 4 gives the full circuit diagram of the first solution, showing the inclusion of the D.C. restorer. The second solution is a straightforward combination of circuits 2, 3 and 4.

To the reader with a box of spare parts bigger than his bank balance, either of these two solutions is more suitable than the use of a heater-to-cathode isolating transformer.

The Birth o

LEST WE FORGET! A SUMMARY OF DEVEL

by F. J



The Baird Television using the Nipkow Scanning Disc.

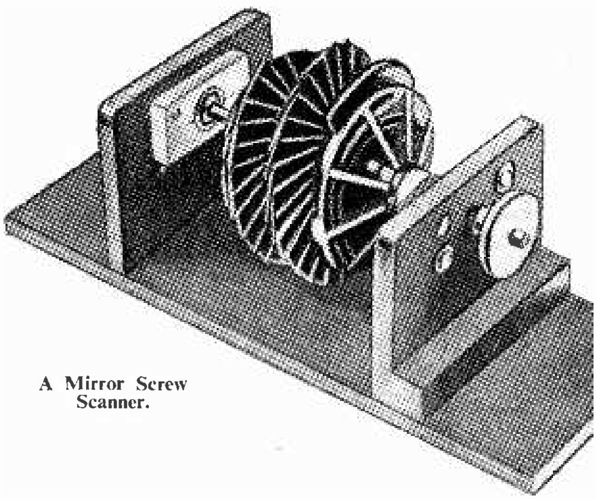
TELEVISION as a public service, if we include the early 30-line transmissions of Baird, is now over 25 years old. Television had hence arrived before many of the present generation were born, and to them it was an accepted part of our life, like the aeroplane, the telephone, radio, and the gramophone. They are thus unaware of the numerous experiments going back for over 80 years which finally led to the high-definition TV system in use today.

Selenium

It may come as a surprise to many to learn that the idea of television occurred in the 1870's, and it followed the discovery some years before that the element selenium is capable of exhibiting a remarkable sensitivity to light, and that its electrical resistance varies according to the amount of light which impinges upon it. This property is made use of in photo-electric exposure meters. It was in 1873 that Willoughby Smith, Chief Electrical Engineer of the Telegraph Construction Company, happened to use some rods of selenium to increase the resistance of some of his experimental electrical circuits. The results, however, were inaccurate and resistance varied from day to day. Closer investigation revealed that the changes in resistance were centred in the selenium rods, the resistance of which varied according to the intensity of the light to which they were exposed. They showed maximum resistance, or minimum conductivity, in the dark, and exactly the opposite when they were exposed to full sunlight. Thus was born the selenium cell, and the mysterious property was soon incorporated in a large number of photo-sensitive devices and numerous patents were taken out. There were many discussions and lectures in scientific circles and lecturers spoke of the possibility of "seeing by electricity."

The First Televisor

This fired the imagination of an experimenter named Carley, and he contrived a crude instrument based on selenium, which can truly be said to be the first televisor. Unfortunately, the instrument does not now exist, but its description has been handed down to us. It was undoubtedly successfully demonstrated. It could only deal with rough black and white silhouette designs, and its transmissions were by cable or land line, radio transmissions then being unknown. A description of Carley's instrument was published in 1880. It consisted of a blackboard surface about the size of a small drawing board and inset into its surface were rows of miniature selenium cells. The receiver consisted of another board, but instead of selenium cells, it was inset with corresponding rows of



A Mirror Screw Scanner.

small electric bulbs. Each selenium cell had its corresponding electric bulb on the receiver. It was battery-operated. When a shadow image was projected on to the cells, those with the highest light intensity decreased in resistance so that their corresponding lamps on the receiving panel glowed with maximum brilliance, and those cells which were the least illuminated caused their corresponding lamps to glow with the minimum illumination. Intermediate light intensities falling on the selenium cells set up corresponding glow lamp intensities on the receiver panel. The idea was, of course, no more than a laboratory experiment, but it sparked off developments amongst a number of highly qualified experimenters and towards the latter end of the last

# of Television

PMENTS WHICH LED TO MODERN TELEVISION

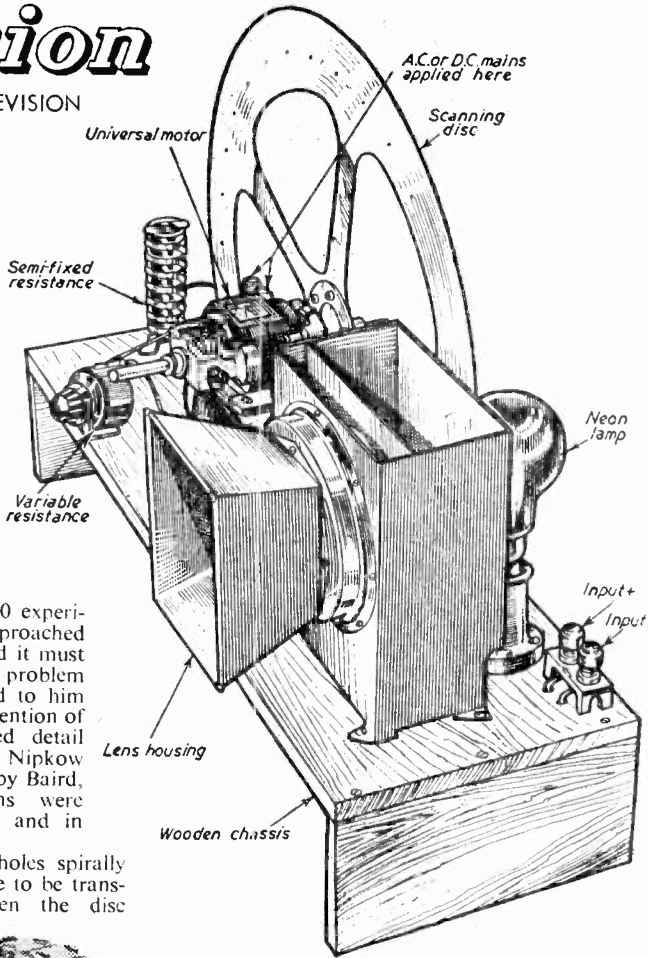
Camm

century many suggestions were made for television transmitters and receivers. The selenium cell, therefore, as far as vision is concerned, performed the same functions as the carbon microphone, the resistance of which varies according to the intensity of the sound which impinges upon it. The varying resistances of selenium were first discovered in 1873. Scientists soon made the disappointing discovery, however, that there is a marked difference between the problems of hearing and seeing. The Frenchmen, Rignoux and Fernerier in 1906 demonstrated a transmission system making use of 64 selenium cells and a similar number of electric light bulbs.

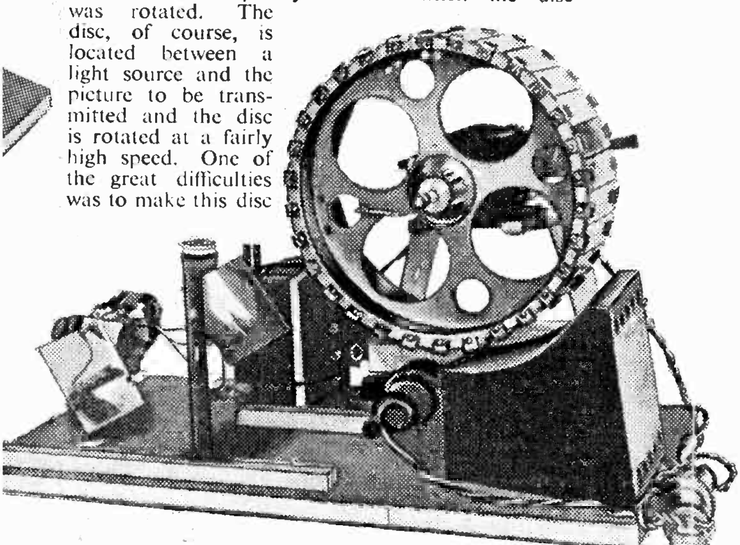
The Nipkow Disc

Some years passed between the 1870 experiments and then, in 1884, Paul Nipkow approached the problem from a different angle and it must be said that his new approach to the problem resulted in present day television, and to him must be given the real credit for the invention of it. Baird and others later introduced detail improvements. Making use of the Nipkow scanning disc, identical with that used by Baird, the first experimental transmissions were carried out by Baird, in this country and in New York, from 1927 to 1931.

His scanning disc had a series of holes spirally arranged in such a way that the picture to be transmitted was completely scanned when the disc was rotated. The disc, of course, is located between a light source and the picture to be transmitted and the disc is rotated at a fairly high speed. One of the great difficulties was to make this disc rotate at a constant speed. Baird achieved this object by producing his synchronising system, and it is for this that Baird should be mainly remembered. As the disc rotates, each light spot in succession flies across the picture. If the disc, for example, has 18 holes there will be 18 scanning paths quite close to one another. The scanning lines, of of course, will be slightly curved. The scanning disc thus splits the picture up into a number of small pieces, so to speak, which are arranged in their correct order on the viewing screen. Each picture element will emit a greater or lesser amount of light according to its composition. These variations, registered on a selenium cell, produce the illusion of the picture.



The elements of a Nipkow Disc Televisor, as marketed by Baird.



The Mirror Drum Scanner.

