THREE-DIMENSIONAL TELEVISION

Practical Television

1/3

MAY 1957

AND TELEVISION TIMES

EDITOR: F.J. CAMM

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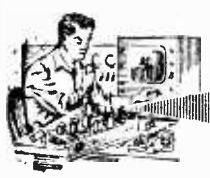
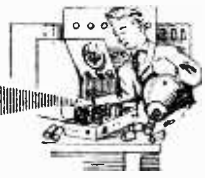


Practical Television



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CONTENTS :

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

TELEVIEWS

AWARDS FOR TECHNICAL WRITING

IT deserves to be more widely known that the Radio Industry Council awards up to six premiums of 25 guineas each year to the writer or writers of articles published between January and December in any one year which, in the opinion of the Council's panel of judges, are likely to enhance the reputation of the industry and focus the attention of other countries on Britain's undoubted leadership in the fields of radio, television and electronics. The awards are made for articles published at home or abroad which depict British achievements in radio, television and electronics in papers which can be bought by the public on bookstalls. This, of course, includes trade and technical journals, but not only those dealing directly with radio and electronics. Journals which cover industries such as the motor car and aircraft, steel, furniture, machine tools, and atomic energy plant are all in the scope. Additionally, one of the six 25-guinea premiums will also be open to articles published in manufacturers' journals with an overseas circulation, but articles published in journals circulated exclusively to members of a trade and journals of professional institutions or learned societies are not eligible.

Any writer is eligible who is not paid a salary wholly or mainly for writing and not earning 25 per cent. or more of his income from fees for articles or from book royalties. In the case of joint-authorship each of the authors must be eligible under these terms and the award may be made jointly.

The scheme provides a great encouragement to amateur writers and to win one of the premiums is a distinct honour. Full details are available from the Radio Industry Council.

THE V.M. TV TUNER

READERS who were unable to obtain copies of this journal containing the series of articles on the modification of the View Master for ITV, and of a three-station tuner designed for the View Master and which may be used with other receivers, are reminded that we have reprinted them in booklet form and copies are available from this office for 2s. 9d. post free.

THE "PRACTICAL TELEVISION" FILM SHOW

THE PRACTICAL TELEVISION and *Practical Wireless* Film Show at the Caxton Hall, on February 21st was a great success, and the whole of the seating capacity was occupied by our readers. The three films showed the development of the transistor circuit, the manufacture of valves and the manufacture of TV tubes. The films were shown by courtesy of Mullard, Ltd., to whom our gratitude for a successful evening has been expressed.—F.J.C.

Our next issue, dated June, will be published on May 22nd.

Television Society's Exhibition

A REVIEW OF SOME OF THE MORE IMPORTANT EXHIBITS AT THIS YEAR'S SHOW

COLOUR and the use of transistors in TV equipment formed the main element at this year's exhibition organised by the Television Society. This was held at the Royal Hotel on March 5th, 6th and 7th, and among the exhibitors the following were prominently featured.

Automatic Coil Winder and Electrical Equipment, Company.
BBC.
Belling-Lee.
Cossor.
Cintel (Cinema-Television).
E.M.I.
Edison Swan.
G.E.C.
Marconi.
Mullard.
Murphy.
Philco.

Whilst test instruments and subsidiary equipment formed quite a large proportion of the show, there were a number of most interesting exhibits which will now be described.

Colour

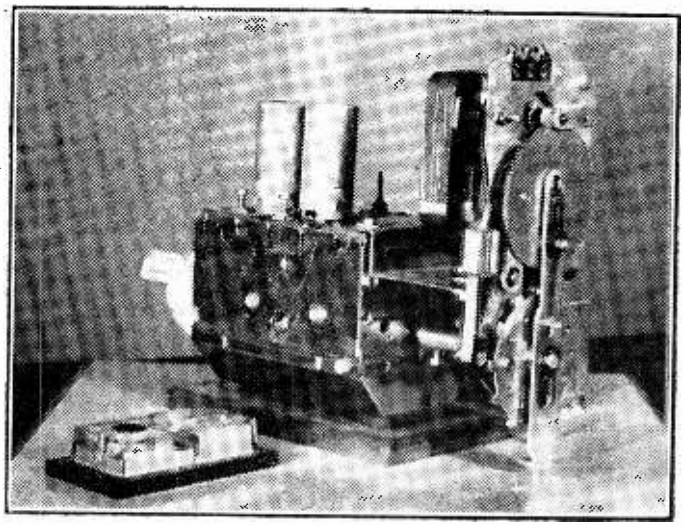
Several experimental colour sets were shown by different firms, and these all took their picture from "still" colour pictures radiated from a flying-spot transmitter on the Cintel stand. This was a most compact unit, and for monitoring purposes a three-tube display unit was employed. This consists of a narrow vertical rack assembly in the lower part of which are arranged three 12 in. tubes in a vertically-disposed arc. The tubes have coloured phosphors (red, blue and green) and by means of specially designed semi-transparent mirrors the operator may look down at the slightly sloping monitor desk and see a single image in colour.

To facilitate control various control knobs on the complete installation are coloured with the three colours, and apart from the attractive appearance which this gives it makes quite certain that the operator will not have his work complicated by having to check that he is operating the correct control. Judging by the pictures shown on the various stands this is a most efficient piece of equipment, but at the moment we are unable to give any technical details as to circuitry, etc.

Close by was the Belling-Lee stand and they had a most informative type of demonstration. We have already described the film strip which they have developed for the use of dealers, etc., to demonstrate the efficiency or otherwise of aerial systems, and at this show they had a unit made up to simulate the effects of different aerial systems. Ghosts, reflections, fading and similar troubles could all be introduced by the operation of switches, and the effects were shown on a standard colour set such as is now being used by most firms for experimental use in connection with the BBC test transmissions. This showed even more clearly than the normal black and white transmissions what reflections or bad aerial erection can do to a picture. Due to the more complicated wave-form of the colour transmission, a ghost can result in a displaced image in a single colour, giving a peculiar effect as a result of the deepening of a tone where the double image comes and the weaker single tone which is displaced will have peculiar effects on the image over which it appears. This was a most interesting demonstration and showed just how difficult it will be eventually to set up a colour receiver and to decide whether a given picture is a result of maladjustment or faults in the circuit or to the aerial. Great credit is due to Messrs. Belling-Lee for the enterprise in designing this piece of equipment, and it emphasised most clearly that the aerial can be a most fruitful source of trouble if not properly designed and erected.

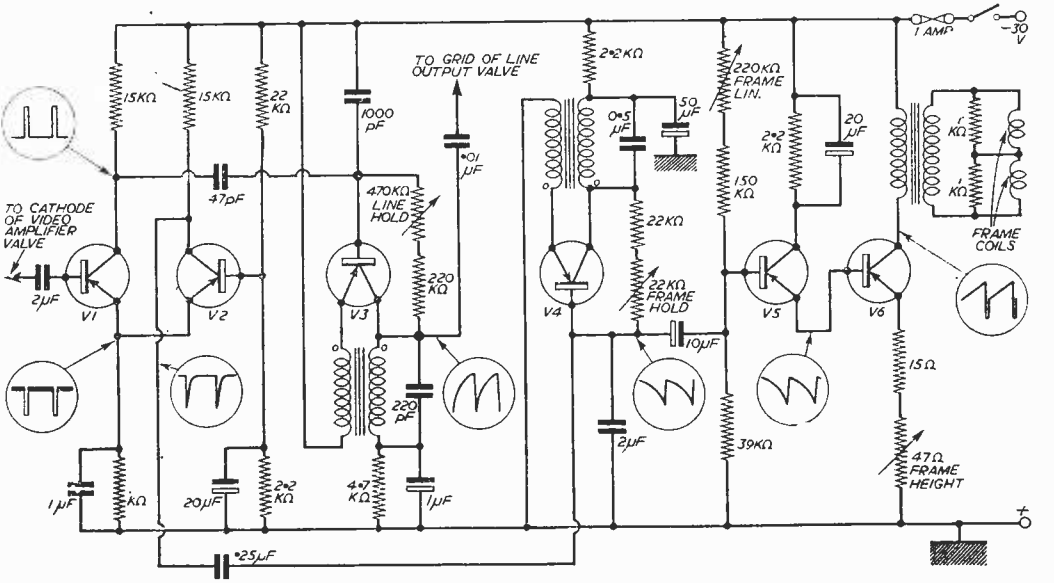
Test Equipment

Among the various items of test gear were quite a number for testing colour receivers, and whilst a wobbulator or similar device is adequate for lining up or testing a black and white receiver, this is of little use when it is desired to set up a colour set and there are no transmissions available. As a result special colour generators have been produced and these develop bands of colour and other effects which have



The Philcomatic automatic tuning device attached to a turret tuner. (See also page 478).

been found necessary in order to adjust all the circuits and mechanical devices used in a modern colour receiver. Cossor, for instance, were showing a Colour Burst Generator, which gives a "burst" of nine cycles of the colour subcarrier, providing the a buffer amplifier V5. The sync pulses are derived from a two-stage separator V1 and V2, and this is fed from the cathode of the video amplifier valve. The total current consumption is approximately 160 mA from a supply of 30 volts.



The transistorised timebase unit which was shown by the G.E.C.

reference phase signal from which measurement of deviation from the standard may be made.

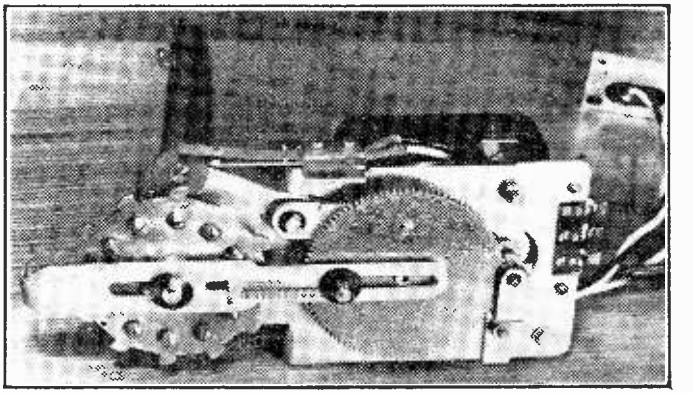
Another interesting piece of equipment was seen on the E.M.I. stand and consisted of a 'scope which developed a marker so that when connected to a receiver under test it was possible to pick out any desired line of the raster for examination of waveform, and the point being examined could be identified by a short marker line on the raster of the receiver. As a control on the 'scope or analyser was adjusted one could see the small marker line travel on the raster and at the same time the waveform depicted on the 'scope changed and kept in tune with the raster. Test Card "C" was being shown when we visited the show and this gave a most interesting display.

Transistorised Sets

Amongst the various uses of transistors in TV sets there were two interesting exhibits. On the G.E.C. stand was a timebase using transistors and the circuit is shown above. The line timebase employs a P-N-P transistor, V3, which is used in a blocking oscillator circuit. A positive-going sawtooth output of approximately 45 volts (peak-to-peak) is obtained and is used to drive the valve line output stage in the receiver.

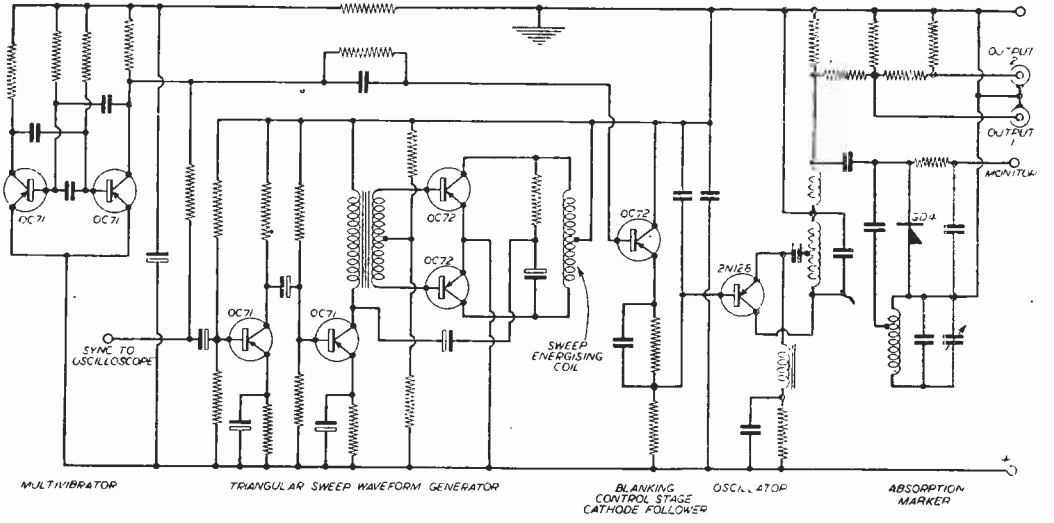
The frame timebase uses a P-N-P transistor, V4, also in a blocking-oscillator circuit, and this drives the frame output transistor V6, via

Another interesting transistor circuit was a wobbulator, shown by Philco. The circuit of this may be seen on page 458, and uses four OC71s, three OC72s and a Philco (American) surface-barrier transistor, the ZN128, as a Hartley oscillator. This interesting circuit is powered by a 4.5-volt supply and consumes approximately 110 mA. At the moment we cannot supply any values for the various components. The actual oscillator coil is wound on a Ferrite rod, and this is placed between the jaws of an L.F. electromagnetic circuit polarised by means of a Ferrite permanent magnet suitably positioned. In use a triangular waveform is passed through the L.F. coil which causes a change of permeability in the H.F. Ferrite and hence a change in frequency.



The Philcomatic motor-operated remote-control tuning device.

Another interesting exhibit on the Philco stand was the Philcomatic Remote Channel Selector Unit. This is a neat push-button operated control which enables a viewer to tune to any desired channel on a receiver without leaving his armchair. This unit was seen fitted to a Philco A.1961 receiver and when the push-button is depressed the motor rotates and by means of a toothed wheel drives the turret from channel to channel. It is stopped when the desired channel is reached. The addition of this device does not affect the manual operation of the tuner which may be switched to any desired point, whether pre-selected or not, by means of the normal panel control knob. If a new station becomes available all the user has to do to receive the new station is to switch off the receiver, turn the turret to the required position, and replace a screw in the driving wheel opposite a red arrow marked on the unit. To ensure that maximum performance is obtained on all stations, when the unit has been installed the fine tuner of the turret should be turned clockwise to a position approximately two-thirds of its full rotation, and the oscillator slugs then adjusted for peak performance on each channel to be selected. Beyond this no circuit modifications are called for.



A transistorised wobbulator for I.F.s of 31-41 mc/s.—shown by Philco.

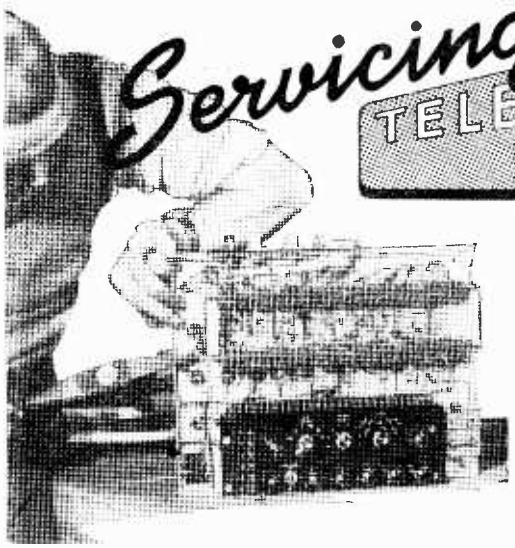
West Country ITV

MR. CHAPMAN-WALKER, Managing Director of T.W.W. Ltd., in a recent statement said: "The decision by the Minister of Housing and Local Government to permit the Independent Television Authority to erect the mast at St. Hilary (nr. Cardiff) is welcomed by T.W.W. Ltd. (Television South Wales and the West of England) as a decision, after a full public enquiry, which indicates that this mast will not constitute a danger to air lines in the area.