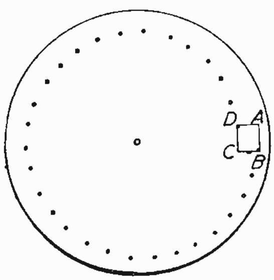
Other Scanning Systems

Much more complicated methods of scanning are employed to-day in the television studios but the principle remains the same. There have been hundreds of inventions for scanning systems, and of these perhaps the most common are: The Apertured Disc; The Lens Disc; The Prismatic Disc; The Apertured Drum; The Mirror Screw, and the Cathode Ray.

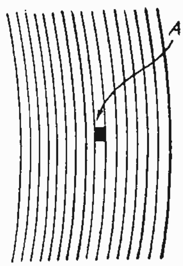
The Scanning Disc

The apertured Nipkow scanning disc is perhaps the simplest of them all. It consists of a thin flat disc, circular in shape with a single turn spiral of holes punched at regular intervals near the periphery, and is shown on page 27. As the disc revolves about its centre, concentric strips, which touch one another, are described by each hole. The disc in this form is suitable for vertical or horizontal scanning, and if we examine the area shown by A B C D in the diagram, it will be seen that each hole as it passes across the area describes a small arc of a circle, thus dissecting the area into the same number of strips as there are holes in the disc.

The actual scanning area is a factor of the disc diameter, hole size, number of holes, and the shape of the television picture, and simple formulae can be derived to enable anyone to mark out a scanning disc accurately. Usually the holes are square, but when a disc is made for a large number of scanning lines, then hexagonal holes are used. When using a disc for scanning a film at the transmitting end, the exploring is carried into effect by having a circle of holes instead of a spiral of holes and as the disc revolves the film is moved relative to it and the same effect produced as a stationary film or object with spiral exploration.



The holes in the disc form a light opening having an area embraced by the letters A B C D.



The complete area is subdivided into small light squares in this manner.

The Prismatic Disc

Another very interesting type of scanning disc is that invented by Jenkins, of America. It is called a prismatic disc. It is a disc of thick glass, the outer edge of which has been ground into the shape of a prism, the section varying gradually and continuously round the circumference so that at one point the base of the prism is outward, while diametrically opposite this point the base is inward. If a beam of light be directed through the edge of such a disc it will be bent in a certain direction, the angle at which the beam bends depending upon the angle of the prismatic section at that point. By superimposing a second disc over the first so that their overlapping edges revolve in directions at right angles to each other, a lateral as well as a vertical movement can be given to the light beam.

The Mirror Drum

While the lens and prismatic disc provide more intense illumination than the plain apertured disc, some form of drum scanning is preferable when it is desired to carry out experiments for projecting the television image on to a screen. One of the simplest arrangements for this purpose is the apertured drum. It consists of a hollow drum having a spiral of holes pierced through the side. It is possible to place the source of light inside the drum and, by revolving the drum at constant speed, each hole will pass across a definite light area and throw a beam on to a screen placed in any convenient position.

In another system the light from an arc lamp has its beam condensed by a lens on to a right-angled prism mounted inside the hollow drum. The beam of light is in this way bent at right-angles and made to cover a definite rectangular area. As the drum revolves, each aperture passes across this light field and the pencil of light emerging from the drum side can be focused on the subject or object that has to be televised.

If desired, lenses may be inserted in each drum aperture, and in this way the advantages mentioned for a lensed disc are secured. One development from the apertured drum is the belt scanner which has a thin strip of flexible material with holes punched in it diagonally from end to end. When the ends are joined together a belt is made, and this can be passed over two wheels or pulleys which drive the belt when they are caused to revolve through the medium of a motor coupled to one of them. The source of light is placed between the belt bands and observation made in the usual manner.

One of the most efficient methods which can be used for projecting television images on to a screen at the receiving end, or alternatively for governing light spot movement at the transmitting end, is to employ a mirror drum. A beam of light from the arc lamp is focused on to an inclined mirror, which in turn reflects it on the drum. Round the edge of this drum is a number of rectangular mirrors made from optically-tested glass. Each mirror is canted at a slightly different angle with reference to the drum axis when compared with its immediate neighbour, and in consequence if the drum is revolved the beam of light is reflected from each mirror in turn and made to move upwards until it comes outside the area focused on the drum from the bottom reflecting mirror.

In this way the drum causes the single light beam to create a number of strips of light, disposed side by side.

The Mirror Screw

One objection which is levelled at the ordinary mirror drum is its relatively bulky nature, and in consequence one idea which has been developed on the Continent to replace the mirror drum is called the mirror screw. One of the best ways of picturing this device is to recall a spiral staircase. Arms radiate from the centre, and on the end of each one of these arms is a reflecting device such as a mirror or thin piece of stainless steel.

As the "screw" revolves the reflecting surface at the end of each arm comes into any beam of light that may be focused on it.

A TV Pattern, Pulse and Square Wave Generator

FOR SETTING UP VERTICAL AND HORIZONTAL LINEARITY

By J. Hillman

Description

THIS instrument was designed primarily for setting up TV sets for vertical and horizontal linearity, and gives a series of vertical or horizontal straight lines, the number of which can be varied from one to a great number. It can also be used to provide square waves from 50 cps to 10 kcs and gives fairly good wave form thus enabling amplifiers of all types to be checked for distortion. The square wave can be changed to a pulse wave, either negative or positive being selected by means of a switch. The range of the pulse waves is greater than that of the square

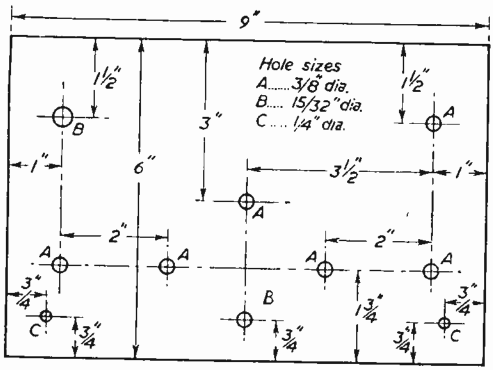


Fig. 1.—Drilling details for front panel.

waves being from 50 cps to 100 kcs. Unlike most pattern generators there is very little radiation of signal and even when the cover is removed and the instrument placed beside the TV set no pattern appears on the screen until the co-ax lead is connected from the generator to the set. The circuit consists of an electron coupled oscillator 6C4 which covers all the channels in Band I. This is modulated by means of a crystal diode with either a pulse or a square wave. The oscillator is a cathode coupled 12AT7 having a coarse frequency selector switch S2 and a fine frequency control VR2. With a high value of cathode resistance good square waves are produced and by operating S3 the bias resistor can be reduced to give pulse waves. Valve EF91 is used to reverse the phase of the wave to give either negative or positive waves. negative feedback being introduced to stabilise the valve. It will be noted that the instrument does not incorporate a power supply. The reason for this is that by using a separate power pack it is only necessary to have one power pack for several pieces of test gear, that is, gear that would not normally be used at the same time. However, there is no reason why the power supply shouldn't be fitted to the existing chassis if expense is of no importance, but in that case the chassis would need to be about an inch deeper than shown. It will be noted that extra smoothing is incorporated using C16 R16 and that the power requirements are 250 v. 17.5 mas H.T. and 6.3 v. 0.75 amps heater supply. Details of a suitable power pack will be given later.

Construction

First mark out the front panel as Figs. 1 and 2 then bend the ½in. edges at right-angles and cut the corners off the edges as shown in Fig. 2. Now drill the various holes as shown in Fig. 1 and proceed with the chassis. Mark off as in Fig. 3 and cut out as shown, then bend the two 6in. sides at right-angles and then the back side to form the chassis as in Fig. 4. Drill ⅛in. holes as shown in Fig. 4 and bolt the chassis together with two 6 B.A. bolts. Now place the chassis and front panel together and mark off the holes through the chassis on to the front panel and drill ⅛in. holes and secure with 6 B.A. bolts. Now make sure the front panel is at right-angles to the chassis and drill a hole each side ⅛in. through the edge of the front panel and on through the chassis side and secure with 6 B.A. bolts. Now mark out the holes as in Fig. 6 and drill and punch them out. The large square hole is to enable the tuning condenser vanes to clear the chassis as the condenser is mounted upside down. Next mark out and cut the top cover as Fig. 7 and bend the edges to form cover as Fig. 8, drill ⅛in. holes and use 6 B.A. bolts to secure it at the sides. Also drill ⅛in. holes about ¼in. from the edges two to a side for securing to front panel and chassis. Now make up the base cover as Fig. 5 and drill ⅛in. holes around its edges ¼in. in from the edge. Place the base cover in position and mark off one hole only then drill 3/32in. and secure with 6 B.A. self tap screw. Adjust cover to fit correctly and then drill another hole and secure in the same way. The rest of the holes can now

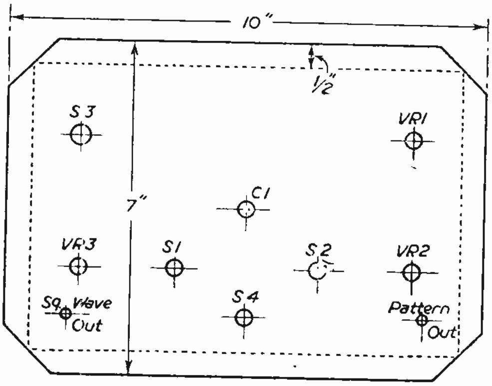


Fig. 2.—Layout of the front panel.