It is the intention of T.W.W. Ltd. now to press forward with their plans for providing an alternative television service for South Wales and the West of England.

The construction of studios at Cardiff will start immediately and it is hoped that despite these setbacks to the original schedule they will be able to provide programmes welcome by all before the end of the year."

Servicing TELEVISION RECEIVERS



No. 30.—THE PYE V14C AND ASSOCIATED MODELS

By L. Lawry-Johns

(Continued from page 420 April issue)

A RATHER confusing fault symptom is excessive brilliance combined with a weak picture. The raster lines are still obvious, even with the brilliance turned down, and increasing the contrast from minimum first produces a grey picture and then a negative one. Replacement of the PCF80 video amplifier cathode follower will often produce an immediate cure, but where no improvement results, check the two 15 KΩ resistors associated with the valve. These are shown in the video amplifier circuit diagram.

In some cases the defect may be due to the tube itself, but a voltage check on the video amplifier valve base should clear any doubts, as a defective PCF80 or associated resistor would cause a reading far different from those given in the table. If the voltages correspond to those given within reason, the tube could be fairly suspected.

The A.P.C. circuit following the video amplifier is rather complicated compared to some systems which derive the control voltage from the sync separator input circuit. In this receiver a gated system is used and the following brief description may help to clarify the circuitry.

In the transmitted waveform a signal of brief duration representing the black level follows each line-sync pulse. This signal only varies when fading is experienced. It is this signal which is used as a reference level for the A.P.C. circuit. The output signal of the vision I.F. amplifier is rectified by the vision detector (V3) and is amplified by the video stage (V5A). The video signal is fed via a cathode follower (V5B) to the cathode of the picture tube and the sync separator (V21A).

The polarity of the signal at the V5B cathode is such that the sync pulses are positive with respect to the picture. A small transformer in the anode circuit of the sync amplifier (V21B) has a tapped secondary. Differentiated line-sync pulses in anti-phase are fed from the secondary to the A.P.C. gating diodes (V8 and V9). The vision signal from V5B via a .1 μF to the junction of V8 and V9 being D.C. restored by V6. The differentiated line-sync pulses cause V8 and V9 to conduct during the black level period, thereby connecting the junction of V8, V9 and R28 to the junction of R31 and R32. A negative signal proportional to black level will be developed between R31/R32 and chassis. This voltage is smoothed by C28 and is applied as grid-bias to the first vision I.F. amplifier (V1). A positive delay voltage which determines the point or level where the system comes into operation is applied to the bias line by the contrast control (R26). The crystal diode (V10) is only used to prevent the bias line becoming positive in the absence of a signal. The control bias for the tuner unit is derived from the junction of R29 and R30, the voltage at this point being a mean value of the A.P.C. (automatic picture control) and the A.G.C. (automatic gain control) of the sound circuit. Thus, the first vision I.F. amplifier is controlled by the vision A.P.C. circuit and the first sound I.F. amplifier by the A.G.C. voltage derived from the sound detector circuit. The two control voltages being combined to produce the bias applied to the tuner unit PCC84. It should be noted that this valve and the PCF80 in the unit are referred to as V1 and V2 and should not be confused with V1 and V2 of the main receiver, which are both EF80 vision I.F.

VALVE VOLTAGE CHART

	Anode	Screen	Cathode
V1	138	138	2.0
V2	133	133	1.6
V5 (pen.) ...	97-105	182	2.9
V5 (tri.)... ...	187	—	97-105
V11 and V12 ...	—	—	204
V13	137	137	2
V14	130	130	1.5
V17 (tri.) ...	50	—	1.8
V17 (pen.) ...	155	145	7.5
V19A	95	—	3.5
V20	170	180	4.2
V21 (pen.) ...	4	35	—
V21 (tri.) ...	187	—	24
V24 (tri.) ...	65	—	12.5
V24 (pen.) ...	75	135	7.2
V26	—	130	—
V27	185	—	—
V28	—	—	13-14 kV

V29 (tube) cathode 105 ; grid 0-105 ; first anode 320 ; final anode 13-14 kV.

Note : These figures are intended as a guide. Tube base voltages will vary with the position of the brilliance control.

V1 readings vary with setting of contrast, this should be at minimum for all other readings.

amplifiers. Another part of the circuit which requires comment is the auto-sync.

In areas of somewhat weak signal strength, noise-pulses tend to " tear " sections of the picture, due to the line oscillator being triggered by these undesired pulses. The net result is a ragged picture with unreliable line-hold. The auto-sync circuit overcomes, to a degree, this random triggering and its operation may be described as follows :

Differentiated line-sync pulses in antiphase are derived from the transformer in the anode circuit of V21B, as in the A.P.C. circuit, and are applied via C74 and C75 to the discriminator diodes V22 and V23.

A sawtooth waveform, obtained by integrating a pulse from the line-output transformer (T9) is applied to the discriminator. At the junction of R87 and R88 the discriminator diodes produce a control voltage ; the amplitude of this voltage depends upon the relative phases of the sync pulses and the reference waveform derived from T9. The voltage is filtered by R90, C80 and the network C79 and R94, and is applied to the grid of the triode section of V24A for

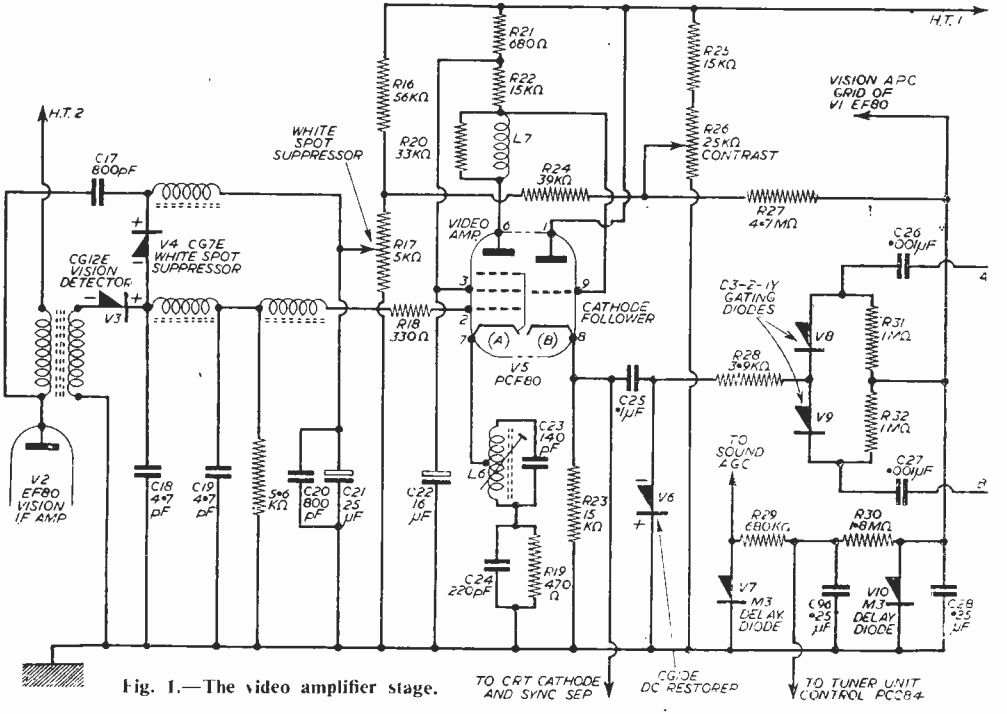


Fig. 1.—The video amplifier stage.

Tuner Unit

V1 PCC84	Cascode R.F. amplifier.
V2 PCF80	Frequency changer.

Main Chassis

V1 EF80	1st vision I.F. amplifier.
V2 EF80	2nd vision I.F. amplifier.
V3 CG12E	Vision detector.
V4 CG7E	Vision interference limiter.
V5 PCF80	Video amplifier (pentode). Cathode follower (triode).
V6 CG10E	D.C. restorer.
V7 M3	AGC delay diode.
V8 D3-2-1y	AGC gating diode.
V9 D3-2-1y	AGC gating diode.
V10 M3	AGC delay diode.
V11 PY82	H.T. rectifier.
V12 PY82	H.T. rectifier.
V13 EF80	1st sound I.F. amplifier.
V14 EF80	2nd sound I.F. amplifier.
V15 CG12E	Sound detector.
V16 CG10E	Sound interference limiter.
V17 PCL83	Audio amplifier (triode) and output (pentode).
V18 M3	Interlace diode.
V19 ECC82	Frame multi-vibrator.
V20 PL83	Frame output.
V21 PCF80	Sync separator (pentode). Flywheel line-sync amplifier (triode).
V22 D3-2-1y	Flywheel sync discriminator.
V23 D3-2-1y	Flywheel sync discriminator.
V24 PCF80	Line multi-vibrator.
V25 M3	Line clipper.
V26 PL81	Line output.
V27 PY81	Efficiency diode.
V28 EY86	EHT rectifier.
V29 MW36-24	Cathode-ray tube.

EF80 Valve Pins		PCF80 Valve Pins	
Cathode	1 and 3	Triode Anode ...	1
Grid	2	,, grid ...	9
Heater	4 and 5	,, cathode ...	8
Internal screen ...	6	Pentode anode ...	6
Anode	7	,, screen G^2...	3
Screen grid G^2 ...	8	,, grid ...	2
Supp. grid G^3 ...	9	,, cathode G^3	7
		,, heater ...	4 and 5

the purpose of controlling its frequency. The horizontal hold control (R92) adjusts the free-running frequency of V24 over a small range. However, once the picture is locked, i.e., once synchronisation occurs, the discriminator circuit will take over control and the horizontal hold control will affect but little the operation of the oscillator.

Note, however, that the picture must lock initially for the circuit to operate, and thus the setting of the control is critical to an extent when the receiver is

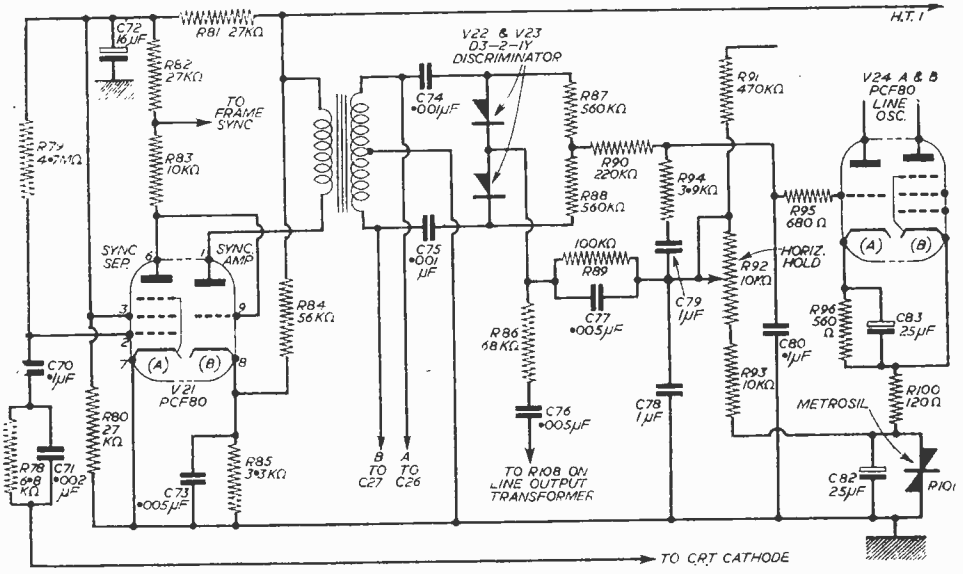


Fig. 2.—Sync separator and line discriminator stage.

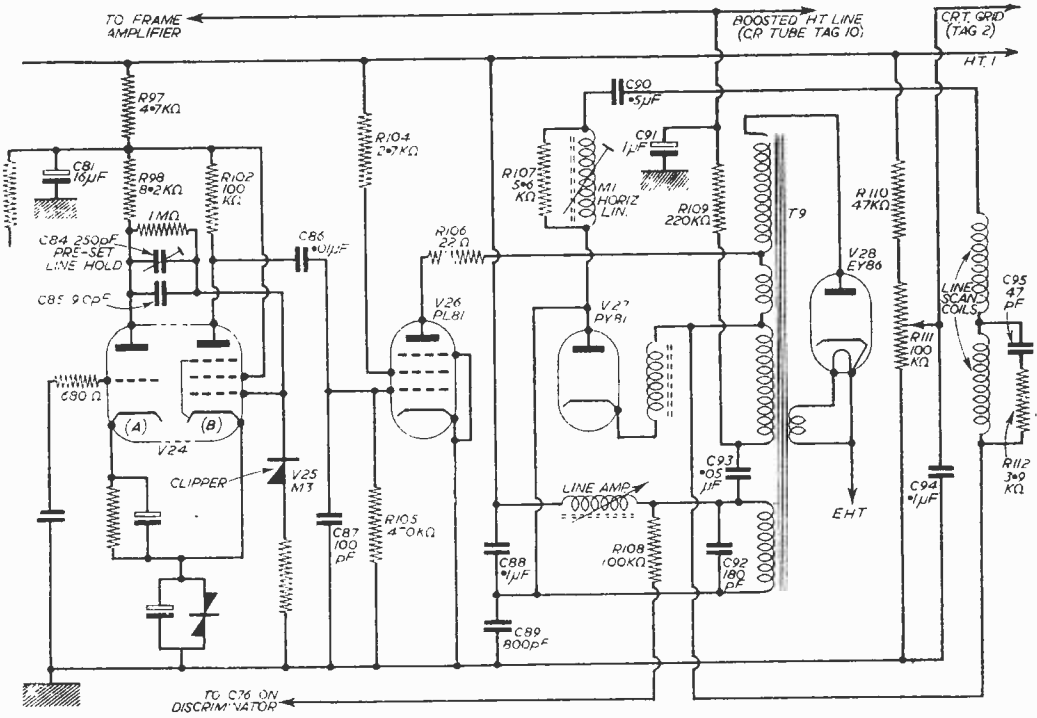


Fig. 3.—The line timebase.

first switched on and when changing from one channel to another. As mentioned last month, it is essential to use a "steady" PCF80 in the V24 position if the circuit is to function correctly.

The Frame Timebase

This is a conventional circuit using an M3 interlace diode feeding the frame pulses to the V19 ECC82 multi-vibrator oscillator. The vertical amplitude control (height) feeds the ECC82 B section triode anode via a 1.8 MΩ resistor and the H.T. voltage is derived from the boosted H.T. line (R109, C91). Where the symptom of insufficient height is experienced, the decrease in height being uniform top and bottom, check upon the 1.8 MΩ resistor (R66). This symptom should not be confused with cramping at the bottom of the raster.

In connection with this latter fault, the following experience may be of interest. The writer was asked to examine an Invicta T126 which according to the owner was suffering from a black band at the bottom of the picture after the set had been running for a short time. Calling at the customer's home, confidently armed with a PL83, a 200 μF electrolytic and other less likely to be needed accessories, the writer approached the offending receiver which although it had only been on 10 minutes already displayed severe cramping. It was immediately noticed that the whole rear of the receiver was covered with a rich-looking piece of velvet! It was explained that this, held in position by a fairly heavy viewing light, served to cover the front of the set during non-viewing hours and only occupied its present position whilst the set was on. Having removed the cover—putting it to better use to cover the bird cage—the picture gradually expanded until a reasonable frame scan was displayed. This, of course, was an extreme case of lack of ventilation, but it does serve to show how temperature rise affects the frame scanning.

Special TAM Report on First Year of ITV

DURING the first year of independent television the number of homes receiving I.T.A. transmissions rose from 190,000 to 1,850,000—46 per cent. of all homes with television in the three areas—and the number of viewers from under 700,000 to some 7,000,000.

I.T.A. homes in the Croydon area rose from 190,000 to 930,000 (53 per cent. of all homes with television in the area) over the full year; in the Lichfield area from 220,000 to 486,000 (41 per cent.) over the 36 weeks of transmissions; and in the Winter Hill area from 287,000 to 440,000 (40 per cent.) over the 20 weeks of transmissions.

This is stated by Television Audience Measurement Limited (TAM) in a special Report on audience developments and viewing trends during the first year of independent television.

But, adds TAM, it will be more than two years before ITV is received by all homes with television in these areas unless there is an increase in the 80,000 BBC-only sets being replaced or converted each month to receive ITV.

In the Croydon area, where no more than one in nine BBC-only homes converted their sets to receive ITV during the last six months, there has been a slight reduction in the rate of conversion; in the Lichfield area the rate was steady at a level similar to that in the Croydon area after a comparable period of transmissions; in the Winter Hill area the rate of conversion was relatively high though it was slower in the first two months of transmissions than in other areas.

ITV Homes Higher In Social Scale

Referring to the characteristics of the ITV homes the Report states that they are relatively higher socially than the rest of the homes in all three areas. Although the areas themselves are reported to differ considerably in social class, ITV homes in each area had some five per cent. fewer of their number in the "D" social class—the lowest two-thirds of the population in the socio-economic scale—than had all the homes in the area.

Reviewing transmissions in the Croydon area, TAM states that throughout the year an average of 65 per cent. of switched-on sets able to receive ITV programmes were tuned to independent television between 7 p.m. and 11 p.m. compared with 35 per cent. to the BBC. During the last 12 weeks ITV viewing rose to an average of 69 per cent. compared with 62 per cent. during the first 12 weeks. And during the last four weeks ending September 23rd, ITV's share of audience rose to 72 per cent.

The Report also shows that between 7 p.m. and 11 p.m. the weekly viewing time of each set averaged 18 hours—64 per cent.—out of a possible 28. The highest weekly average was 20 hours during February and the lowest 15½ hours during August.

Average viewing time and ITV share of audience in the Lichfield and Winter Hill areas respectively was 18 hours and 66 per cent., and 17½ hours and 64 per cent.

Move Towards Early Week Viewing

Commenting on the total audience and share of audience day by day in the Croydon area, TAM states that in January the total viewing was less during the early part of the week. Then, each set was switched on for an average of 2.5 hours on Mondays and Tuesdays compared with 2.7 during the rest of the week.

Gradually, however, the early part of the week became more popular until, in September Monday and Tuesday averaged 2.65 hours per home against 2.55 for the rest of the week. Similarly, the ITV share of audience showed the same tendency to improve in the early part of the week. This, states TAM, was presumably due to deliberate programme planning to raise ITV audience levels on these days. Although Monday has been reported as being a difficult day for which to sell advertising time, TAM reports that a slightly higher average evening audience to ITV was being attracted on that day than on any other weekday.

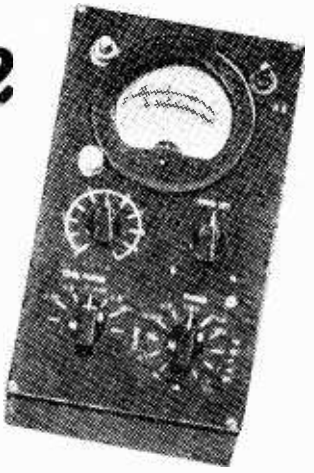
Visitors Boost ITV Audience.

Commenting on differences in the amount of viewing between individual homes, TAM adds that between 7 p.m. and 11 p.m. about three quarters of homes in the Croydon area had their sets switched on—to either ITV or BBC—for an average of at least two hours per evening, and that of the remainder the majority were switched on for an average of at least one hour per evening. In addition, some five per cent. viewed for less than one hour.

A Multi-Range Test Meter

A VALUABLE ACCESSORY FOR THE EXPERIMENTER OR SERVICEMAN

By H. M. Thomson



(Continued from page 409 April issue)

THE 250 volt A.C. range must be adjusted before the 500 volt A.C. range has its parallel resistor connected in position.

The current shunts are adjusted in accordance with details given in Fig. 9. A new battery is necessary for all adjustments, a G.B. 9 volt type being suitable.

Operation

On all voltage and current tests the selector is set to "V.I." and the range switch is set to the required range.

To check resistors on the high ohm circuit the zero set adjuster is turned to "High" and the selector and range switches set to "High Ohms." The test prods are now touched together and the zero set adjusted to give F.S.D. which is equal to zero. The resistor being checked is then connected between the test prods and the reading in microamps, which will be obtained, is then checked with the chart given in Fig. 4.

Before checking resistors on the low ohm ranges it is necessary to ensure that the zero set adjuster is turned to "Low" and the range switch set to "Low Ohms" (5 or 100 milliamps). The selector switch can now be set to "Low Ohms" and the zero set adjuster slowly turned to give F.S.D. this being equal to infinity. Resistors to be checked are now connected between the test prods and the needle will move back from F.S.D. to give a reading which can be checked with the chart given in Fig. 4.

The zero set adjuster should always be set to "Low" before changing one low ohm range to the other.

To test condensers for leakage turn the range switch to "Neon" and the selector switch to "Leakage." A D.C. voltage of 200/230 volts is now

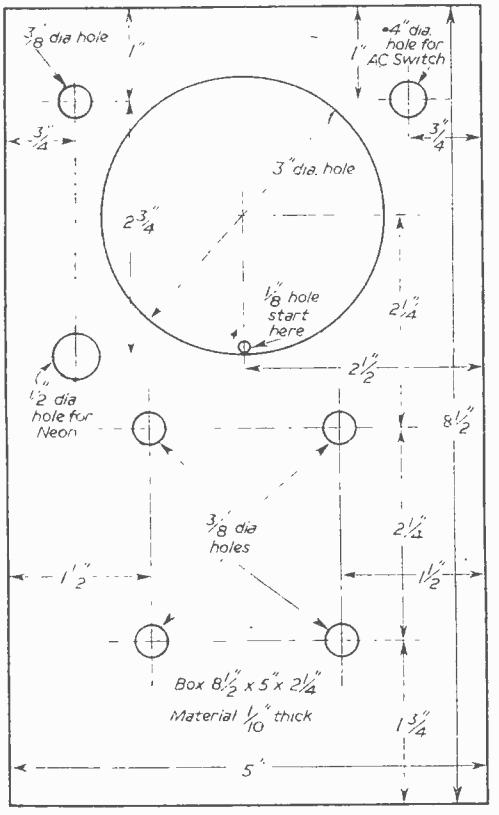


Fig. 6b. Panel drilling details.

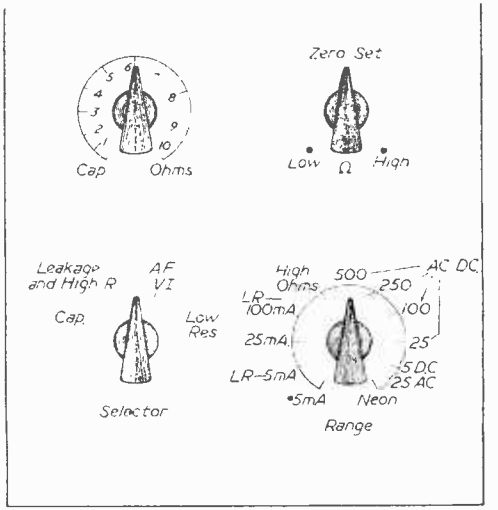


Fig. 7. Switch markings. Transfers may be used for these.

applied to the sockets on the side of the meter case and the condenser under test touched with the test prods. The neon bulb should remain unlit if the condenser is up to standard. Should the condenser have a leak the neon will flash at a rate determined by the value of the leakage. This value is found by applying the equation $R = 100N$ where R equals insulation resistance in megohms and N = the number of seconds per flash.

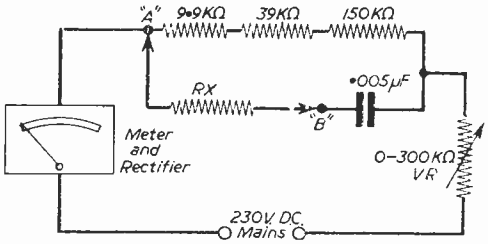


Fig. 9.—Adjusting the current shunts.

1. With Rx out of circuit adjust V/R for a meter reading of 470 microamperes.
2. Switch off.
3. Connect resistors at Rx between "A" and "B" of from 1 to 1.5 megohms until F.S.D. is obtained.
4. When the resistor that will give F.S.D. is found, remove the temporary connections and the V/R and solder this resistor into place on the tag board.

Should a good A.C. voltmeter be available it could be used as a standard in calibrating the A.C. volt ranges.

The mains voltage is now applied to the 250 and 500 A.C. volt ranges and resistors of the approximate values shown in Fig. 1 connected in parallel until 230 volts A.C. is obtained on the 250 and 500 volt ranges respectively. The approximate values of the parallel resistors are 2.7 megohms and 2.2 megohms.

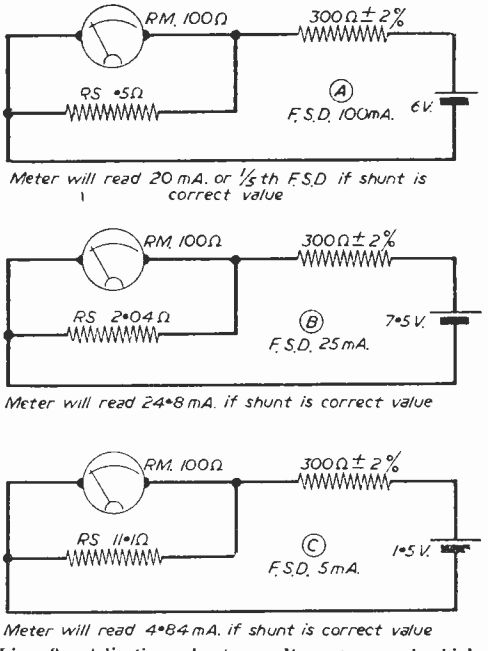


Fig. 8.—Adjusting shunts. If meter reads high, reduce value of RS, and vice versa.

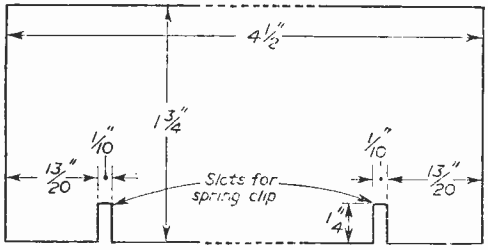


Fig. 6a.—Tag board dimensions.

The condenser can now be checked for continuity by turning the selector switch to "Cap" and applying an A.C. voltage of 200/230 volts to the power input sockets. See Fig. 1.

Should the condenser be up to standard the neon will remain alight. To find the approximate capacity of the condenser, the 1 megohm potentiometer is rotated until the neon is extinguished. A scale or new chart will have to be made up using known condensers as standards. High value resistors can also be checked here.

An A.F. source is supplied by switching the selector switch to "A.F." "V.I." and applying a D.C. voltage of 200/230 volts to the same sockets as for condenser testing. The output is via an 0.1 μF condenser to a socket on the front of the meter case. The A.F. output can be used to test the L.F. stages of receivers, and the output from the set under test can be connected to the meter test prods via a condenser of 0.1 μF. The meter will have to be switched to A.C. volts and the range switch set to a suitable voltage.

A power supply for the operation of the neon circuit is not described here as many constructors will have one available. However, as the current required is very small, a power pack consisting of a metal rectifier, one 8 + 8 μF condenser and a 3 KΩ smoothing resistor is all that is required.

The neon was made to oscillate by connecting a condenser of 0.002 μF in parallel with it and a resistor of 5 megohm in series with the neon and condenser. The condenser may have to be reduced if the neon fails to oscillate.

Servicing A.C./D.C. Receivers

SOME HINTS ABOUT SAFETY WHEN HANDLING CERTAIN MODERN TELEVISION APPARATUS

THE majority of modern television receivers make use of what has now become commonly known as the "A.C./D.C. technique." At one time a receiver designed for use on A.C. mains had as its main component a special transformer designed to change the mains voltage into a lower voltage for the heaters of valves, and to step it either up or down for H.T. (Fig. 1). This is a very expensive component and is fairly heavy if the current demands of the receiver are on the high side. In the case of a set designed for use on D.C. mains, however, it is not possible to use a transformer and, therefore, the mains supply is simply smoothed for the H.T. (which prevents any increase in voltage) and the valve heaters are all joined in series and preferably of high voltage rating so that the chain of heaters more or less totals the same as the mains (Fig. 2). However, there are only a few districts where D.C. mains are left, and to enable a purchaser to use a set on either A.C. or D.C. mains it becomes necessary to remove the transformer. This has the added advantage of making the set much cheaper to construct, removes a source of trouble and also makes the set lighter. Modern valves are designed for an H.T. round about 180 volts and, therefore, it becomes quite a practical proposition to adopt the D.C. arrangement with perhaps in some cases an auto-transformer, that is, one with no separate primary winding, to facilitate the derivation of various voltages. Such a set can, of course, only be used on A.C. supplies, but from the foregoing it will be realised that old receivers which are marked "A.C." only may be generally considered to have a transformer, whilst a modern receiver having the same marking, may not.

Live Chassis

The main point to be emphasised from the above remarks is that one side of the mains supply may be in direct contact with the "H.T.—" line of the receiver, and this generally includes the chassis and everything which is mounted on it—unless special insulating materials are employed to isolate it. Therefore, special precautions are necessary when a set of this type has to be serviced, or some nasty shocks may be experienced.

Fortunately, the common electrical shock in TV servicing is rarely dangerous, provided the technician has no organic physical defect and his general health is good. But these jolts are annoying at best and may become dangerous because of side effects—pulling a hand away quickly against the sharp corner of a chassis, dropping or breaking a picture tube, etc. Under special conditions, *some of these shock hazards are potentially fatal.*

Occasional shocks in the course of servicing may be due to carelessness. In a surprising number of cases, it is not the basic cause. The shock may result from an unfamiliar circuit connection, an unpredictable type of component breakdown or simply a lack of published information concerning possible shock hazards. As a result, most technicians receive their education the hard way. This article, which is reprinted from our American contemporary, *Radio Electronics*, may provide a slightly less painful method of obtaining some of this information:

Less-familiar Hazards

Most technicians think they are relatively safe from shock when they turn the power off in a series-filament set and that the only hazards then are charged capacitors and glass picture tubes which may retain a charge. This assumption is valid if power is turned off by removing the mains lead from the chassis. However, if the lead is still connected to the chassis and the power switch is turned off, the technician can still get across the full line voltage in series-filament receivers by touching the chassis and an external earth. For example, the set in Fig. 3 has the power switch in the off position. The "hot" side of the line is connected to the top of the filament string. This means that the live side of the line is connected to the chassis *through the filament string.*

By touching the chassis and an external earth, the technician's body is put in series with the filaments across the line. That is, the entire series circuit is connected between the hot side of the line and external earth. Since body resistance is much higher than the total filament resistance, practically the entire line voltage is applied across the body.

Incidentally, a common external earth is the metal wall mains outlet plate (or mounting bolt, if the plate is insulated).

Grounded mains socket mounts and cover plates or mounting bolts are not as prevalent as many of us assume. Knob-and-tube wiring is still used in many older buildings and non-metallic sheathed cable

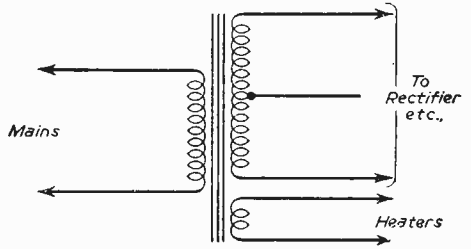


Fig. 1.—The normal A.C. mains input arrangement.