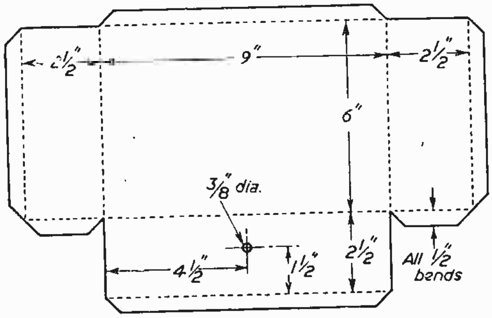


Fig. 3.—Measurement details of the chassis.

all be drilled and screws fitted. Similarly, the top cover is fitted using one screw only at first to ensure a good fit and then the second screw and then all the rest of the screws. Now remove the top and base covers and fit the various components to the front panel not forgetting to mount the tuning condenser upside down. The pots are mounted as follows: the VR1 is mounted so that its tags are downwards nearest the chassis and VR2 and VR3 are mounted so that their tags are horizontal, facing inwards towards the centre of the panel. Fig. 9 shows layout of major components.

Wiring

The coil is made by winding 14 turns of 16 tinned copper wire on a ⅜in. former and then slipping it off the former and separating the turns so that they are spaced about one diameter, the distance is not important at this stage as it will be altered later on. The R.F. choke is made up by winding 60 turns of 36 enamel wire on to a 1 watt 2.2 meg resistor, soldering the ends of the wire to the ends of the resistor. The coil is mounted direct on to the lugs of the tuning condenser, the one used being an ex-government 10C/3996 which has wide spaced vanes and is mounted on a ceramic base. R8 and R9 are mounted above the chassis and attached to S3. C17 is mounted close against the front panel between VR3 and S4. Condensers C9 to C14 are mounted direct on the switch S2, their other ends going to a wire soldered vertically from pin 6 of V2, the C9 being nearest to the pin 6 and C14 the farthest.

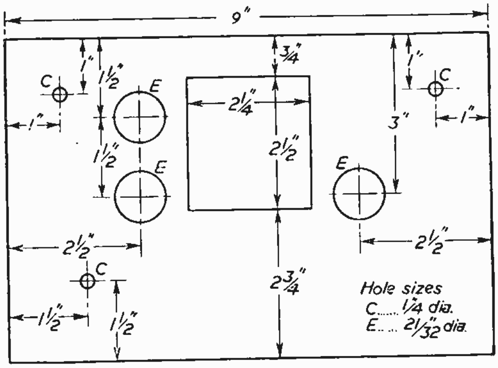
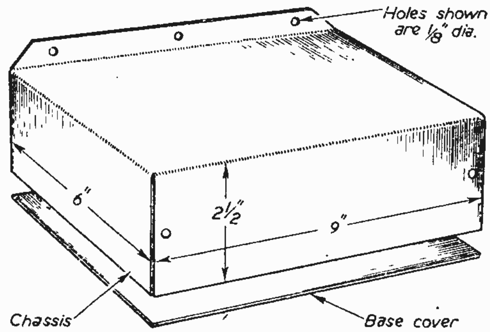


Fig. 6.—The chassis layout.

A seven-tag strip is mounted close to the edge of the square hole in the chassis and the power supply lead comes in through the back of the chassis and connects to three of the tags. C16 is mounted between this tag strip and the back of the chassis. One point to notice is that instead of using an R.F. choke in the heater lead of V1 a ferrite bead is used as this makes a more efficient choke at Band I frequencies. The germanium diode is mounted in the wiring as is the R.F.C. Condenser C15 is mounted direct to pin 1 of V2 and its other end is joined to junction of R11 R12. Wire up the heaters first using a 20 t.c. wire as an earth return for all under chassis wiring and keep it close to the chassis and nearest the square hole. The other heater wire runs close to the chassis around the outside of the valveholders and the tag strip. If the valveholders are placed exactly as shown in Fig. 9 no difficulty should be experienced in wiring correctly.

Testing

Having completed the wiring and checked it over leave out the valves and connect the power supply and check from the circuit diagram the



Figs. 4 & 5.—The chassis and the base plate.

pin voltages to ensure that the heater and H.T. supply goes to the correct pins of each valve. Now put in the valves and reconnect the supply and check the voltages which should be approximately as follows: V1 Pin 1 115 v.; V2 Pin 1 145 v.; Pin 6 170 v. with S3 in square wave position; V3 Pin 5 160 v.; Junction R15, R16 190 v.; input at R16 250 v. 17.5 mas. If an oscilloscope is available then connect Y input of scope to square wave output and check each range of S2 for a good square wave, using the direct input of the scope to ensure perfect reproduction of the wave. That is, using the scope without its internal Y amplifier. It will be found that the wave will have sloping tops and bottoms below about 100 cps., but from 100 up to about 10 k/cs the top and bottom of the wave will be horizontal with sharp edges where the verticals meet the horizontals. The two halves of the wave will not be quite the same length, but this is not important as the main portion of the wave is its edges which should remain perfect for perfect reproduction. Now switch to pulse and observe the wave, which should be spiky, this spike will be at the top in one position of S4 and at the bottom in the other position.

Next couple up a TV set with co-ax lead from its aerial socket to the pattern socket of the generator. Set S2 to range 5 and adjust VR2 until a whistle becomes audible then rotate C1 until a pattern appears on the screen of the TV set, this should consist of a number of horizontal lines. By adjusting VR2 the lines can be locked so that

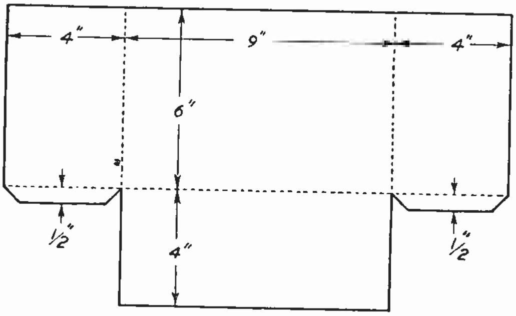


Fig. 7.—Method of marking out the top cover.

they are stationary and the number can be varied.

Now check that the tuning condenser covers all the channels by setting the turret tuner of the TV set to each channel in turn and tuning the generator until a pattern appears. If the channels do not appear spread out enough then bend the turns of L1 to widen the spaces between each turn until the channels are well spread out. As an indication of the sort of readings you will get the following is the calibration of the prototype: Channel 1 152

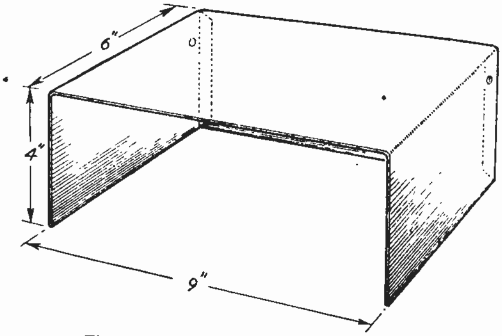


Fig. 8.—The top cover bent to shape.

to 124; Channel 2 118 to 95; Channel 3 95 to 72; Channel 4 72 to 46; Channel 5 50 to 16. Should the tuning condenser not cover all the channels then coil L1 can be altered by either widening or narrowing the space between the turns. The tuning knob is marked 0 to 180 degrees.

Use

To check a TV set proceed as follows: first couple up the aerial socket of the TV set to the pattern output socket of the generator. Switch on both TV set and generator and allow them to warm up. Set S2 to range 5 and rotate tuning knob of C1 until some sort of pattern appears on the screen of the TV set. Now adjust VR2 until steady horizontal lines appear, S1 being set to pattern position. Use the number of lines that enable you to check the distance between them which should be the same both top and bottom

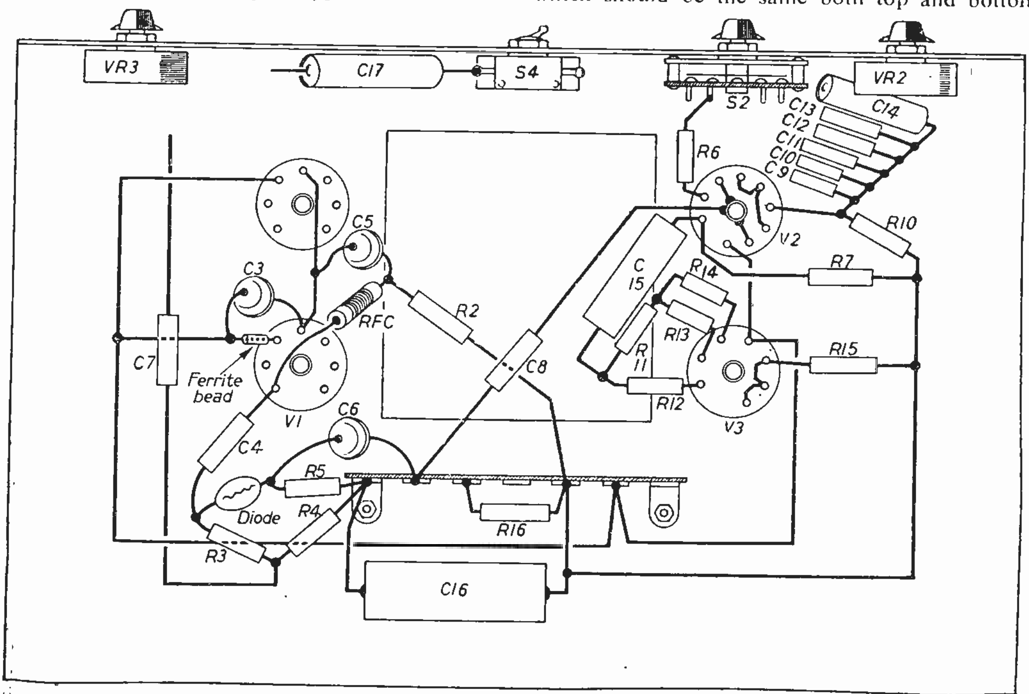


Fig. 9.—Wiring details of the generator.

for perfect linearity of frame time-base. If the lines are not spaced the same distance apart then use the linearity controls of the set to get the lines equally spaced. Now switch to range 2 and adjust VR2 to give steady vertical lines which

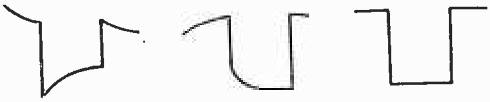


Fig. 11 (left).—Waveform shows poor L.F. response.
Fig. 12 (centre).—Waveform shows poor H.F. response.
Fig. 13 (right).—Perfect waveform.

should be spaced evenly. If the lines are not spaced evenly then use the linearity controls of the line time-base to correct them. In all these tests the contrast control of the set is set at maximum and VR1 is usually set near maximum. By using S3 and S4 either double lines or single lines will appear. but it is usually easier to check the linearity with single lines.