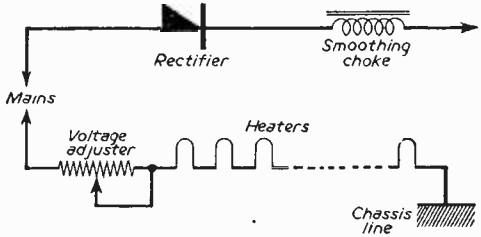


Fig. 2.—The normal D.C. mains input.

without an earthing wire and non-metallic outlet boxes in many newer installations. Therefore, never assume that an earth is available at all outlets. An

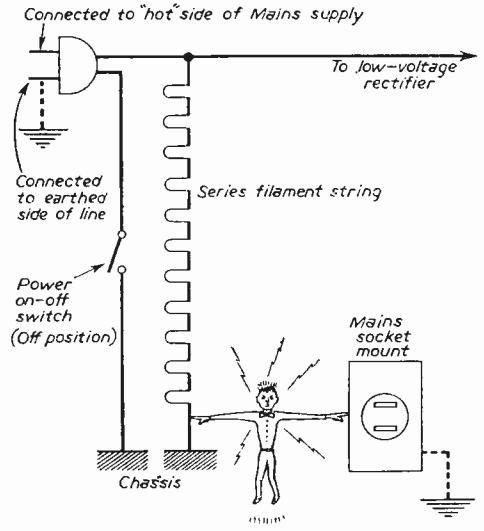


Fig. 3.—Showing how the possibility of shocks exists even with the mains switch "off."

isolation transformer is the safest precaution when servicing transformerless equipment.

A basic precaution, therefore, is to avoid touching any external ground and the chassis at the same time, even with the power off, when the receiver's mains lead is still connected to the outlet and the set. Even better, power should always be turned off by disconnecting the mains lead from the set rather than by using the power switch, before digging into the set.

A related problem is making voltage or signal-tracing checks in the home on an energised series-filament chassis. In such cases technicians often make a voltage check between the chassis and the outlet plate or mounting bolt, using a voltmeter or a neon tester, with the power on. If mains voltage is found on the voltmeter or the neon tester lights, the mains cord plug must be reversed at the outlet. The chassis is now connected to the earthed side of the line when the power switch is on. The recommended procedure for working on an energised chassis. However, this is exactly the connection which makes the chassis "hot" if the power switch is turned off and the mains lead is left connected to the outlet.

In some equipment, the on-off switch is in the "hot" side of the line—the lead supplying the low-voltage rectifier. With this arrangement, the chassis will be "hot" and dangerous whether the switch is open or closed when the plug is inserted one way and at earth potential and safe with the switch open or closed when the plug is reversed. Therefore, it is all the more necessary to follow the precautions noted above when power is turned off for making various other checks.

While some checks must be made with the power on, it is a good policy to keep such checks to a minimum. Valves, for example, should be changed with the power *off*. When checks must be made on a live chassis, use one hand only whenever possible.

In servicing series-filament sets in the shop, a 1-to-1 isolation transformer should be used (Fig. 4). This avoids making the chassis of the serviced set "hot" to external earth or other test equipment.

Technicians may sometimes be called in to service sets in shops or home basements with concrete floors. Such floors are good electrical conducting grounds; they can become booby traps, especially when servicing series-filament sets. When standing on a concrete floor you can get a shock simply from touching the chassis with one hand, even though the power is off (if the "hot" side of the line is connected to the top of the filament string and the switch is in the cold side) or with the power on (if the "hot" side of the line is connected to the chassis through the power switch). Standing on an insulating material and following the precautions listed above will prevent possible shocks between the chassis and the concrete floor.

In the same way a shock can result from touching the arm of an electric record player while standing on a concrete floor, outdoors grass lawn, etc. This occurs if an A.C./D.C. unit is used and the "hot" side of the line is connected to the chassis (and pick-up arm) when the power is turned on. In such cases, reversing the plug in the outlet disconnects the "hot" side of the line from the pickup arm and shock is avoided when the arm is touched. Needless to say, operating an A.C./D.C. record player in areas with conducting floors is not advisable.

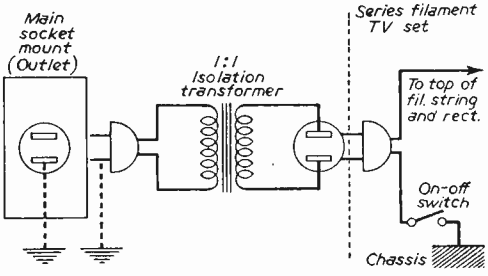


Fig. 4.—A mains transformer removes the chassis from "earth."

When making checks on a live chassis, avoid touching the fuse end. In changing fuses make certain line voltage is not applied to the receiver by disconnecting the set's line cord (or mains lead) from the chassis.

Changing any type of blown cartridge fuse with the power on may provide a nasty jolt if both ends of the fuse clip are touched (or, in some circuits, one end and the chassis). The full source voltage in the circuit is across the open

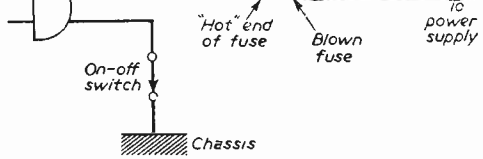


Fig. 5.—Showing how a shock could be received even with a blown fuse.

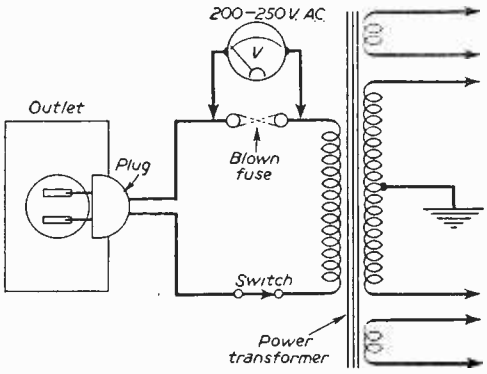


Fig. 6.—The full mains voltage is across the open fuse.

fuse (Fig. 6). By touching both ends of the fuse clip the technician completes the circuit and places his body in series with the other circuit components. The amount of voltage across the body depends on the ratio of body resistance to the resistance of the other elements in the series circuit.

On the basis of the points outlined previously, it may seem that a shock can be caused only when the body or any part of it is placed across the two terminals of a voltage source or when the body completes a break in the circuit with power applied. This is true enough in low-voltage circuits, but there is one additional rule in high-voltage circuits.

Some technicians may be of the opinion that no shock will be felt if a high-voltage point is touched with one hand only, provided nothing else in the circuit or elsewhere is touched and the shoes are insulated from earth—in other words, if contact is made with only one high-potential terminal, not both. *This is an erroneous assumption.* Remember, an arc can be drawn from the anode of a high-voltage rectifier or horizontal output valve with the tip of a screwdriver. No internal or external path to earth is required. For example, when the high-voltage A.C. on the anode is positive, the electrostatic charge attracts an excess of electrons to the tip of the screwdriver, which is held close to the anode, and makes the tip highly negative instantaneously. The resulting difference of potential between anode and screwdriver tip is sufficient to ionize the air between the two points and cause arcover (current flow). When the A.C. voltage on the anode becomes negative and induces a positive potential in the screwdriver tip, current flows in the reverse direction in the arc.

The point to remember concerning possible shock hazards in an energised high-voltage circuit is simply this: Not only avoid direct body contact but keep a respectful distance between any portion of the energised high-voltage circuit and the body.

The more commonly known shock hazards in TV sets are worth listing to refresh the memories of those who know them and to warn off those who have been fortunate enough to avoid them so far.

Familiar Shock Hazards

A glass picture tube retains a charge for a considerable period after the anode connector is removed. Although the shock may be minor, touching a charged tube may cause the technician to drop the tube, swing his elbow against the neck and possibly break it or cause other dangerous secondary effects. It is good practice to turn the power off and short the tube and high-voltage circuits before touching any component in this area. Earthing can be done very simply by using a screwdriver and a test lead with alligator clips at both ends (Fig. 7). One end of the lead is clipped to the chassis, the other end to the metal shank of a screwdriver with an insulated handle. The tip of the screwdriver is then touched several times to the picture-tube anode button and anode connector and the anodes of the horizontal output and high-voltage rectifier (Fig. 8). Low-voltage filter capacitors should be similarly earthed before touching them.

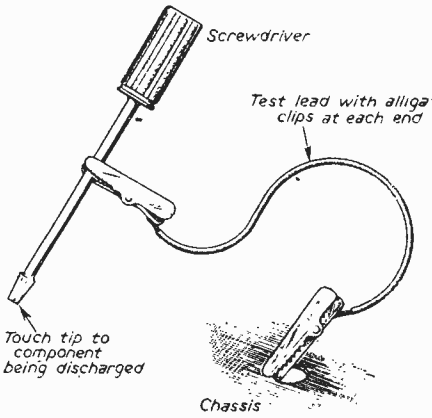


Fig. 7.—A simple method of earthing a charged component.

Sometimes the horizontal oscillator valve is taken out to kill the high voltage in transformer type sets in the course of making various checks around the horizontal output stage. While there may be no high voltage with the power on, there still is about 300 volts D.C. on the anode of the horizontal output valve.

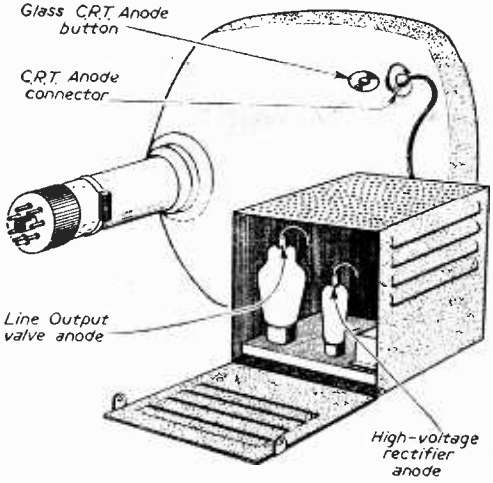


Fig. 8.—Key points to discharge in a high-voltage circuit before servicing.

A common source of shock danger is the large number of exposed H.T. positive points in newer sets. This includes sets with printed-circuit wiring and receivers with many top-chassis check points. Take special care to avoid contact with these points.

Cases of shock have resulted from touching a TV aerial and an external earth, such as a metal pipe on the roof. This occurs in series-filament sets when there is a shorted coupling capacitor between the aerial feeder and the aerial coil in the tuner (Fig. 9). The aerial is connected directly to the chassis through

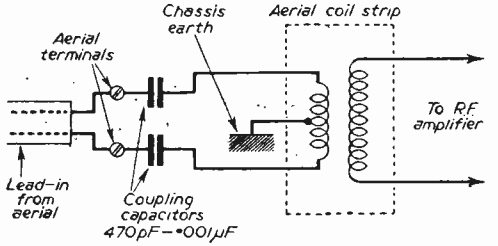


Fig. 9.—A shorted condenser can make an aerial "live" to earth.

the shorted capacitor and part of the aerial coil. The chassis, in turn, connects to the hot side of the A.C. line either directly or through the filament string.

The great danger of putting up TV aerials in the vicinity of high-tension lines, especially if metal ladders are used, is obvious. The risk is deadly. Aerials should never be installed near enough to such lines to make contact possible under any combination of circumstances, either directly or through a falling aerial mast or ladder.

Miscellaneous shock possibilities in a TV set include :

a. A loose deflection yoke cap which may expose high-voltage points.

b. Turning the chassis over with the power on, making it easy to poke fingers into a live circuit and practically inviting a charge.

c. Using a metal screwdriver instead of an insulated probe for tapping suspected parts with the power on. Accidentally touching the screwdriver shank with the finger may result in a shock.

d. Changing valves with the power on, especially if an uninsulated metal picture tube is used in the set.

e. Haphazardly increasing the capacitance of a line filter capacitor in a set using a power transformer. This increases the potential shock hazard of the chassis and should be avoided. The line filter (Fig. 10) connects the chassis to external earth through the capacitor. This places the chassis at ground potential for signal voltages but does not connect the chassis directly to ground for 50-cycle A.C. Therefore, if the chassis and an external earth are touched simultaneously, as shown in Fig. 10(b), only a fraction of the line voltage is applied across the body and a correspondingly smaller shock results. In most cases the shock is not perceptible. The line voltage divides across the capacitive reactance of the capacitor and the body resistance in series. Naturally, the higher the capacitance, the lower the reactance and the more voltage across the body.

Dangerous Voltages and Currents

The amount of voltage which may be fatal to an individual depends on his general physical condition, body resistance and the parts of the body exposed to shock. For example, a shock between the fingers of one hand would be less serious than the same degree of shock between the two hands, causing a current through the chest. Basically, the quantity of current passing through the body determines how dangerously the shock is. This, in turn, depends on the applied voltage and the resistance of the body at the time. One additional factor is the type of voltage, D.C. or A.C. and the frequency, if A.C. Generally, low-frequency A.C. (50-cycle) is more dangerous than direct current.

Body resistance varies widely with different people. When the skin is wet and more conductive, body resistance goes sharply down.

On the basis of these considerations, a 50-cycle line voltage can give extremely uncomfortable but not dangerous shocks to people in good health, wearing normal clothing and with no abnormal conditions of body humidity, or conductivity. As mentioned previously, however, dangerous side effects may result. On the other hand, if the body is wet and a good contact is made with earth (as in a bath or shower), touching the hot side of the mains line may be fatal.

Flyback high-voltage supplies in TV receivers usually have such poor regulation that any excess current drain caused by human contact results in a sharp reduction in output voltage. Here again, the shock hazard under normal conditions is probably less dangerous than possible side effects. This is also true of shocks from low-voltage power supplies

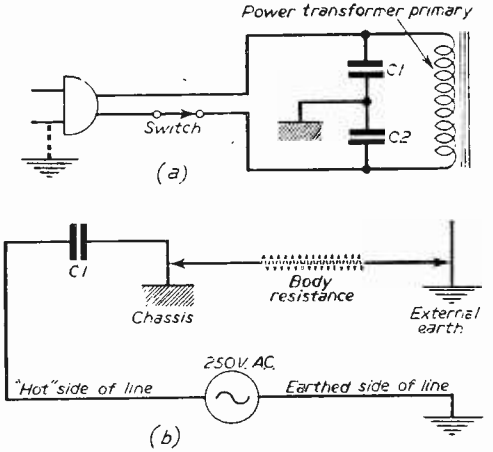


Fig. 10.—Actual and equivalent circuits of power transformer primary with respect to chassis and earth.

delivering D.C. outputs up to 300 volts. The shock is likely to be less hazardous than the reaction to it.

The only sensible approach to the problem of shock hazards in TV servicing is : Use every possible precaution—*don't be a shock absorber* !

A Beginner's Guide to Television

TECHNICAL TERMS (contd.)

By F. J. Camm

Director Transmission

TERM applying to television transmission whereby the image, view or scene to be televised is focused directly on to the scanning device employed by the instrument, as opposed to "indirect" transmitting systems in which the transmission takes place from a photographic image in one form or another.

Duration of Vision

The length of time during which a light stimulus must be given to the retina of the eye in order to set up the sensation of vision. This time-length has not been accurately determined. It is, however, an exceedingly minute fraction of a second, as may be judged from the fact that an electric spark discharged from a Leyden jar condenser has a duration of only 0.000000866 of a second, yet it is plainly visible to the eye.

Emission

In television terminology, as in radio nomenclature, this term usually refers to the emitting of a stream of electrons from the surface of a body, either under the influence of heat, as in a radio valve or cathode-ray tube, or by means of light action, as in a photo-electric cell.

In a cathode-ray tube or radio valve the electron emission is controlled primarily by the temperature to which the cathode or filament is raised and in a photo-electric cell by the intensity of the light acting upon it.

Emitron

Registered trade name of the Marconi E.M.I. television camera, incorporating the principle of Dr. Zworykin's iconoscope.

Extinguishing Voltage

Term used in connection with neon lamps and tubes to signify the voltage applied across the electrodes, which just serves to cause an already glowing neon lamp or tube to be extinguished. Usually the extinguishing voltage of a neon lamp is about 30 volts below its striking or firing voltage.

Fasciculation

The term applied to the manner in which the electrons emitted from the cathode of the cathode-ray tube bunch together.