When testing amplifier circuits the switches S1, S3 are put to square wave position and the output taken from the socket marked square wave. Amplifiers will vary in their reproduction of the square wave and if they have poor L.F. response the wave will appear as Fig. 11 whilst for poor H.F. response the wave will appear as Fig. 12. For perfect reproduction the wave will appear as Fig. 13. By varying the frequency of the square wave using VR2 and S2 the range of reproduction of the amplifier can be checked. This applies equally to video amplifiers of TV sets. For those not possessing an oscilloscope the square wave generator can still be used for checking radio sets as quite an audible signal can be obtained from it and by injecting this from the square wave output socket to the set either TV or radio audio stages can be checked. It can also be used to supply bridges.

The approximate ranges of S2 are as follows: range 1, 25 k/cs to 100 k/cs; range 2, 4.5 k/cs to 60 k/cs; range 3, 1.2 k/cs to 30 k/cs; range 4, 100 cps. to 9 k/cs; range 5, 60 cps. to 6 k/cs; range 6, 50 cps. to 2 k/cs.

LIST OF COMPONENTS

R1—22k	C1—30 pfd. tuning
R2—10k	C2—47 pfd ceramic
R3—22k	C3—.005 ceramic
R4—1k	C4—.005 ceramic
R5—22k	C5—.005 ceramic
R6—1k	C6—.001 ceramic
R7—22k	C7—.005 ceramic
R8—470	C8—500 pfd ceramic
R9—2.2k	C9—10 pfd ceramic
R10—22k	C10—100 pfd ceramic
R11—1 meg.	C11—500 pfd ceramic
R12—1k	C12—.005 ceramic
R13—220	C13—.01 ceramic
R14—4.7k	C14—.05 tubular
R15—4.7k	C15—.1 tubular
R16—3.3k, 1 watt	C16—8 mfd, 450 v.
VR1—50k carbon pot.	C17—.1 tubular
VR2—500k carbon pot.	
VR3—25k carbon pot.	

RFC 60 turns 36 enamel wound on 1 watt 2.2 meg. resistor
L1—14 turns 16 tinned copper ⅜in. diam. former tapped 4 turns from earth end and spaced
V1—6C4
V2—12AT7
V3—EF91
S1—S.P. 2-way wavechange switch
S2—1 pole 6-way wavechange switch
S3, S4—S.P.D.T. toggle switches
3 wander plugs 1 B9 valveholder 1 Ferrite bead
2 B7G valveholders 2 co-ax sockets 1 7-tag strip

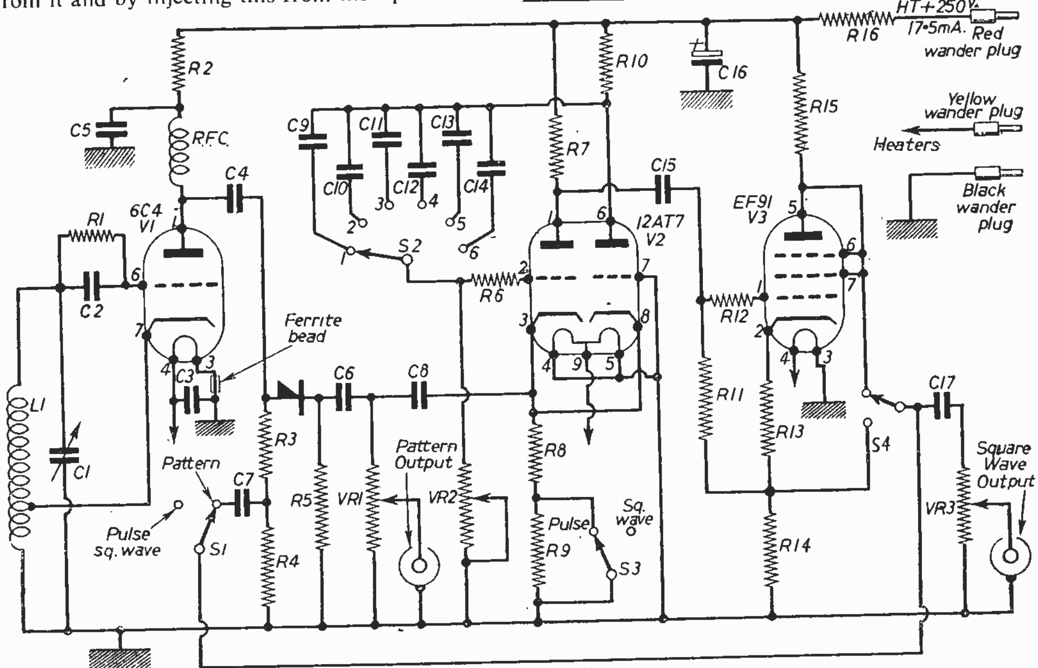
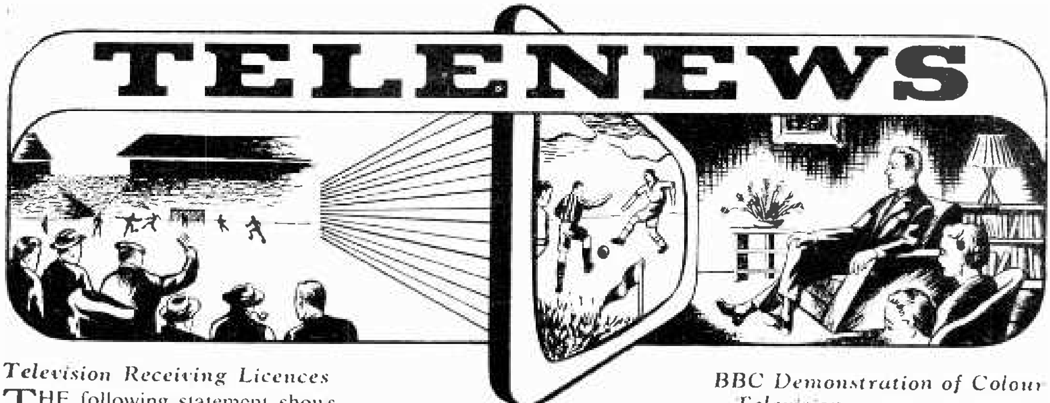


Fig. 10.—The circuit diagram.



Television Receiving Licences

THE following statement shows the approximate number of Television Receiving Licences in force at the end of May, 1958, in respect of receiving stations situated within the various Postal Regions of England, Wales, Scotland and Northern Ireland.

Region	*Total*
London Postal	1,589,325
Home Counties	1,012,771
Midland	1,315,928
North Eastern	1,320,751
North Western	1,147,507
South Western	637,644
Wales and Border Counties ...	473,928
Total England and Wales ...	7,497,854
Scotland	615,435
Northern Ireland	87,809
Grand Total	8,201,098

Price Reduction

COSSOR Radio and Television Limited announce that Models 939 and 942 17in. Television Consoles are now price decontrolled.

Limited stocks of both models are still available. Further orders will be dealt with in strict rotation whilst stocks last.

Also Philips Electrical Limited announce that the prices of their 1757U. console television receiver and 653A. radiogram are decontrolled forthwith.

TV Sales Boom in Australia

RETAIL sales of electrical goods in Australia rose to £124 million in 1957, an increase of 17 per cent. in twelve months. This is revealed in a census by the Commonwealth Bureau of Census and Statistics.

The increase was largely due to sales of television receivers in Victoria and New South Wales.

Latest returns show that 220,221 television licences were in force in Australia on March 31. Of these 114,097 were in Victoria, 106,085 in New South Wales and 39 in Tasmania.

Production of television sets jumped from 49,010 in 1956 to 208,360 last year.

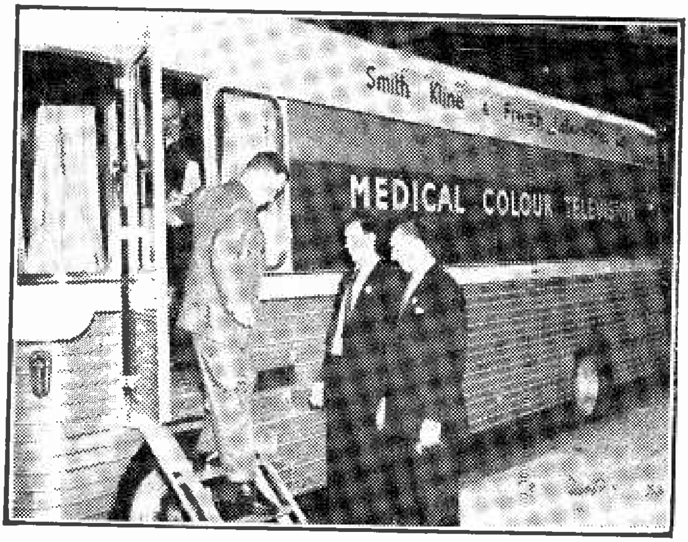
Colour Television Unit

IN June this year the first Mobile Medical Colour Television Unit of its kind to be designed and manufactured in Great Britain was officially handed over by the manufacturers, Marconi's Wireless Telegraph Co. Ltd., to its owners, Smith Kline & French Laboratories Ltd. For complete details see next month's issue.

BBC Demonstration of Colour Television

AMONG more than 70 exhibits shown to members of the Institution of Electrical Engineers and their guests at the conversazione held by the Institution at the Royal Festival Hall on Wednesday, June 25, was a demonstration of colour television on a closed circuit arranged by the BBC. Guests were interviewed by Miss Sylvia Peters and the pictures were seen on five colour receivers distributed about the Festival Hall. Between the interviews colour slides were displayed.

The colour television equipment was some of that used by the BBC in their colour television studio at Alexandra Palace for the recent series of experimental transmissions. The colour camera used at the Festival Hall was manu-



Mr. R. Pfizenmaier, managing director of Smith Kline & French, descending from the colour television vehicle.

factured by Marconi's Wireless Telegraph Company Limited, the colour receivers by Murphy Radio Ltd., and the slide scanner by the BBC.

ITV's Share

INDEPENDENT Television's share of the total time spent viewing television in homes with a choice of BBC and ITV programmes continued to increase during May, reports Television Audience Measurement Limited. It reached 71 per cent., one per cent. more than the April figure, and four per cent. higher than in March.

ITV's share in BBC/ITV homes in each ITV area was: London 71 per cent.; Midlands 78 per cent.; Northern 73 per cent.; Scottish 71 per cent; South Wales and the West of England 63 per cent.

"A Beginner's Guide to Television"

OUR recently concluded series of articles entitled "A Beginner's Guide to Television" has just been published in book form at 7s. 6d. or 8s. 3d. by post, from the Book Department, George Newnes Ltd., Tower House, Southampton Street, Strand, W.C.2. The edition is limited and early application for copies should be made.

Tyne Tees Television Appoint Managing Director

TYNE TEES TELEVISION LIMITED announce the appointment as Managing Director of Mr. Anthony Jelly.

Mr. Jelly was Associated Television's first Sales Manager, afterwards their Assistant Sales Director, and at 35 he became the youngest Sales Director of any contracting company when in January, 1957, he left to join Scottish Television in this capacity. With James Coltart, S.T.V.'s Managing Director, he was responsible for setting up operations in the Theatre Royal, Glasgow, from the outset.

ITV Progress in TWW Area

A MID-APRIL survey of the TWW area carried out by Television Audience Measurement Limited (TAM) showed that 295,000 homes in the area could receive ITV programmes, an increase of no less than 39,000 since the TAM mid-March survey.

Parallel with the steady growth in ITV homes, there was a marked rise in the number of homes with good reception of ITV programmes—from 206,000 in mid-March to 243,000 in mid-April. Over the same period the number of Band III homes still unable to receive ITV fell sharply from 104,000 to 88,000.

Commercial TV and Free Trade Area

TO be fully successful, all European Free Trade countries must make the best use of commercial television, the most effective advertising medium of all, the Earl of Bessborough, President of the European-Atlantic Group and a director of Associated Television, said recently.

He was addressing an audience of distinguished visitors to the European Television Exhibition, Park Lane, London.

Lord Bessborough said: "We know that television in the United States and in Canada and now in the United Kingdom is indispensable in all major marketing campaigns. We know also that Germany, Italy and Portugal have gone ahead with their own forms of commercial television and that Finland, a newcomer to the medium, has planned its television service dividing the time between sponsored and government programmes.

New Scan Coil

DIRECT TV REPLACEMENTS of 138, Lewisham Way, New Cross, S.E.14, announce a new scan coil, suitable as a "Direct" replacement in Ferranti Models 14T2 and 1225. Primarily designed for use by a large rental organisation the coil has been subjected to extensive chassis test before being released. Of castellated Ferrox-core construction it requires no electrical or mechanical modifications. The retail price of the unit is 50s.

Noisy Switches

NOISY switches on turret tuners are becoming a major problem for the service engineer, particularly when the sets are subject to a maintenance or rental contract. Cleaning the contacts with normal switch cleaner fluids acts as a temporary remedy but engineers report that this usually lasts for only a short period, after which the fault recurs.

Direct TV Replacements, 138, Lewisham Way, New Cross, S.E.14, have discussed this problem with one of the largest tuner units manufacturers and they state that only M.S.4 (Silicone) Grease should be used on tuner units. Knowing silicone grease to have good insulation properties, this matter was taken up with Midland Silicone. They strongly recommend the use of M.S.4 on all wave change and tuner unit contacts.

Carbon Resistors

IN recent years manufacturers of resistors have upgraded the rating of all resistors; the ¼ w. resistor is now ½ w. and now there is in fact no ¼ w. resistor.

However, some designers and writers appear to be ignorant of these facts. Similarly the old ½ w. rating is 1 w., 1 w. are 1½ w., 2 w. are 3 w. ¼ and ½ w. are advertised for sale in response to demand, but only ½ *w. are supplied.*

Approximate length of resistors will indicate wattage 10 mm., ½ w.; 20 mm., 1 w.; 40 mm., 1½ w.; 50 mm., 3 w.; diameter can be ignored.

Russian Industrial Television

THE Leningrad Television Research Institute is reported to have produced a television unit for use in industry in badly-lit places such as smelting shops and rolling mills. The unit consists of a transmitting camera with a range of about 500 yards, a receiving set, manual control apparatus and a supply unit. A distinct picture is claimed for the unit as a result of the high sensitivity of the transmitting tube.

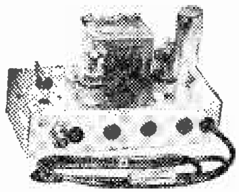
New Plessey Executive Director

MR. ANDREW M. BROWN, M.A., Ph.D., has been appointed an Executive Director of The Plessey Company Limited, with special responsibilities as Personnel Co-ordinator. He joins Plessey from the Mars Group of Companies, where, since 1952, he has been Executive Director (Administration and Personnel).

TRS

Our specialist buying knowledge and reputation ensure a square deal . . . and enable us to

offer the best for your money!



BAND 3 T/V CONVERTER—180 Mc/s-205 Mc/s

Suitable for London, Birmingham, Northern, Scottish and Welsh ITA Transmissions.

Mk. 2 Model as illustrated. Latest Cascode circuit using ECC84 and EF80 valves giving improved sensitivity (+ 18 db) over standard circuits. Built-in Power supply AC 200-250 v. Dimensions only 6½in. x 3in. Ht. 4in. Simple and easy to fit—only external plug in connections. wired, aligned and tested ready for use. State Channel required. Guar. Bargain Offer—good results or full refund, only £3.19.6. Carr. & Pack. 2/6. Band 1, Band 3 Change-over Switch and B.B.C. aerial socket, 8/- extra.

CONVERTER ACCESSORIES

Band 1-Band 3 Cross-over Unit, 7/6. Var. Attenuators 6db-36db., 7/6. BBC Pattern Filter, 8/6. Band 3 Aerials—outside Single Dipole with 4 yds. co-ax., etc., 13/9. 3 Element Beam, 27/6. 5 Element, 35/-, etc.

Volume Controls

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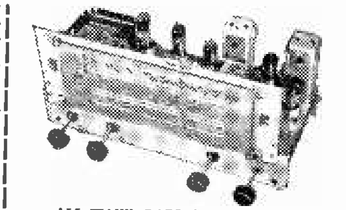

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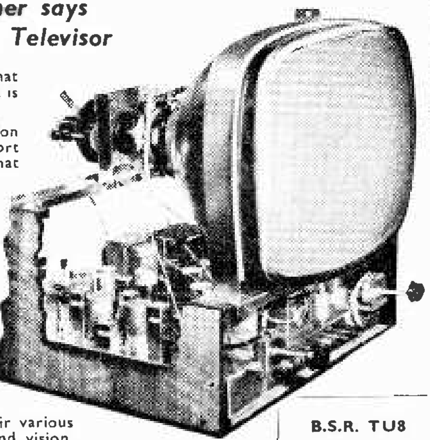

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TELEVISION PICK-UPS AND REFLECTIONS

By Iconos

Television Studios of the Future

WHAT is the ideal shape and size for a television studio? The BBC has made up its mind, so far as the White City Television Centre is concerned, by building a number of stages 70ft. × 50ft. × 33ft. high, for "general purposes," with 100ft. × 80ft. × 44ft. high, for dramatic and spectacular shows. It is significant, however, that at least one of the large stages will be built so that it can be readily converted into two smaller studios, if required. And now, many of the I.T.A. chief engineers are planning ahead, working out the shape of their future stages as they survey the cramped operation of some of their somewhat makeshift existing facilities. Naturally, expansion has followed success—and now long-term planning of specially designed premises must follow the use of expedients.