Field of Vision

The vertical and horizontal range of vision. Normally, in human beings, the field of vision extends to about 150 deg. horizontally and to approximately 120 deg. vertically.

"Fly-back"

Term referring to the extremely rapid return to its zero point of the light spot on the fluorescent screen of a cathode-ray tube following the cessation of the activating voltage. "Fly-back" lines are the short white lines seen when the brilliance control is advanced.

Fluorescence

The emission from certain substances under the influence of light or electrical excitation. As soon as the exciting cause departs, the fluorescence ceases. Calcium tungstate, barium platino-cyanide, quinine sulphate and certain aniline dyes, such as fluorescein and eosin, for instance, are well-known fluorescent substances.

Focusing

The concentration of the electron beam in order to produce a sharply defined, small luminous spot on the screen.

Methods of focusing are classified as follows:

(a) Gas focusing, in which the beam is constricted by its ionising action on traces of gas present in the tube.

(b) Magnetic focusing, in which the electron beam is constricted by means of a magnetic field parallel to the axis of the tube.

(c) Electrostatic focusing, in which the beam is caused to converge by the action of electrostatic fields between two or more electrodes through which it passes.

Focusing Electrodes

Anodes or accelerators or other electrodes to which a potential is applied in order to produce the focusing action on the beam.

Focus Coil

A coil of wire through which a current is passed so as to convert it into an electro-magnet. This is placed round the neck of the picture tube and brings the beam to a focus at the tube face. A permanent magnet is often used in place of the electro-magnet.

Frame

This term applies to the area of the picture as seen on the television screen, and also each of the individual pictures of a cinema film.

Frame-frequency

The number of scannings of the frame by the scanning-beam per second. In interlaced scanning the frame-frequency is an integral multiple of the picture-frequency.

Framing

The process by which that portion of the exploring device upon which the phased image is formed is brought into an allocated relationship with a fixed screen.

Framing Mask

Name given to a sheet of metal or other material having a rectangular aperture cut in the middle of it.

Framing the Image

The process of correctly positioning the image within the bounds of the television screen. This is usually effected by moving deflection coils and/or magnet.

Frequency Modulation

A system which causes the frequency of the carrier wave to vary in accordance with the applied modulating signals. Unlike amplitude modulation, it does not affect the power of the carrier wave ; therefore, for any given power rating of a transmitter the full power is radiated consistently. This results in increased efficiency, reduction of apparatus and operating controls. On the receiving side, it offers a high degree of fidelity of reproduction, freedom from atmospherics and man-made static. It necessitates, for detection or demodulation, the use of three valves in the detector stage, one acting as a " limiter," which ensures that the strongest signal, having a frequency the same as that to which the receiver is tuned, becomes effective ; the second valve is called the " discriminator," and its function is to reduce or nullify any noise (static) or signal other than that required. The third valve is employed as the actual detector.

Fresne Lens

A special optical system used in connection with projection television.

Fringe Area

Name applied to those places which are situated towards the outer limits of the field of reception of a station. Generally applied to those areas in which the field strength is of the order of 100μ V./m.

Gas-filled Cell

A type of photo-electric cell which is constructionally similar to the vacuum type of photo-electric cell, but in which a small quantity of inert gas, such as nitrogen, is admitted before the cell is finally sealed up.

In cells of this type the free electrons which are emitted from the sensitive cathode under the influence of light collide with the molecules of gas existing within the cell, the result being that further electrons are detached from the gas particles. These electrons collide with other molecules of gas, giving rise to a further quantity of electrons, and so the process continues. Hence, in a gas-filled photo-electric cell the electrons which arrive at a positively charged anode are much greater in number than those which were originally emitted from the cathode by the action of light. Consequently, with a given light source, the current produced by a gas-filled photo-electric cell is considerably greater than that produced by a photo-electric cell of the vacuum type. Gas-filled cells, however, are more difficult to operate than are vacuum cells.

Grid

An electrode which does not primarily serve for the acceleration of the beam, but is for the purpose of otherwise controlling the flow of electrons.

Gun

A term which is applied to the electrode assembly of a cathode-ray tube. The anode possesses a central hole or perforation through which the cathode rays are " shot " on their way to the screen at the end of the tube.

" H " Aerial

The general type of television aerial consisting of a dipole and reflector.

Hard Tube

Name applied to a cathode-ray tube which is devoid of any gas filling.

High Definition

A term used to differentiate between the obsolete 30-line and Baird systems, and the modern systems, in which the line frequency is (in England) 405 and France 625 and 819. Even higher line frequency is employed in some countries.

Horizontal Scanning

Term denoting method of scanning in which the scanning spot explores the picture or image to be televised in a series of horizontal lines or " sweeps."

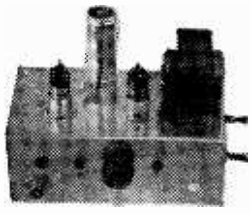
Hunting

A term which, in television parlance, refers to the up-and-down or side-to-side movement of the televised image on the screen.

Iconoscope

A special form of cathode-ray tube used in some systems of television transmission. It is the invention of Dr. V. Zworykin, of America. In place of the usual cathode-ray fluorescent screen, the Iconoscope has a metal plate coated with a light-sensitive material. The image to be televised is focused upon this plate which is scanned by a rapidly moving cathode-ray beam. Each grain of the light-sensitive material on the metal plate acts as a miniature light-sensitive cell, and when acted upon by the cathode ray beam it gives up its charge of current which thereupon flows through an external circuit where it is amplified and transmitted in the usual manner.

(To be continued)



BAND 3 T/V CONVERTER—185 Mc/s - 199 Mc/s

Suitable for London, Birmingham and Northern Transmissions

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

Full range of Band 3 aerials in stock. Adaptors from 7/6 per set. Indoor or outdoor dipoles with 5 yds. cable 13/9. Band 1—Band 3 cross-over filter unit, 7/6. Variable attenuators 6 db—36 db, 7/6. BBC Break-through Filter, suitable for BBC pattern rejection, 8/6.

Volume Controls

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

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

Linear Ratio, 10,000 ohms — 2 Megohms. Less switch, 4,- each.

Coax plugs, 1.2. Coax sockets 1/-. Couplers 1/3. Outlet boxes, 4/6.

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

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

50 OHM CABLE 8d. per yd. ¼in. dia.

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

RESISTORS.—Pref. values 10 ohms to megohms.

CARBON		WIRE WOUND	
20% Type, ¼ w., **3d.** ; ½ w., **5d.** ; 1 w., **6d.** ; 2 w., **9d.**	5w.	25 ohms—10,000 ohms	1/3 1/6
10% Type. ½ w., **9d.** ; **5% Type.** ½ w., **1/-** ; **1% Hi-Stab.** ½ w., **2/-.**	10w.	10,000 ohms	1/6
	15w.	15,000—33,000 ohms	1/9 2/3
	5w.	15,000— 33,000 ohms	1/9 2/3
	10w.		

WIRE-WOUND POTS. Pre-Set Min. T.V. Type Knurled Slotted Knob. All values 25 ohms to 30 K., 3/- ea. 50 K., 4,- Ditto carbon Track 50 K. to 2 Meg., 3/-.

CONDENSERS. Mica or S. Mica. All pref. values. 3 pf. to 680 pf., **6d.** ea. Ceramic types, 2.2 pf.-5,000 pf. as available, **9d.** each. **Tubulars,** 450 v., Hunts and T.C.C. .0005, .001, .005, .01 and .1, 350 v., **9d.** .02, .05, .1 500 v. Hunts, T.C.C., 1/-. .25 Hunts, **1/6.** .5 Hunts, **1/9.** .1, 1,500 v. T.C.C. (Simplex), **3/6.** .001 6 kV. T.C.C., **5/6.** and 20 kV. T.C.C., **9/6.**

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

ALUMINIUM CHASSIS.—**18 s.w.g. Plain, undrilled, folded 4 sides and riveted corners lattice fixing holes. Strong and soundly constructed with 2in. sides. 7in. x 4in., 4/6 ; 9in. x 6in., 5/9 ; 11in. x 7in., 6/9 ; 13in. x 9in., 8/6 ; 14in. x 11in., 10/6.**

SOLON SOLDERING IRONS (200/220v. or 230/250 v.), 25 watt instrument type, **21/6** ; 65 watt Pencil Bit Type, **26/8** ; 65 watt Oval Bit Type, **25/-.** Comprehensive stock of spares available.

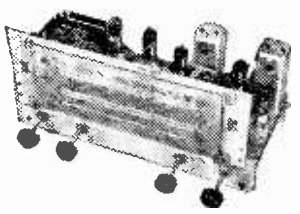
RECORD PLAYER CABINET

Cabinet size, 18½ x 13½ x 11½in., with uncut motor board 13½ x 12½in., **£3.3.0.** carr. 3/6. 2 valve amplifier to fit above, ready wired and tested with 6½in. speaker, **£3.12.6.** carr. 2/6. Record changers available to suit this cabinet.

80 ohm CABLE COAX 8d. yd.

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

SPECIAL — Semi-air spaced polythene. 80 ohm. **Coax** ¼in. diam. Stranded core. Losses cut 50%. **9d. yd.**



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Double wound mains trans. **BARGAIN PRICE 9½ Gns.** Carr. and ins., **4/6.**

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NEW BOXED VALVES ALL GUARANTEED

1R5, 1T4	7/6	DAF96	9/-	EC'L80	10/6
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3S4, 3V4	8/-	DK96	9/-	EF80	10/6
5Z4	9/6	DL96	9/-	EF86	12/6
6AT6	8/6	35L8	10/6	EF91	8/6
6K7	6/6	EABC80	8/6	EL41	10/6
6K8	8/6	EB91	6/6	EL84	11/6
6Q7	8/6	EBC41	10/6	EY51	10/6
6SN7	8/6	EBC33	8/6	EZ40	8/6
6V6	7/6	ECC84	12/6	EZ80	8/6
6X4	7/6	ECF80	12/6	M114	9/6
6X5	7/6	ECF82	12/6	PC84	10/6
7C5	9/-	ECH42	10/6	PCF80	10/6
7Y4	8/6	ECH81	10/6	PCF82	10/6

PCL82	12/6				
PL81	11/6				
PL82	10/-				
PL83	11/6				
PY80	9/6				
PY81	9/6				
PY82	8/6				
U22	8/6				
U25	11/6				
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1R5, 1T4, 1S5, 1S4 or 3S4, or 3V4 ... ... 27/6
DK96, DF96, DAF96, DL96 ... ... 35/-
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SPEAKER IRET.—Expanded Bronze anodised metal 8in. x 8in., 2/3 ; 12in. x 8in., 3/- ; 12in. x 12in., 4/3 ; 12in. x 16in., 6/- ; 24in. x 12in., 8/6, etc.

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16—16/450 v. T.C.C.	5/6	60+100/350 v.	11/6
32/350 v. Dub.	4/-	60+250/275 v.	12/6
32 500 v. Dub.	5/-	100+200/275 v.	12,6
50—50 450 v. B.E.C.	6/6	3,000 mfd. 6 v.	3/6
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I.F. TRANSFORMER—465 kc/s

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MAINS TRANSFORMERS.—Made in our own Workshops to Top Grade spec. Fully interleaved and impregnated. **RADIO AND AMPLIFIER TYPE.** 250 v., 60 ma. F.W. sec. 5 v. or 6.3 v. 1 a. rect. 6.3 v. 2.5 a. set Htrs., **21/-,** etc. **C.R.T. HTR., ISOLATION TYPE.**—Low leakage with or without 25% sec. boost voltage. Ratio 1 : 1 or 1.25, 2 v., **10/6** ; 4 v., **10/6** ; 6.3 v., **10/6** ; 13.3 v., **10/6.** Ditto with mains primaries 200/250 v., **12/6.** Specials to order.

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SCOTCH BOY, EMITAPE, etc., 1,200ft., **30/-.** Long playing, 1,800ft. reels, **45/-.** Paper tape, good quality 1,200ft., **12/6.** Reels only, 5in., **3/8,** 7in., **4/3.**

TWIN GANG TUNING CONDENSERS.—.0005 pf. Midget, **6/6** ; .0005 mfd. Standard size with feet, **8/6.**

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TRS RADIO COMPONENT SPECIALISTS (Est. 1946)

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Terms : C.W.O. or C.O.D. Kindly make cheques, P.O.s, etc., payable to T.R.S. Post Packing up to 1lb. 7d., 1lb. 1/1, 3lb. 1/6, 5lb. 2/-, 15lb. 3/6

Television in 3-D

SOME DETAILS OF ONE OF THE NEW DEVELOPMENTS IN COMMERCIAL APPLICATIONS OF TV

SINCE television has been adapted to commercial needs as distinct from entertainment in the home, many interesting developments have taken place. The miniaturisation of cameras, for instance, resulted from the need of certain manufacturers to have a monitoring device in a confined space, and increased sensitivity in tubes has also to a large extent resulted from the need to use cameras in places where the lighting was restricted. Hospitals are using television to relay operations to students and others who are outside the operating theatre, and here also, colour has been developed to assist in conveying a more accurate picture of what is taking place. The latest development has received quite a lot of publicity in the national Press and is depicted on our cover this month. It is TV in 3-D. Developed by the Marconi company, this was primarily intended for use at the Harwell atomic research station. As many of our readers know, certain processes have to be carried out by remote control, and certain apparatus which is radioactive has to be manipulated inside a screened chamber. Messrs. Savage & Parsons developed a most interesting mechanical arrangement by means of which an operator can carry out operations up to a distance of 5ft. with great accuracy, the first two fingers and thumb of each hand being inserted in clips, and any movement of the hand then provides exactly similar action to two rubber-faced clips inside the cubicle. The movements are conveyed by thin strip steel cables and precision-made gearing, and the accuracy and sensitivity is such that it is possible to take out a match from a match-box and light a candle with the remote "fingers."

However, whilst this provides the necessary control there are certain occasions when it becomes difficult at the distance to judge the proximity of two objects, or it may be necessary that the experiment should be carried out at a distance. Special equipments are at present under development, some of which will be capable of remote manipulation up to distances of half a mile (or more if desired).

Ordinary closed-circuit television has already been tried, but has proved to have limitations in so far as the absence of perspective in the screened image makes it difficult for the operator to judge the distance of the manipulator's "hands" from the objects to be handled. With the stereoscopic television now developed, perspective has been restored and the operator sees what appears to be a solid (i.e., three-dimensional) image.

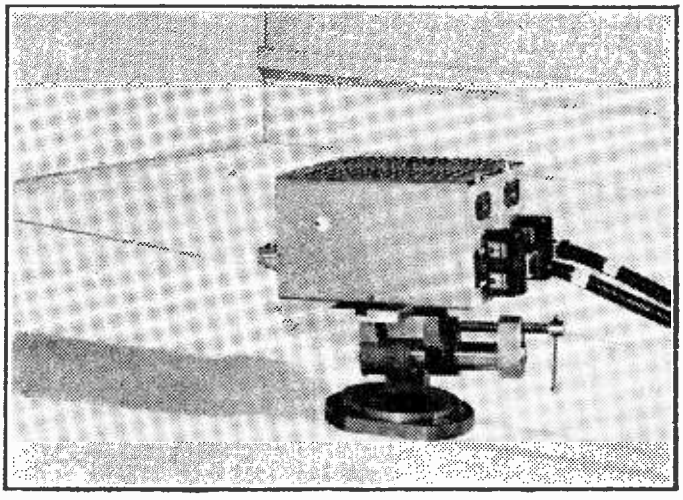
The Marconi stereoscopic camera channel consists of two industrial Vidicon cameras, two control units and two display monitors. The cameras are mounted side by side, with their lines of sight inclined so that they intercept at the "point of interest."

The left-hand camera of the pair (corresponding to the left eye) is connected to one of the monitors, which thus gives a left-eye view of the scene; similarly, the right-hand camera and monitor give a right-eye view.