Site Values

UP to now, most of the I.T.A. companies followed the lead of the BBC in converting existing buildings—ex-music halls, theatres, cinemas, chapels or warehouses. The dimensions of the studio stages and their adjacent service rooms — offices, dressing rooms, workshops, control rooms—have largely been a matter of luck. Time has been a big factor, too, because not many months elapse between the signing of a programme companies' contract with the I.T.A. and the opening of the station, during which period plans have to be drawn up and passed by the authorities, premises to be modified and equipment to be installed. Programme companies also value the site location, which is of enormous publicity value if it is in the centre of a city. Scottish Television's conversion of the Theatre Royal, Glasgow, is a good example of theatre modification, enabling a first-class public relations job to be done, both for keeping the name of the organisation well in the public eye and for enabling audience participation programmes to be carried out in the best possible manner. Wood Green Empire, London, A-TV's main studio of this type, is also favoured with reasonable facilities and space for workshops and scene docks, though I have always been puzzled at the decision to dispose of the original pleasant theatre frontage on the High Road, Wood Green.

New Buildings

GRANADA were lucky in Manchester in finding a fine central site on which to build new premises, with plenty of space for expansion. This foresight is now paying off.

Granada's original main stage was 65ft. × 48ft. and their new one is 60ft. × 76ft. × 37ft. high. Other I.T.A. companies, riding the waves of success, are already considering expansion on a large scale and are feeling the restrictions imposed by their converted premises. T.W.W.'s decision to build new at Cardiff, and to build a very large stage on a site which allowed for future expansion, was a good one. Here, the main stage is 60ft. × 80ft. with a clearance height to the lighting grid of 19ft. This seems low, but in practice is entirely satisfactory and economical to operate for lighting. It also fulfils the requirement of a "general purpose" studio of ample space for a large number of small sets on one stage. I hear that Tyne Tees Television at Newcastle-on-Tyne are planning two stages, each 65ft. × 75ft., together with a small presentation studio—all in brand new buildings. Southern Television, at Southampton, have converted a cinema into a main 50ft. × 65ft. studio and an interview studio with an area of 600 sq. ft., but much of the building work is new and there is plenty of adjacent land for expansion.

It is a curious fact that the building of new studio premises, if economically carried out, is not very much more expensive than modifying existing buildings. New television studio buildings enable full advantage to be taken of the latest time and labour-saving devices for lighting, camera operation and production control. By comparison, the traditional fittings and fixtures of the theatre or the film studio appear to be almost prehistoric! The new television stages now coming along will owe little to the one-direction mechanics of the theatre or to the heavyweight lamps and restrictive practices of the film studio.

"As the Twig is Bent"

A-TV's play *As the Twig is Bent* could scarcely be called a cheerful subject. The steady downward path of a juvenile delinquent, influenced either by environment or heredity, was the basic theme of Ivor Novello's play *Downhill* and of the Rex Harrison film *Rake's Progress*, but the downbeat atmosphere of these subjects was relieved by the charm of the principal actor and by occasional comedy. Barbara Couper's play *As the Twig is Bent* did not have these advantages and yet, surprisingly, held the attention of viewers. With a rather documentary approach to the development of the story, producer Lionel Harris presented the principal character, Chris, in such an unsympathetic light that one wondered at the dumbness of the other characters in the story in ever believing in his integrity. Brian Bedford played this role with great brilliance, as did Margot van der Burgh in the part of his long-suffering mother. Smoothly directed and with fine production values, it steadily moved towards the inevitable end—prison for the son and suicide for the mother.

Television Films

THE number of films specially made in England for television is on the increase, and one authority has claimed that no less than £8,000,000 will be spent on them this year. A large proportion of this huge sum is accounted for by several joint Anglo-American serial films, in which American television film companies have a large investment. These include *Ivanhoe*, and *The Tales of Frankenstein*, in which Screen Gems Inc. are participating, *Dial* 999, which is partly financed by ZIV, *Glencannon* for Gross and Krasne Inc., *Robin Hood* and *Four Just Men* by Sapphire Films and *William Tell* by I.T.P.C. All of these film series will be shown on major American networks, in addition to being shown either by the BBC or I.T.A. As the average cost per 24-minute episode is about £9,000, it would not be possible to recoup this amount in Britain alone—which rarely pays more than £2,000 per episode.

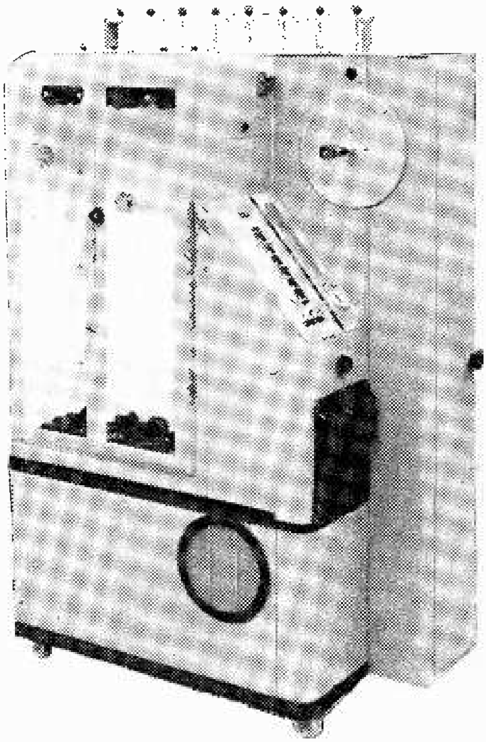
Next year, I am told, the output of British-made television films will be even greater, with dozens of studio stages devoted to this new form of "quickie." Some of the older studios for feature films which were turned over to other work, such as the Teddington Studios, may come back into the films—for television purposes only. Teddington, at one time used by Warner Brothers, but it has for many years been used as an aircraft factory. It has two large stages, 123ft. × 70ft. and 130ft. × 80ft. with adequate workshops and ancillary buildings.

Special Negative

KODAK LTD. and other film stock manufacturers are making special 16mm. negative with much greater accuracy in the perferations. Experiments are going ahead with lacquering the negative film so that it can be handled more easily for editing purposes without getting damaged. And there is every possibility that a special heavy-duty 16mm. projector will be manufactured, for use with Vidicon telecine machines, to replace the light-weight amateur type projectors now in use. In this way, good quality 16mm. films should be able to be made at a cost of about £1 per minute for film stock and processing, including the cost of magnetic striping on the film. This will certainly be a boon to the regional stations of both BBC and ITA.

Reduction Prints

ALMOST all the big television series or serial films are photographed on 35mm. film, from which are made optical reduction prints in the 16mm. gauge. This is essential in U.S.A., where a large proportion of the 250 or so television stations are equipped only with 16mm. telecine machines. Local newsreel or magazine items, on the other hand, are photographed on 16mm. film, processed at the television studio in a small automatic developing machine and televised in negative form, a positive picture being obtained by phase reversal. This system is used here by both BBC and Independent Television News, and is likely to be extended to other features if improvements in equipment and techniques now being worked out prove successful. Technical Cinematographical Requirements Ltd. "Lawley Junior" automatic 16mm. or 35mm. film processors are now in action at the BBC, I.T.-News and various programme companies.



The Technical Cinematographic Requirements Ltd. "Lawley Junior" Film Processor.

Farce and Satire

PRIVATE'S PROGRESS and *Brothers In Law* were so successful in the cinemas that it is not surprising that the same formulæ have inspired quite a few television plays. Granada's *The Army Game* must be one of the most successful series that this go-ahead organisation have turned out, having obtained top ratings from the public opinion polls week after week. During the process of adapting it to the television medium, it has lost some of the satirical touches and decended into the light-headed regions of farce without losing its appeal. With the BBC play *Touch Wood*, descent to farce was avoided, but the mixture was none the less highly acceptable. This was the story of an unfortunate young serviceman whose blunders in the Army and on being demobbed lead to tremendous complications of nation-wide importance.

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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).

MORE FOR THE BEGINNER?

SIR,—Could you not publish more articles for the beginner? I know that you have published such articles in the past, but I am sure you are aware of the fact that newcomers enter the field every year, and that it is necessary to some extent to go over the same old ground—as the gardening papers do. A feature of your paper which I find most interesting is "Your Problems Solved" pages. I regularly cut these out each month, classify them according to make and stick them into a book. I work for a radio and TV dealer and am often able from this source of information to remedy troubles which have baffled the dealer, and he is quite hot stuff. My book of cuttings is in constant demand.—P. B. (Westerham).

SPECIAL NOTE

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

TROUBLE WITH A PROJECTION RECEIVER

SIR,—After my Philips 1400A projection receiver had been operating for about an hour or so, the picture began to deteriorate and focus control required frequent adjustment until the tube finally blacked out. After about 10 minutes' rest, the picture reappeared normally, and then started to fade out again. The EHT amplifier valve and video amplifier were renewed. The tube no longer blacked out but the picture was not very strong and showed three or four diagonal lines at times. Brightness control was fully retarded and if advanced the picture disappeared. Contrast control also could only be slightly advanced. Focus control had to be almost fully advanced and when the television cameras switched the strength of the picture altered giving two different qualities of picture, one fairly good and the other faint and misty. When a voltmeter was applied between the grid of the tube and earth the picture became normal and there was plenty of adjustment on all controls. The set is now operating satisfactorily with a 100,000 ohm resistor connected in place of the voltmeter. Sound is perfect with no hum or interference.—D. F. (Glasgow).