The two monitors are positioned in a display cabinet in such a way that the pictures are superimposed by means of a semi-silvered mirror. A vertically polarised polaroid filter covers the face of one screen, while the other is covered by a second polaroid filter which is horizontally polarised.

The operator wears a pair of polaroid spectacles and thus on looking through the front of the cabinet, as shown on the cover, the left-hand eye sees the image picked up by the left-hand camera and the right-hand eye the other view. Without the spectacles, of course, a slightly blurred double image can be seen. The two monitors have separate controls and may be adjusted to suit the vision of the operator. In a demonstration which we witnessed we found that the field of view was rather short, but it is understood that this may be adjusted at the camera end to suit the work in hand. For the type of close-up work which was demonstrated and which is illustrated, only a narrow field of view is required and sufficient depth is given to enable the remote "fingers" to carry out their work.

Having started, the process can, no doubt, be developed. As it stands it is, of course, of little use for home entertainment. Apart from the necessity of wearing the special spectacles, the view-point is



The twin cameras used to relay the two views for the stereoscopic receiver shown on our cover this month.

restricted and a crowd would have difficulty in viewing the screen. Apart from which, the two separate receivers take up considerable room. However, a double-gun tube could no doubt be developed to provide the two images, and by using two phosphors with a shadow-mask similar to that used in colour TV it should not be a difficult matter to produce two side-by-side images in red and green. This would then resemble the earlier stereo prints which used to be published and were known as Anaglyphs. Some early 3-D films utilised the same system. This would enable a number of viewers to see a single screen, although they would have the disadvantage of having to wear the special spectacles.

Such a scheme could not, of course, be used for standard broadcast transmissions as it would not conform to the necessity for any system to be compatible. That is, it would be difficult to cut out one of the transmissions for those who did not possess a 3-D receiver. Perhaps, however, such a scheme is not insurmountable.

As a matter of interest it may be stated that the two cameras, double-control equipment and the double monitor used in the demonstration (with 14in. screen) costs approximately £2,500.

BBC Engineering Designs Department

THE functions of Designs Department are to develop and design equipment for use by the BBC which cannot conveniently be bought from outside manufacturers. Close co-operation is maintained with the BBC Engineering Research, Planning and Installation and Equipment Departments.

The Television Group is sub-divided into four sections dealing with transmission, apparatus, recording and measurements. It has been responsible for the design of radio links for outside broadcast use and for the H.F. carrier equipment installed in the coaxial cable system between Broadcasting House and Crystal Palace. The section's work has also included the development of distribution amplifiers, waveform and commentator's monitors, and it was responsible for the design and construction of the one- and two-camera "Roving Eyes." Its experimental O.B. team has carried out special operational projects including successful television programmes from one of H.M. submarines, an aeroplane and a helicopter.

Other aspects of its work include colour television experiments and it is concerned with the development of apparatus to produce the signals required for experimental work on colour equipment and links. The section has made important contributions to the design of telecine apparatus and has produced a 16-mm. suppressed-frame recording equipment. Side by side with this work it carries on a continuous investigation into the fundamental requirements of telerecording and methods for obtaining the best results.

The following is a brief description of some of the many items of equipment produced by the department.

Roving Eye, Mark II

Since the BBC's first Roving Eye was designed and built by the department about three years ago, a great deal of experience has been accumulated. This has shown that amongst its functions it has much more frequent use in doing modest broadcasts such as short inserts into programmes like "Sportsview" and "Panorama," than in doing broadcasts while roving. Roving Eye II, therefore, is designed as a small self-contained two-camera mobile unit, but the facility to rove when required, has been retained.

An additional feature has been added by the inclusion of a 45ft. pneumatically-operated extending mast (see page 488), so that the radio links, which are necessary for roving, can also be used over a considerably increased range when operated from a fixed point. This feature will make it useful for reportage types of broadcasts.

Cameras

The cameras used are Marconi Mark IB image orthicon type, these being smaller and lighter than later models. One of the cameras is brought into its operational position by raising it through the roof. The cameraman stands on a fixed platform, which does not rise with the lift, but which is above the floor level of the vehicle.

The second camera is mounted at the near side front of the vehicle, alongside the driver, and it can look forward through the windscreen or through the nearside window.

Alternative Modes of Operation

For normal outside broadcast operation, both cameras can be used away from the vehicle, to which they can then be connected by cables, which may be up to 1,000ft. in length. Alternatively, the whole of the apparatus comprising the camera channel and sound and vision control equipment can be conveniently removed from the vehicle and set up elsewhere, using a spare cable "harness."

When the vehicle is not roving, the Yagi aerial and also the single whip aerial serving both the transmitter and receiver on Band I can be mounted on a telescopic mast which gives an overall height of 45ft., thereby considerably extending the operating range. A combining unit enables the Band I transmitter and receiver to share the whip aerial, and includes a 60 db rejector to prevent break-through from transmitter to receiver. The range is of the order of two miles when roving, but when standing still and using the high mast, it is of the order of ten miles.

The Radio Microphone

The radio microphone was developed to relieve outside broadcast commentators of the encumbrance of a microphone with a trailing lead. It consists of a miniaturised V.H.F. (F.M.) transmitter and a battery pack, each approximately the size of a packet of 20 cigarettes, associated with a miniature microphone. The aerial consists of a few feet of wire concealed in the user's clothing. With an R.F. output of about ¼ watt, it is believed to be the smallest high-quality transmitter of its power at present available for its particular purpose.

Suitable transistors were not available for the required power and frequency, and sub-miniature valves are used throughout.

Naturally, the transmitter has a limited range, depending upon conditions; it is intended only for short distance operation.

Timebase Calibration

TWO CIRCUITS FOR THE PRODUCTION OF MARKER PIPS IN 'SCOPES

THE calibration of the X timebase of an oscilloscope is an essential feature for measurement of sync. pulse width and many TV waveforms.

The methods generally adopted for the calibration of the X timebase are :

(1) Direct calibration from a knowledge of the sweep period ;

(2) Calibration by means of fixed marker pips produced by a ringing circuit ;

(3) Production of a variable marker pip by auxiliary circuits.

Two types of circuits are suitable. They are the multiar circuit, using a pick-off diode and blocking oscillator, and the Miller-Sanatron circuit triggered by the timebase being used.

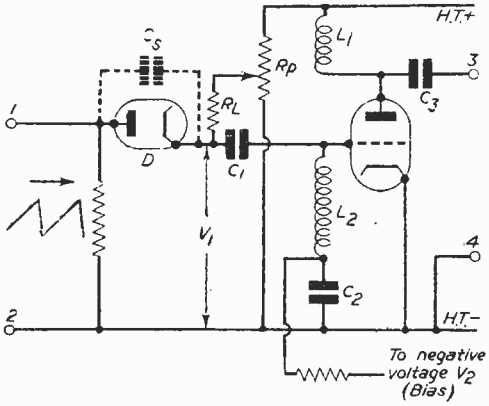


Fig. 1.– Multiar circuit for the production of marker pips.

Method 1.– Figure 1 shows the multiar pick-off circuit and blocking oscillator which may be used to give the variable marker pip. The timebase voltage supplied from the oscilloscope is applied to terminals 1 and 2. The voltage is, of course, of a saw-tooth waveform. The output marker pip is obtained from terminals 3 and 4. The marker may be used on the tube by application to the Y terminals when used as a pip or, alternatively, applied to the grid of the tube to produce a brightening or black-out marker ; in the latter case the marker appearing as a bright or dark spot on the trace.

Operation of the Circuit

In the circuit shown in Fig. 1 the diode D will remain non-conducting until the input voltage becomes equal to the voltage V1 which can be adjusted by the potentiometer Rp. When the voltage between points 1 and 2 exceeds V1 the diode conducts. At the instant when the diode begins to conduct the voltage developed across RL is applied via C1 to the grid of the blocking oscillator. This lifts the grid voltage, which has been previously held beyond cut-off by the negative voltage V2, and the blocking oscillator is excited and produces a single pulse due to heavy positive feedback between anode and grid (L1 and L2 are tightly coupled together on laminated iron core). This pulse, which is used to produce either the brightening, black-out or pip, depending whether the pulse is applied to the grid or to the Y deflection plate, is taken off through C3. Although this circuit may appear more simple than the one to be described below, it is not recommended by the author due to the stray capacity Cs across the diode causing direct feed-through at high timebase frequencies.

Method 2.—Figure 2 shows the Miller-Sanatron circuit which provides the marker pulse as follows :

The trigger pulse for the Miller is obtained by differentiating the leading edge of the saw-tooth waveform of the timebase being calibrated. It is applied to V1 suppressor through D1 and the auxiliary switching valve V2. This initiates the run-down of the Miller in the usual way. During the run-down V2 remains cut off. At the end of the run-down V2 conducts causing the anode voltage to fall rapidly. This fall is differentiated by C1 and R1 giving the desired output marker pip. The position of this pip in time may be changed relative to the start of the timebase in the oscilloscope under test by adjusting the potentiometer R6.

The valve V1 should preferably be one with a short suppressor base in order to ensure correct switching by valve V2. If the control grid base of V2 is shorter than that of V1, the resistance R3 may be omitted since this ensures that the valve V2 is cut-off during the run-down of V1. The total voltage applied to the grid of V2 during the run-down is that between grid

(*Concluded on page* 484)

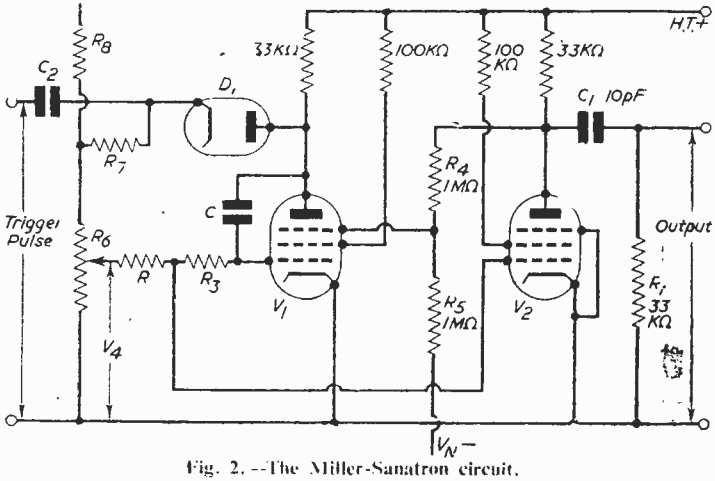


Fig. 2.—The Miller-Sanatron circuit.

Starting a Service Department

NOTES BY A SERVICE ENGINEER FOR THOSE WHO WISH TO START UP A TELEVISION SERVICING BUSINESS

By F. E. Apps

ALTHOUGH a large number of sets can be serviced on site, there are still a considerable number that require servicing in a properly organised and efficient service department. These will include sets with obscure faults and sets that are intermittent at varying intervals. With these sets it is practically impossible to render good service on site and, if it is possible, it is not economic, taking into consideration time and labour. The latter being quite an item in a customer's bill. This article, therefore, proposes to set out a plan for an efficient service department, although of course, circumstances will vary, according to space, labour available and the amount of work handled.

The principles, however, remain the same, whether for a large, medium or small service department, and can be adapted for any.

The Workshop

For the purposes of this article, a medium-sized service department is taken for reference, or a department that will handle approximately 12 television sets a week (for service in the department). Fig. 1 gives a layout which, of course, need not be strictly adhered to, but is only intended as a guide. The main point to observe is that there are positions at the bench for specific jobs. This should be adhered to, otherwise the organisation falls apart. Note the position for unboxing and reboxing sets and arrangements made to ensure safe keeping of bolts, etc., from each individual job. Nothing is more time wasting than having to search around for securing bolts, control knobs, and backs of sets after servicing, and in fact, this often results in sets being returned minus a couple of bolts and probably with the wrong back. If this happens and the customer is critical, it will probably mean loss of further business.

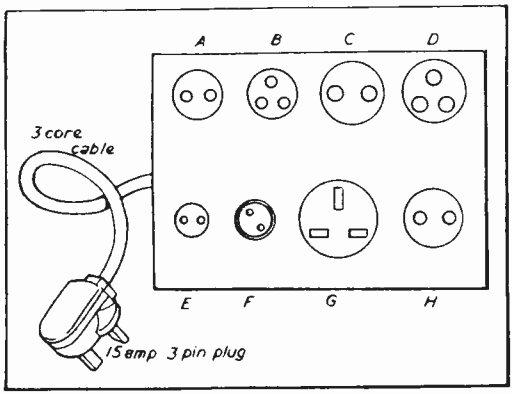


Fig. 2.—Details of a mains distribution board.

A	...	**5 amp., 2 pin.**
B	...	**5 amp., 3 pin.**
C	...	**15 amp., 2 pin.**
D	...	**15 amp., 3 pin.**
E	...	**2 amp., 2 pin.**
F	...	**Lamp socket.**
G	...	**13 amp., 3 flat pin type.**
H	...	**10 amp., 2 pin.**

As shown in diagrams, provision should be made for a blower or vacuum cleaner to clean out sets. This is important. A set returned to a customer in a clean state, looking almost new, will often mollify a customer, who is not pleased at the size of the bill.

Power Points

Provision should be made so that sets can be plugged into power points without having to change the plug on the set. An arrangement is shown in Fig. 2 which should cover all eventualities. This is really worth the cost of making up as it saves time in changing plugs and obviates the set being returned to customer with a wrong plug fitted.

Main Testing Positions

The number of engineers will, of course, depend on the size of the department and the amount of servicing to be done. I have just taken one position only but, of course, this can be duplicated or triplicated as desired. The necessary instruments should be placed on a shelf at the front of the bench, and should include A.M./F.M. signal generator, output meter. An oscilloscope should be at one side of the bench and a C.R.T. with loud speaker and the necessary leads to attach to a chassis, where the C.R.T. and/or speaker are fixed to cabinet. The C.R.T. should, of course, have its line and frame coils on and the leads should be of sufficient length to reach the chassis. In some cases this method is not possible, but it will suffice for quite a number of makes. As it is only possible to have one C.R.T. in position (either a 12in. or 14in.) scanning, of course, will not be correct, but in the case of faults other than this, allowances can be made, and enough picture can be observed to judge whether the fault has been rectified.

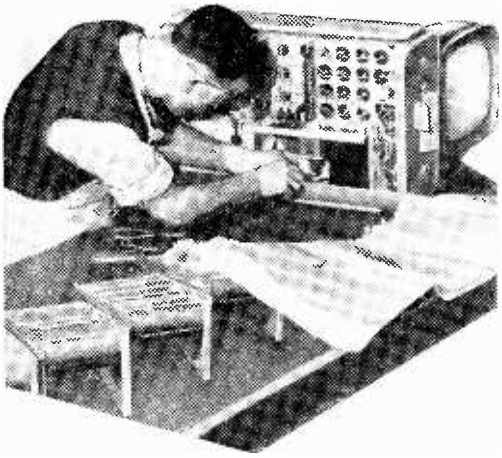
Other Instruments

The following instruments are considered by the writer to be essential to a good servicing bench.

(1) Multi-range meter (20,000 ohms per volt).
(2) EHT voltmeter (to 25 kV).
(3) A.C. centre zero V.M.

Other Essential Accessories

It is necessary to have proper trimming tools for the different kinds of trimmers fitted by different makers. Accurate trimming cannot be carried out with a metallic screwdriver and in many sets accurate



trimming to obtain correct waveform is very necessary to achieve the necessary 3 Mc/s bandwidth.

A few short leads with crocodile clips at each end should always be readily available, as in various operations "shorting" of certain components is necessary.

Organisation of Labour Available

At least one good service engineer will be required, and if possible a young beginner who is learning the trade. A point to note here is that the service engineer is probably getting £14/£15 per week, and as such should be employed on skilled jobs where he will be earning his money. To have an engineer wasting his time unboxing, cleaning and re-boxing sets is uneconomic. This job can be done by the young lad or trainee (having been given complete instructions how to do so). He should be instructed to ask, if in doubt, about any set on which he is working, and also told about how bolts, knobs, etc., of each set are to be kept separately with necessary label attached, stating type and serial number of each set.

Service Records

It is essential that complete records be kept of each set serviced. This can be done by either filing cards or book. Information on cards or in book should give maker's type and serial number, customer's name and address, date or dates serviced, the work and parts involved and the charge made. This record should be kept up to date, otherwise it is useless. A good method is to complete the current entry before the set leaves the department. This record is very useful should a set be returned for servicing within a short space of time. From it one can gather whether a new fault has occurred or if it is a recurrence of a previous fault, in which case it may be the real reason of the failure was not discovered, or it is an inherent fault of this make, in which case there is probably a maker's modification to carry out.

Service Sheets and Information

These are invaluable for speedy service work, saving time that would be otherwise wasted searching for components suspected. They should be kept separately in box files under various makers' names, and should *always* be returned when finished with. It is very handy, if possible, to have circuit diagrams of various makes pasted on a cardboard back for bench work only. This prevents the service data on sheets from being torn or rendered illegible.

Should you be in a fortunate position to be able to receive information of modifications from the various makers, it is advisable to note them on the service sheet and on the circuit diagrams as soon after receipt as possible.

One other very important point. You will find in this journal, in each issue, a list of makers' types, with various faults and the suggested cure. It is advisable to keep these handy for reference: they will probably save your time and money.

(To be continued)

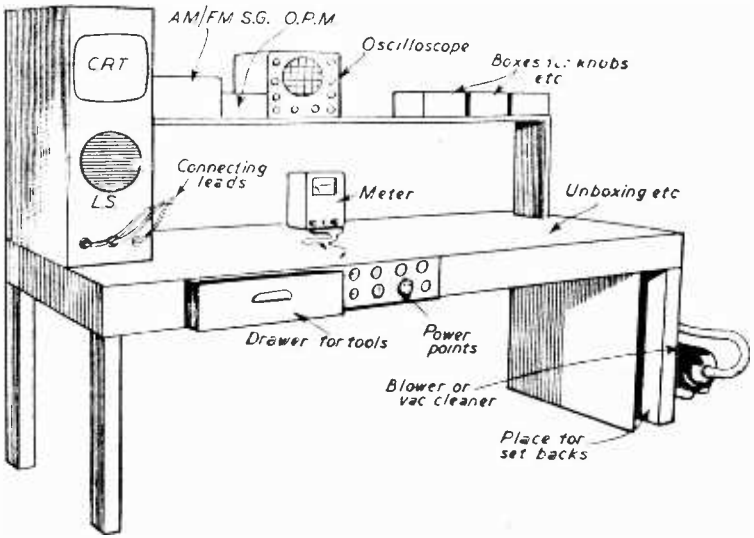


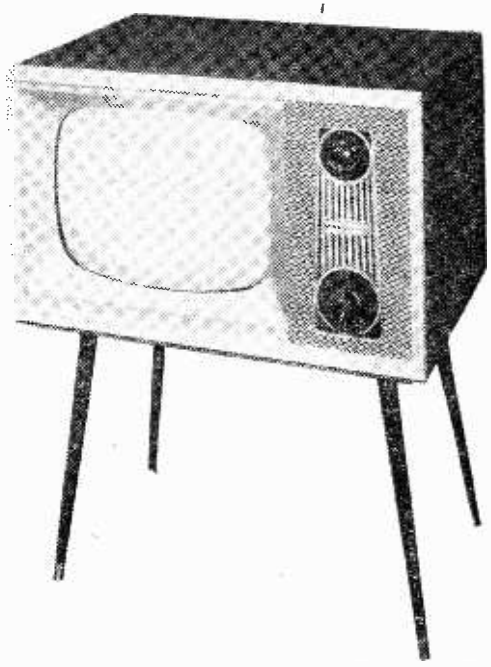
Fig. 1.—Suggested bench layout for a service workshop. The arrangement of the power points below the bench edge may be as shown in Fig. 2, with a 13 or 15 amp. input plug for the mains. See also the article on p. 465.

THE P.T DATA SHEETS

PHILCO MODELS A.1960 AND A.2160

THESE two models utilise an identical chassis but differ in the cabinet finish. The illustration shows Model A.1960 and the view of the chassis is of the same model. The receiver incorporates an 18-valve circuit, including the turret tuner. The latter employs the standard cascode arrangement, and the output feeds a three-stage I.F. video amplifier, the sound receiver being fed from the first of the I.F. stages. The sound receiver has two I.F. stages and the usual rectifier, interference suppresser, etc., with a pentode output stage. Both sound and vision sections use valves and no metal rectifiers are employed in these two sections.

The timebases are standard, a multivibrator being used for the line section and a blocking oscillator for the frame. An interesting feature is that the line transformer and EHT valve are of the plug-in type and thus are readily replaced.



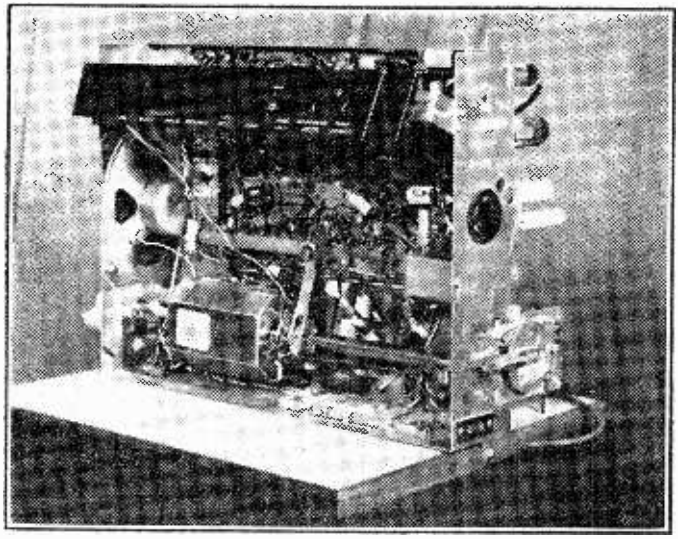
Servicing

One of the most interesting points about this model is the arrangement of the main chassis and the various pre-set controls. In many receivers the latter are arranged on the back of the chassis and a mirror or assistant is required when making certain adjustments. In this series of receivers, however, a wooden panel on the *side* of the cabinet may be easily removed and uncovers a strip which may be seen in the upper part of the illustration below. This carries sensitivity, fine and frame, tone and other subsidiary controls. The illustration shows the chassis in the position it occupies in the cabinet, it is not stood on one edge.

An inspection of the front view above will show that the speaker is "on end" between the main controls. This position of the chassis enables tests to be carried out without removing the chassis, and in many cases certain items may be replaced whilst it is in the same position.

This receiver lends itself admirably to the use of the automatic tuner (the Philcomatic) described on page 458. The view on the left shows this tuner device fitted to the receiver, and below the shaft, which operates this control, will be seen the mains rectifier, which in this case is of the contact type and is bolted direct to the side runner of the chassis.

The I.F.s are 38.15 Mc/s for sound and 34.65 Mc/s for vision. The EHT on the A.1960 is 14.5 kV and on the A.2160 it is 16 kV.



A view of the A.1960 showing the accessibility of parts.

A Televisor From Indicator Unit 62

MAKING AN INEXPENSIVE RECEIVER FROM A POPULAR EX-GOVERNMENT UNIT

(*Continued from page 429, April issue.*)

BEFORE connecting the televisor to the mains, the wiring should be checked thoroughly. Make certain that no contacts exist between the H.T. line and filaments, or between H.T. line and earth.

Turn all controls to zero. Now switch on and wait for the unit to warm up. After about one minute advance the brilliance control until a pattern appears on the screen ; now adjust the focus control until the lines forming the raster are finely focused : next centralise the raster by means of the shift controls.

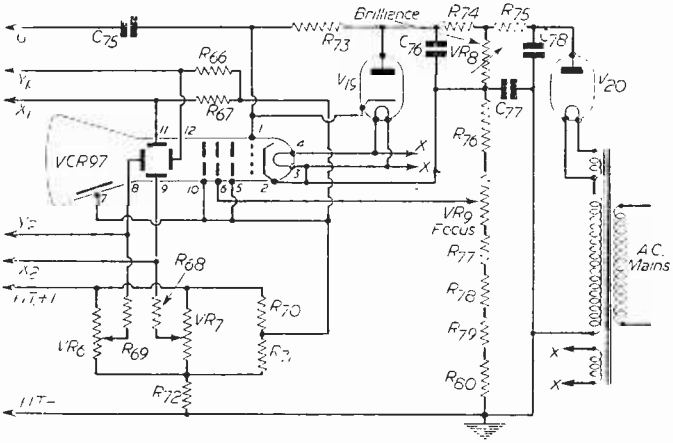


Fig. 6.—Circuit of C.R.T. network.

Receiving Sound

Screw the iron cores until they are level with the tops of the formers. Advance the volume control to maximum position : now adjust L1 and L2 cores until the sound is heard. Bring the sound up to its full volume by adjusting T1, T2 and T3 in that order, reducing the volume control as required.

Should it not be possible to get a peak due to the stray capacitances of the wiring, add half a turn of wire to the secondary of those coils which will not peak when the trimmer is set at maximum without peaking, until the peak point is found.

Receiving Vision

Insert a pair of headphones in the anode circuit of V7 between R24 and R23 and disconnect the lead to the C.R.T. grid. Set all cores level with the tops of the formers ; now turn the contrast control to maximum and the vision signal should be heard. It sounds like a peculiar mixture of 50 cycle hum and motor boating. L1, 2, 3, 4, 5, 6, 7, 8 and 9 are then adjusted for maximum signal, reducing the contrast accordingly.

At the back of the vision signal will be heard the sound programme. Adjust L5 and L8 until the sound is no longer heard. Then readjust L4 and L7 maximum vision signal.

It will be discovered that a peak value cannot be found on some of the coils ; this is arranged purposely so that adequate bandwidth can be received.

Now turn the contrast control to zero, restore the anode circuit of V7 and the lead to "A," reduce the brilliance control so that the raster just disappears ; now, by turning up the contrast control, a pattern should appear on the screen. Turn the "line hold" control in either direction slowly and it will be found that a certain critical setting will resolve the pattern into a picture. Adjusting the "frame hold" will lock the picture in a vertical direction.

If the picture is upside down reverse the connections to 12 and 8 on the C.R.T. If the picture is inside out reverse the connections on 9 and 11 on the C.R.T.

The quality of the picture will probably be very poor, L3, 4, 5, 6, 7 and 9 should, therefore, be adjusted to give the best quality. The contrast control will have to be advanced in step with this operation.

If at all possible, final adjustments should be made on Test Card C.

When the televisor is finally set up, the coils L1 and L2 should be adjusted between the sound and the vision signals. If you have plenty of signal strength in hand, the quality of the picture can be improved by adding damping to the coils. A 4.7 KΩ resistor can also be connected across the vision receiver coils but not across the rejector coils.

V19 (Fig. 6) : General Notes

The cathode of this valve should be connected directly to the grid of the C.R.T. In the unit it will probably be found that the anode is strapped to the grid of the tube, and the anode and cathode leads will have to be reversed.

Although this valve is rated for 6.3 v. heater volts

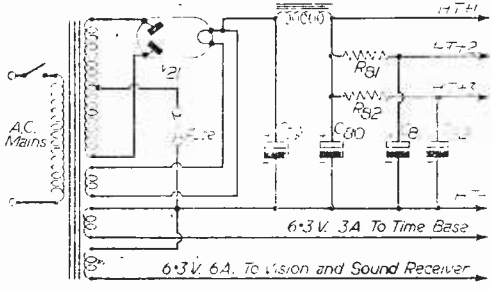


Fig. 7.—Circuit of the power pack.

it performs its function of D.C. restorer although only fed with 4 v. from the C.R.T. supply. This method avoids using a non-standard type of transformer, or the employment of a separate filament transformer with highly insulated windings.

The VR54 valve is an Osram D63 in some units and a Mullard EB34 in others. Either of these valves is suitable although their characteristics differ a little. A 6H6 will perform equally as well in the circuit.

The values given for C60, 61, 68, 74 are quite suitable to provide an adequate scan if the H.T. voltage is over 400 v. Should insufficient scan be obtained 0.1 μF condensers can be employed. Use condensers available from the unit.

Timebase current. Although six SP61s are used (whose normal current drain is 10.5 mA each) it will be found that the actual current drawn is not six times 10.5, but somewhere between 20 and 30 milliamps. The reason for this is because the valves are not working under their normal conditions. Current readings taken when the timebase is in operation can be very misleading.

It has been pointed out that the efficiency of SP61s begins to fall above 45 Mc/s. However, this fact has been taken care of by the provision of an EF50 in a common R.F. stage to boost up the signal. In places close to the transmitter this valve can be omitted.

No claim has been made for this televisor as a long-range receiver due to the fact that the economy called for SP61s to be used. The sensitivity can be increased markedly by substituting EF50s for the SP61s. We believe the Indicator 62A contains EF50s in lieu of SP61s, but have no practical knowledge of this unit and are not in a position to answer questions regarding it.

Due to the fact that long leads are required to the grid caps of the SP61s, it may be found that the stray capacitances necessitate some slight variation (plus or minus one turn) to the coil windings.

C58 has been made variable so as to obtain a greater control over the amplitude of the line sync pulse. If desired, it can be substituted by a fixed capacity one, and the optimum value obtained during the alignment.

The pins of the VCR97 are numbered as follows looking at the tube from the back. Observe the first pin on the right of the top projecting key at about one o'clock. This is pin 1 and the base is consecutively numbered in a clockwise direction from this pin.

The EHT transformer has two 4 v. centre-tapped windings. Transformers of this type are readily obtainable, and if a 2 v. rectifier is used (such as 2X2) one half of one of the windings only is used, the other lead being left free. A 4 v. valve can be used if desired. It is worth while paying a good price for the transformer; it does not matter if it overhangs the end of the chassis.

First TV Train

BRITISH RAILWAYS are to put into service in April what is claimed to be the first train in the world to be permanently equipped with closed-circuit television for the entertainment of passengers. With a coach fitted as a soundproof studio the pictures will be seen on 17in. monitor sets at each end of the passenger coaches. Three loudspeakers in each 64-seater coach will provide the accompanying sound.

All the equipment was designed, and will be installed, by Pye Ltd., of Cambridge, who equipped a similar train experimentally last summer. As a result of that successful demonstration, Scottish Region of British Railways have decided to make the television train a permanent feature.

The order placed by British Railways with Pye is for one industrial TV camera and its associated control equipment, including a 5in. video monitor, 18 17in. sets, and for sound equipment comprising a 4ft. audio rack, four-way mixer, 50-watt amplifier, tape deck and 27 speakers, by Pamphonic Reproducers Ltd., one of the Pye Group of companies.

"This is another British 'first'—nowhere on either side of the Atlantic has it been achieved yet," said Mr. W. J. Kennett, Pye's Scottish representative. "It offers the railways a big chance to increase their revenue, attract new custom and compete with long-distance coaches.

"It also offers us a tremendous export potential, particularly in countries where they have never seen TV; in Africa, for instance," added Mr. Kennett.

The receivers will also be specially mounted at each end of nine coaches so that 600 passengers facing both ways will have a clear view.

Programmes will probably consist of light entertainment and interviews, with occasional views of interesting features of the passing scenery, with a commentary.

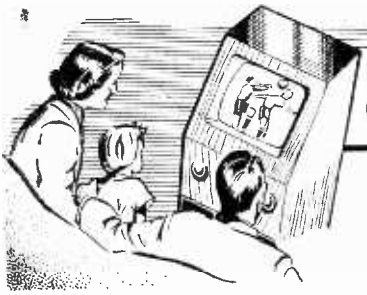
A Gunshot Generator

THE use of firearms in dramatic or variety productions in sound or television is complicated, both from the point of view of safety and from that of producing a realistic sound. Even a theatrical blank cartridge if not fired under closely controlled conditions can seriously overload a microphone and thus produce an entirely unsatisfactory sound.