FAULT WITH THE T161

SIR,—Your diagnosis of the trouble with my T161 proved correct. I have fitted an isolating transformer as you suggested and the picture is now perfect. Prior to writing to you, I had not thought to look to the tube heater which had a separate winding on the filament transformer and this had led me into a sense of false security. I should like to add that I was only able to obtain service information through one of your advertisers, a request for a theoretical circuit from Messrs. Ekco having been turned down flat with the suggestion that I took the set to a service agent. Would it not be possible through your columns to list firms who refuse to supply this very necessary diagram, so that the public may be warned before purchasing a new receiver? Some firms do supply this information without quibble and these firms should be patronised to the detriment of others who do not. Good wishes to your practical journals.—C. B. C. (Pinner).

A VISION ABOUT TELEVISION

SIR,—I read in my local paper that a local man had invented a brand new system of colour television which he claimed was revolutionary. So I went along for a demonstration. A weird contraption was generating a smoky gas on which the inventor claimed a picture would appear. He said the receiver did not always work as it was only in the experimental stages. Needless to say, a picture did not appear. I asked him how he had arrived at this weird device, and he informed me in all seriousness that as a spiritualist he had been informed that he was sent to produce colour television and his "guide" had told him to persevere with the experiments and he would become more famous than Baird! Aren't there some crazy people in this world? The line of demarcation between sanity and lunacy must be a very fine one in such cases as that quoted. I suggested to him that he was either a conceited humbug or a borderline case. I wrote to my local paper, asking them, not, in future, to publish such tosh and giving the editor the facts.—D. C. (Orpington).

TV ON TAPE

SIR,—Several years ago you defied the critics, who said that recorded TV was impossible, except by film, by stating that it was possible to record on wax and on tape. You have seen both your prophecies come true. The Ampex system now being introduced over here to record both sound and vision on tape is the justification for your belief, and it should go a long way to cheapen programme production. Artistes will be able to record at their leisure. It will dispense largely with telecine and repeat performances can be given without the personal appearance of the cast.

Whilst I am writing, I should like to congratulate you upon the high standard you have set in your journal. It not only gives us the gen on servicing which the manufacturers refuse to supply, but your technical articles are written for all to understand. News of new developments always appear first in your journal and I for one should like to see it published as a weekly.

I have all the pre-war issues of PRACTICAL TELEVISION.—B. O. (Plymouth).

News From the Trade

The New "Vantenna"

THE "Vantenna" All-band Room Aerial has been designed to satisfy every possible requirement for a high quality all-band room aerial at a remarkably low price (25s. retail). It is intended for use in good signal areas which are free from interference. It will stand on top of a television receiver or hang on the wall as required. It is the ideal "second aerial"—enabling the television receiver to be used in any room.

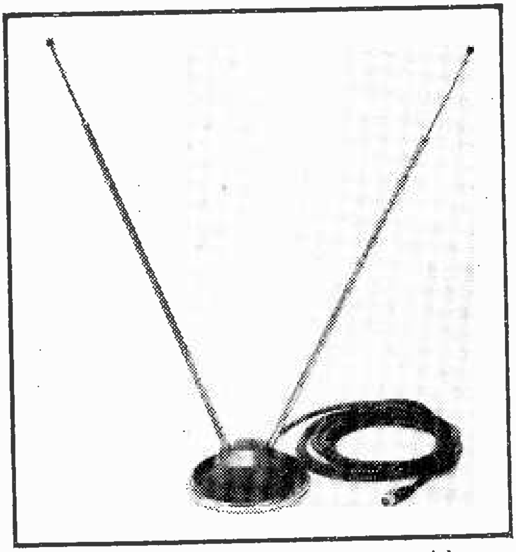
A special feature of this new aerial is the capacity coupling provided by high grade silvered mica capacitors in each lead which give complete anti-shock protection enabling the aerial to be handled in complete safety with the receiver switched on.

The "Vantenna" is well designed, soundly constructed and superbly finished. It can be used as a "Vee" or as a straight dipole (vertical or horizontal), the wide range of adjustment providing exceptional performance on all channels is achieved by specially designed spring loaded ball-joints giving a 90 deg. cone of rotation to each rod. The high impact Polystyrene moulding is black and mounted on a heavy casting with a highly polished copper rim. The twin telescopic rods have a bright copper anodised finish and black tip protectors to match the base. The adequate weight of the base together with the rubber/cork composition non-slip friction pad prevents the aerial from slipping, toppling or scratching when placed on a polished surface.

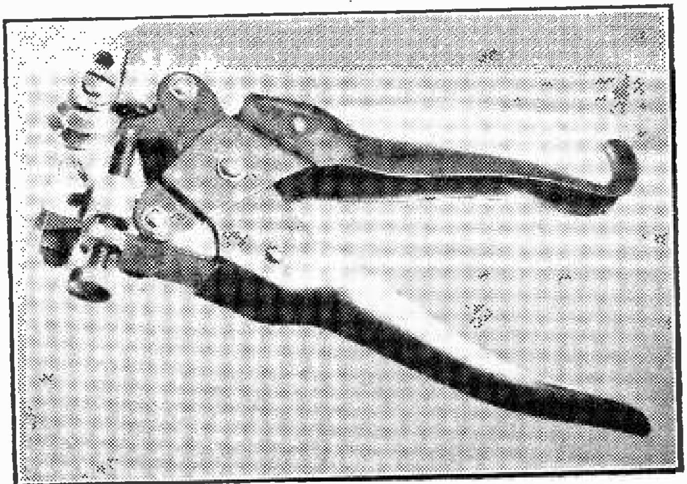
Two alternative "key hole" positions are provided on the underside of the base to enable the aerial to be hung on the wall as a "Vee" or as a straight dipole for vertically or horizontally polarised signals.

A 10ft. coaxial lead fitted with a standard coaxial plug to R.E.C.M.F. specification is provided so that it is "ready to plug in."

Supplied in attractive display cartons the "Vantenna" will be available almost immediately through all Antiference distributors at 25s. each (retail).—Antiference Ltd., Bicester Road, Aylesbury, Bucks.



The "Vantenna" all-band room aerial.



The new roller-type cable stripping pliers.

Cable Stripping Pliers

CREATORS LTD., of Woking, have pleasure in bringing to your attention their new roller-type cable stripping pliers, which have been specially designed to remove the insulation from electric cables of $\frac{1}{8}$in. to $\frac{3}{4}$in. diameter.

The cable passes over an aluminium V-pulley in one of the jaws and is guided in a straight line along the inside of a shaped handle. The other jaw carries a replaceable steel stripping blade and an adjustable and lockable stop-screw which prevents the blade from cutting into the cable core.

Three blade positions and two roller positions are provided to accommodate cables of different diameters, and the blade clamping plate can be adjusted to limit the depth of the cut. Two sizes of roller are available, the smaller for cable diameters from $\frac{1}{8}$in. to $\frac{3}{8}$in. and the larger for diameters from $\frac{3}{8}$in. to about $\frac{3}{4}$in.; rollers for special cable sections can be made up as required.

Retail price £2 7s. 6d., delivery four to six weeks.—Creators Ltd., Plansel Works, Sheerwater, Woking Surrey.

Your PROBLEMS Solved

Whilst we are always pleased to assist readers with their technical difficulties, we regret that we are unable to supply diagrams or provide instructions for modifying surplus equipment. We cannot supply alternative details for constructional articles which appear in these pages. WE CANNOT UNDERTAKE TO ANSWER QUERIES OVER THE TELEPHONE. The coupon from p. 46 must be attached to all Queries, and if a postal reply is required a stamped and addressed envelope must be enclosed.

MURPHY V310

My set was six months old on the 30th June. To date, my original choice and confidence in this set has been fully justified, with the following exception. Under normal transmission conditions I receive a first-class picture on BBC or I.T.A. but on viewing either test card and following all instructions re controls I find it impossible to obtain full picture height without slightly elongating vertically the large circle centrally situated on test card "C." If I make the necessary correction on the test card I am left with an $\frac{1}{8}$in. + gap at the top and bottom of the screen. As I am interested in attaining the maximum performance from my set I find this minor distortion somewhat irritating. Incidentally the mains supply voltage has been tested and found correct by the Electricity Authority.—G. W. Warner (Morecambe).

The original V310 had a 30P12 frame output valve and subsequent ones had a 30P16 (PL82). We suggest you check this valve's performance. You can get to it by laying the set on its face, removing the two bottom bolts and lifting the cabinet off. We assume you have adjusted "frame linearity" which is above "height" and is accessible through the hole in the cabinet.

PHILIPS 1446V

I have been getting excellent reception both vision and sound for quite a while, now I am being troubled by a very bad hum which almost drowns the music or speech and also spoils the picture, the hum is only present when the vision signal is on. If you would let me know what you think may be the cause and what I could do about it I should be extremely grateful.— W. Waygood (Southampton).

The fault would appear to be due to "vision on sound." This usually develops as a result of a change of characteristics in the PCF80 valve on the tuner unit. However, it is quite in order to retune the oscillator coil core so as to tune to maximum sound with the fine tuner in the mid position. A hole is provided in the front of the tuner unit so that a suitable insulated trimming tool can be inserted. To gain access to the tuner unit turn set on its side and remove bottom cover.

MURPHY V280

The trouble is that the whole picture jumps now and again, it does not flicker into any line break up and does not roll up or down. The picture remains complete but this vertical jumping effect takes place now and again. I have watched carefully to see if it was sound on vision but the jumping effect only seems to tie in now and again with sound. Can you help me with this problem?—F. Roach (Romford).

We suggest you check the 6/30L2 frame clipper/ oscillator which is beneath the deflector coils. As the set is a bit critical on frame in fringe areas the 470 pF connected to pin 6 of this valve can be increased to .001 mfd.

SOBEL TS17

The picture of my three-year-old TV set of the above model is falling off rather badly and I am uncertain as to whether I require a new tube or that the trouble lies in another direction. When the set is first switched on in the evening the picture is very poor. Basically, it lacks brightness. If I attempt to overcome this by turning up the brilliance control the result is still unsatisfactory. Black areas become a dark grey, and detail is lacking. It is as if the screen is covered with a fine bluish-grey veil. Flyback lines are prominent when the screen holds no picture between programmes. If the contrast is turned to the right, the picture becomes flooded with light. On the BBC the sensitivity control gives little difference except that when fully extended to the right, both sound and vision are affected by some interference, a drumming noise on sound, and lines across the picture. As the evening goes on so the picture improves and generally when I switch off around 11 p.m. the picture is quite a good one. It is clear, detail prominent in "dark" areas and white areas but it has a faint sepia cast. There is just one other detail. If when the set is first switched on and the programme is tuned to the ITV, then an effect of lightning is received. The dark picture is illuminated at irregular intervals very momentarily. If you think that a new C.R.T. is needed would you care to advise me whether I could fit such a tube? That is, whether the fitting of a tube is a mechanical job, similar to fitting a new valve only requiring more labour, etc. The point that worries me is that it may be that after a new C.R.T. is fitted the set will require some realignment. I shall be most grateful to you for your advice.—J. F. Morris (Cheshire).

From your description we would agree that your C.R.T. is failing. Tube changing on this model is fairly straightforward. You unbox the set, remove the tube holder and EHT cap (discharge it first) and ion trap. Slacken off the band around tube face and pull forward, supporting scanning coils. Remove all dust prior to replacing in reverse order. You may like to try a boost transformer first and we certainly recommend you to check the ion trap setting, which should be positioned for maximum brightness.

R.G.D. 1746

For the last few months I have been experiencing interference from another channel when I am tuned to Channel 9. Recently it has worsened. The interference takes the shape of springy coils at the top and bottom of the picture. The set has had no servicing as yet and as the picture on Band I is perfect I am sure that I am right and that the fault is only interference.—E. Platt (Shoreditch).

The patterning experienced, if present at all times, is likely to be due to adjacent channel interference. There is no wave trap included in the circuit to reject this, and if the fine tuner cannot be set to minimise it, try redirecting the aerial. If there is no improvement, separately tune the R.F. and aerial cores under the tuner unit (ganged to move in and out with the oscillator core). It may then be necessary to retune the rearmost I.F. transformer cores, just to the left of the focus magnet.

STRAD TA1414

My problem is lack of width. The picture usually has a ¼in. or ½in. gap at either side, and no amount of manipulation by movement of the width control can put this right. Can you help me, please?—G. Stevenson (Co. Durham).

Lack of width denotes a failing H.T. rectifier as a general rule, but if this is found to be in order, have the line timebase valves checked.

DEFIANT MODEL 71

I cannot get the picture centred properly and am unable to find any control that moves the picture from side to side, only up and down. The picture was perfect when I first had the set (about 10 months ago), but for about six weeks the picture has gone to the right and has a blank margin down the left and all captions are cut off at the right-hand side. Could you tell me how to centre the picture ?—C. Patmore (Ilford).

The shift lever on the focus assembly is capable of "in and out" movement as well as "side to side." Thus the picture is moved horizontally as well as vertically.

MURPHY V178

I have recently acquired this chassis cheaply, less valves, tube and metal rectifier, and intend it for experimental purposes with the idea of conversion to W.A. 17in. screen. I have searched through my Newnes "Radio and Television Servicing," also my copies of *Practical Television*, which I have bound for reference, but cannot trace any reference to this circuit. In appearance it resembles the V120 but has been modified by the makers to use miniature eight-pin valves in place of octals, in two places on the S/V chassis, also, Line Flyback EHT and metal rectification are used. Would it be possible for you to inform me of the valve line up and positions, also the connections to the Line transformer (which have been disconnected) ? Any information regarding the EHT voltage available, and your opinion as to the feasibility of carrying out the conversion already mentioned will be appreciated.—T. E. Soan (Orpington).

We doubt if the V178 has enough scanning power for a 17in. C.R.T. Its EHT when new was 10kV and there are five connections to the original line transformer. The two thick ones go to EHT condenser and EL38 anode. Of the other three one should read 86 ohms to EL38 anode (this goes to H.T.+). The other two have a reading of seven ohms between them and go to the scancoils via width, etc. The line-up is as per V120 with these differences: extra 6F12 R.F. amp., 6F13 video amp. Extra 6F12 sync sep. 6D2s instead of 6D1s. 6K25s instead of T41s. 6P25s instead of Pen 45s. C.R.T. cathode mod., bridge metal rectifier 14A124. EY51 EHT rect. U281 efficiency diode.

PAM 13-CHANNEL COMMERCIAL TV ADAPTOR

Can you tell me if the above can be used with a Stella Television set Type ST8314U-15. No. M10661. 180 watts?—G. Parkinson (Chorley).

The converter delivers an I.F. of 38.15 mc/s sound, but your Stella has 8.5 mc/s I.F.s. The unit is therefore unsuitable for the receiver and it is not practical to adapt it as it is of the incremental tuning type with preset local oscillator tracking.

FERGUSON 306T

The picture has disappeared altogether from the screen. After the set had been running for a short time the picture disappeared for about five minutes then it came back again, but about ten minutes later it disappeared altogether. The volume is perfect but it seems that a faulty valve is the cause of the loss of the picture. Please let me know the valve that is faulty, or other cause of the fault.—W. Thomson (Renfrewshire).

If illumination cannot be obtained on the screen by turning the brightness control fully on we suspect lack of EHT voltage. This is often caused by failure of one of the following valves ; EY86, PL81, PY81—V9, V7 and V8.

QUERIES COUPON

This coupon is available until AUGUST 21st, 1958, and must accompany all Queries sent in accord with the notice on page 45.

PRACTICAL TELEVISION, AUGUST, 1958

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TELEVISION BARGAINS: 9in., seen working, **£7/10/-;** 17in., **£37/10/-;** new 17in. Sets, **59 gns.** Aerials and Co-ax. cheap. CLAYTON'S, of Church St., Chalvey, Slough.

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VALVE CARTONS.—We can supply from 12 to 100,000 off the shelf. Plain white or printed. Miniatures, **10/-.** "G.T.s," **12/-.** "Gs." **14/-** per 100, plus 2/- postage. Also printing done to your special requirements; quotations gladly given. J. & A. BOXMAKERS, 75a, Goodwin St., Bradford, 1.

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FOR SALE *continued*

100 BAYS of brand new adjustable steel Shelving, 72in. high x 34in. wide x 12in. deep, stove enamelled, dark green; sent unassembled; 6-shelf bay, **£3/15/-;** sample delivered free; quantity discounts. N. C. BROWN, LTD., Eagle Steelworks, Heywood, Lancs. (Tel.: 69018.)

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(Continued overleaf)

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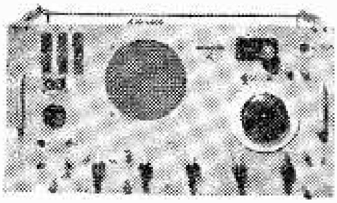

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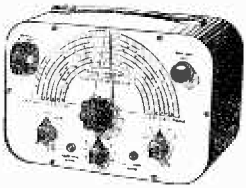

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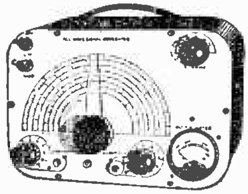

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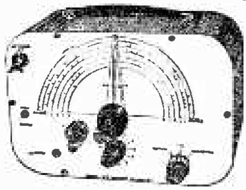

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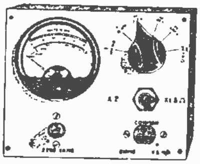

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19/6 Plus P. & P. 1/6. Built and tested 7/6 extra.

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COLLARO 4-SPEED AUTOMATIC CHANGER Model 457 (suitable for use with above amplifier). Type "O" pick-up. Size 12in. x 13½in. Min. clearance above board 3in., below 2½in. 10 records. A.C. mains, 200-250 v., turnover crystal head. Brand new, fully guaranteed. £8.19.3, plus P. & P. 5/-. Or 25/- deposit plus P. & P. 5/- and 7 monthly payments of £1.5.0.

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5Y3G	7/9	6L6G	11/9	EF91	8/9
5U4G	8/9	807	7/9	EL32	3/9
6J5G	4/9	12A6	7/9	EL91	5/9
6K8G	9/9	25Z4G	9/9	FW4/500	8/9
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12.5 v 3 a, 5 v 3 a **12/9**

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25 mfd 25 v	1/3	32-32 mfd 350 v	4/9
50 mfd 12 v	1/3	32-32 mfd 450 v	5/9
50 mfd 50 v	1/9	150 mfd 450 v	5/9
100 mfd 25 v	2/3	100-100 mfd 350 v	5/9
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