In an effort to produce a realistic effect for broadcasting, the gunshot generator was evolved by the BBC. It can provide single shots, with or without ricochet effects, or machine-gun fire and does so by entirely electronic means.

A noise generator using a thyratron valve having a considerable "shot" component of anode current is used to produce noise having a bandwidth extending at least from 50 c/s to 10 kc/s. The output of this noise generator, together with that of the ricochet oscillator, is fed to an output gate-circuit which, together with the ricochet oscillator, is controlled by a relay impulser. Depression of the trigger switch causes the relay impulser to convert the variable-duration impulse received from the switch to a fixed-duration, fixed-amplitude positive pulse, or, for machine-gun effects, to a train of pulses each of equal duration, the train having the same duration as the operation of the switch and a variable pulse-recurrence frequency.

The output gate-circuit consists of a pair of push-pull output valves normally biased beyond cut-off. The "gate" is "opened" suddenly on receipt of impulses from the relay and the valves then return to cut-off in an approximately exponential manner. Thus bursts of noise from the noise generator and bursts of oscillations of falling frequency from the ricochet oscillator—if in use—both with exponentially decreasing amplitude, pass through to the output terminals.



UNDERNEATH THE DIPOLE

TELEVISION PICK-UPS AND REFLECTIONS

By Iconos

"SOUR" NEWS

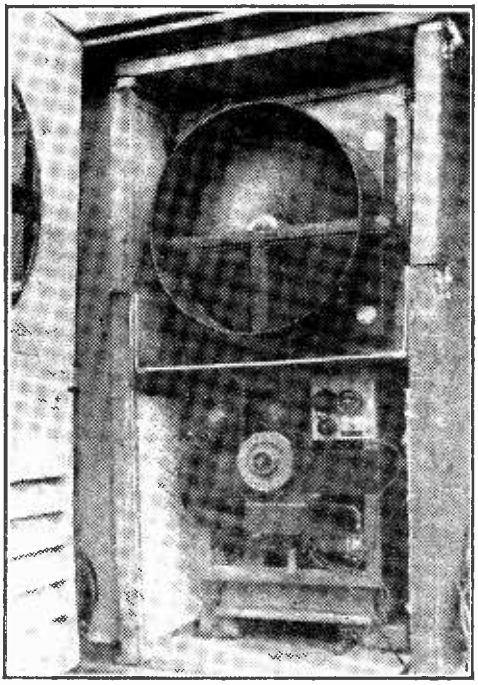
IT is curious that the one item which viewers almost unanimously prefer on I.T.V. is the news. I repeatedly mention this, not to flog a dead horse, but in the hope that the BBC will examine its TV news organisation and presentation with a view to making improvements. Its news coverage is much greater than the little I.T.V. news, and yet the latter gets most of the scoops and puts them over properly. Since I last wrote on this subject, there has been much criticism in Parliament and Press of alleged bias by the BBC TV news editors. I questioned no fewer than 14 of my friends on this point. It so happens that not a single one of them has regularly looked at BBC TV news for some time, and were unable to express any opinion—excepting that they didn't bother with the BBC TV news because it was too "sour." I was comforted by the fact that relatively few of the viewers who can receive both channels were depressed by the BBC TV news presentation, for the simple reason that they don't switch it on. Viewers have come to look upon I.T.V.'s Robin Day and Ludovic Kennedy as their friends.

NOT SO RUSHED

THE BBC, with much more space and far greater facilities, are less rushed in the job of putting on plays and features. It is therefore not surprising that they are able to present musicals, "spectaculars" and elaborate multi-scene plays with greater smoothness and superior technical qualities than the I.T.A. companies operating in London, Birmingham and Manchester. But even the BBC has to hurry along as compared with the makers of first-feature films for cinemas, which have an average shooting schedule of fifty days and are quite satisfied with a weekly screen-time output of about twelve minutes. Compare this with the seven hours of live programmes in a 5-day week from Granada, Manchester, or the 9½ to 10 hours total of live material, the combined efforts of A-TV and A.B.C.-TV from Birmingham. These companies are to be overtaken in the output of live material by Scottish Television Ltd., the I.T.V. programme contractors for Scotland, whose chairman, Roy Thomson, has announced that he will start off with a weekly output of ten hours. Admitting that such a high proportion of local programmes will involve a great amount of programme planning, he claims that this will be possible because of the vast stage space and up-to-date facilities now being installed. "It will certainly make the Scottish station very Scottish indeed in its programme content," he said. Viewers will applaud this worthy aim, but let us hope that those items which are to be networked to southern ears will not have too much accent on the accent!

REGIONAL IDENTIFICATIONS

THE very appropriate umbrella-like dipole trade mark of the Granada TV network is becoming familiar in the south as the number of items from the Manchester I.T.V. Centre increases week by week. There are probably many other items from provincial I.T.V. studios which are transmitted from the London station, but which are not easily identified. This especially applies to several popular features from Birmingham. I think it would be of interest to viewers to know the place of origin, the company responsible and the studio concerned. For instance, in the course of time, an "A.B.C.-TV feature from the Capitol Theatre, Didsbury" might indicate a certain style of presentation and production which is better or worse than a similar feature from the Astoria, Birmingham. Competition between the different studio crews, working as a team, would thus be encouraged; the studio which produces the smoothest and best shows would quickly achieve a reputation. The present anonymity certainly keeps it all a secret, including the name of the studio responsible for those shows which



The rear engine compartment of the new Roving Eye Mark II referred to on page 474.

are mediocre technically and otherwise.

When Associated Rediffusion started off, they had four stages at the Wembley studio, No. 6 was at the Granville Theatre, Walham Green, and stages numbered 7 to 9 were at Television House, Kingsway. For the time being the Granville is closed and two of the studio stages at Television House have not yet been put into operation. Rediffusion started off by identifying the Granville shows. Granada have identified their London TV theatre—still open to the public—as the Chelsea Palace in the excellent *Chelsea Revue*, the first of a series. A-TV have rarely referred to the originating studio, excepting for the Palladium shows, but viewers would be interested to hear whether certain items came from the A-TV television theatres at Wood Green, Hackney or Birmingham. This information would surely be rated more important than the dozens of credits to hairdressers, make-up men, continuity girls, etc., etc., that so often follow TV films from independent makers.

GERTIE MAUDE

FOR some months I have felt that Rediffusion was falling behind the other TV companies as regards polish and smoothness of presentation of their plays. This criticism must be withdrawn after viewing a number of their latest plays, which reach the highest standards in all departments, technical and artistic. *The Giaconda Smile*, which was an adaptation of Aldous Huxley's *Mortal Coils*, was good, but *Gertie Maude*, John Van Druten's play, was better. Both starred the lovely June Thorburn, whose acting abilities have improved so much in the last few months. *Gertie Maude* gave her the kind of opportunity every actress sighs for, a chance to demonstrate the whole range of human emotions in a single scene. In the tragic part of the actress, *Gertie Maude*, June Thorburn attained for herself the full stature of a star.

WINDMILL MEMORIES

THE twenty-fifth anniversary of the opening of the London Windmill Theatre was celebrated at the theatre itself, on the sound radio, at the Trocadero Restaurant after the show, and on BBC TV. The television half-hour was a fine half-hour's entertainment, compered by Richard Murdoch and featuring many of the girls and boys, past and present, who played there. The funniest turn was undoubtedly by Benny Hill and Bob Monkhouse, who were on their very best form—but Peter Sellers made a fine goonish characterisation of the Windmill's stage-doorkeeper. Harry Secombe and Jimmy Edwards appeared in a hilarious serio-comedy vocal act, in which the sheet music became unintentionally mixed up.

TELERECORDING

THE recording of television pictures on magnetic tape by the Ampex Videotape system, reported in this column some time ago, was regarded by many engineers in this country with some scepticism. I must say that I myself regarded with some doubt the claims that really high quality picture recordings could be made, especially with a tape only 2in. wide running at 15in. a second. Good enough, perhaps, for rough recordings for rehearsal or legal purposes—but surely not up to the standard of normal telefilm recordings. A leading TV engineer, returned from U.S.A. in the last few days, has informed me that there have been rapid improvements in quality with this magnetic system in the last few weeks and that he has seen for himself most excellent results on the prototype Videotape machine. This is the stage that has now been reached, and various television organisations are clamouring for production models of Videotape machines. Their introduction will revolutionise the business of telerecording, and when it becomes possible to duplicate these magnetic picture recordings by re-recording—a difficult step to take without deterioration of quality—then picture recording copies will be able to be made quickly and cheaply for circulation all over the world. Nevertheless, it is likely to be some time before the conventional telefilm recording techniques now used by the BBC, A.R.-TV and High Definition studios are outmoded. It is significant that A.B.C.-TV, Granada Network and A-TV have decided to "wait and see" before installing the expensive and elaborate telefilm recording equipment of any type.

"THE BENNY HILL SHOW"

THE success of feature comedy shows depends very much upon the material turned out by the script writers. *The Benny Hill Show* was written by Dave Freeman and Benny Hill himself and turned out to be exactly the right kind of comedy material to show Benny Hill at his best. Naturally, the script gave Benny plenty of opportunities of appearing in thumb-nail burlesque characterisations of a large variety of individuals, such as a fellow-lodger, a barmaid, an American Air Force officer and a schoolmistress.

But the comic highlight of the show was undoubtedly the situation sketch in which Benny Hill shuts himself outside his own front door, which slams as he goes to pick up the early morning milk. The consternation that this leads to, including the arrival of a policeman and neighbours, made a hilarious six minutes.

TIMEBASE CALIBRATION

(*Continued from page 475*).

and cathode of V1 plus that across R3 due to the charging current.

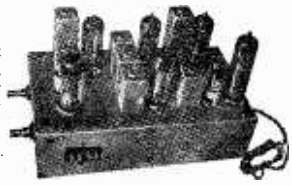
Non-critical Loads

The anode loads are not critical providing the gain from the grid to anode is high. R1 may be made equal to the anode load. C1 should be fairly small (10pF). If too small the output capacity will reduce the amplitude of the pulse. R4 and R5 should be adjusted in conjunction with the negative voltage Vn just to cut off V1. The resistors R8 and R6 set the cathode potential of the diode to some value less than the H.T. voltage limiting the maximum potential to which the anode may rise thus reducing the recovery time. R7 and C2 form the input differentiating circuit providing a sharp triggering pulse.

The main factors governing the rate of run-down and hence the position in time of the marker pulse are C, R and the voltage V4 across R6. This time is given approximately by

$$\frac{\text{high-tension voltage} \times C \times R}{V4} = t.$$

THE I.F. UNIT

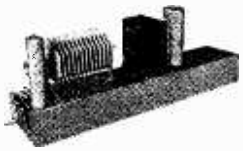


This unit employs 8 miniature all glass valves, the first two of which are common to sound and vision. After separation, sound and vision are amplified separately at 34/36 and 37.5 mc/s respectively. Vision is then detected and passed to two stages of Video amplification, and sound is detected and further amplified by output valve type EL84 to give just over one watt of high fidelity sound.

The circuit employs a variable peak white clipper to reduce vision interference and the second section of the audio detector is used to limit sound interference. The unit which can be driven by any standard 34/37 mc/s curret or other tuner, is beautifully made and contained on a chassis size approx. 8in. x 4½in. x 2in.

The unit with valves made up, aligned and ready to work is available price **£9.12.6.**

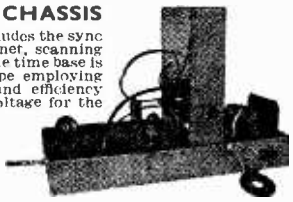
THE POWER UNIT



Intended for A.C./D.C. working with .3 amp. valves, this unit contains all the necessary power components. Rectification is by metal rectifier, smoothing is by a 3 Henry choke, and large electrolytic condensers ensure freedom from hum and a clean picture. The ballast resistor has ample tappings to compensate for H.T. voltage as well as heater current and a thermistor protects the circuit against initial current surges, fuses are fitted in the mains input lead.

There is a front control comprising a double pole on/off switch, this is attached to the sound volume control which, although not part of the power unit, is included for the sake of convenience and symmetry. The size of the unit is 15½in. x 3in. x 2in. It is all wired up and ready to work, price **£3.5.0.**

THE TIME BASE CHASSIS

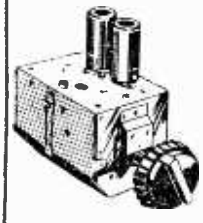


This uses 6 valves and includes the sync separator, the focus magnet, scanning coils and ion trap. The line time base is of the self-oscillating type employing an auto wound O.P.T. and efficiency diode to provide boost voltage for the line fly back E.H.T. transformer which gives about 12.5 kV., the frame time base is multivibrator type, using an ECL80.

The whole unit measures 15½in. x 6½in. x 2in., and the metal work includes tube support for chassis mounting a 14in. tube, but up to 21in. tube can be scanned but will require separate mounting. Price for the unit with valves ready made up and tested is **£12.15.0.**

NOTE

These three units, although quite separate and usable separately, may also be joined together and then comprise a complete T.V. less only tuner unit and speaker (available if required). Demonstrations at all branches—circuit diagrams, etc., 3/6.



TURRET TUNER

Brand new stock, not surplus, with coils for Band I and III supplied complete with valves PCC84 and PCF80—I.F. Output 33/38 Mc/s with instructions and circuit diagram **99 6.** With knobs 3/6 extra ; post and insurance 2/6.

Television Receiving Licences

THE following statement shows the approximate number of television receiving licences in force at the end of February, 1957, in respect of receiving stations situated within the various Postal Regions of England, Wales, Scotland and Northern Ireland.

Region	*Total*
London Postal	1,444,088
Home Counties	810,206
Midland	1,140,147
North Eastern	1,072,431
North Western	980,134
South Western	501,725
Wales and Border Counties ...	383,207
Total England and Wales ...	6,331,938
Scotland	469,334
Northern Ireland	61,962
Grand Total	6,863,234

TV for Gas Board Demonstration

A PYE industrial television camera and three Pye receivers were used to televise the proceedings at Manchester recently, when the North Western Gas Board officially introduced the new smokeless fuel "Phimax," developed by the Board's technologists.

After a speech by the Chairman of the Board (Mr. D. P. Welman) four fires were lit, one burning "Phimax," and the other grates containing other fuels. The demonstration was designed to show the advantages of the new fuel.

The 180 people present included the civic heads of Manchester and adjoining boroughs, representatives of many other interested organisations, and the press and newsreels. Only 40 could be accommodated at the actual ceremony, the remainder watching the proceedings through closed-circuit television on the receivers installed in the demonstration theatre on the floor above.

The equipment used was the standard Pye industrial camera, which measures only 5¼in. by 5¼in. by 10½in. and three 21in. screen receivers.

Nielsen Television Index

TWO more household names have just been added to the steadily growing list of subscribers to the full Nielsen Television Index Service.

The new subscribers, who signed contracts on January 31st and February 1st respectively, are :—

1. The Hotpoint Electrical Appliance Co. Ltd., a member of the A.E.I. group of companies.
2. William Younger & Co. Ltd., of Edinburgh.

Full Nielsen Service incorporates the unique personal analytical and interpretative service indispensable to the profitable use of Independent Television.

Grant of Arms to Brit.I.R.E.

THE Council of the British Institution of Radio Engineers announces that the Institution has been granted Armorial Bearings and Supporters (shown on the right). The Shield of the Coat of Arms makes allusion to the pioneers of radio science, namely Professor James Clerk Maxwell and Heinrich Hertz, while the supporters are those of the 7th Duke of Devonshire, who endowed the Cavendish Laboratory, Cambridge, and of Admiral The Earl Mountbatten of Burma who played an important part in the founding of the Institution and who was President from 1946-48. The shield is surmounted by the head of Mercury, messenger to the gods. In addition a new motto has been adopted, "Scientia pro Hominibus"—science for the good of mankind.

The new B.I.R.E. Armorial Bearings.

February Licence Increase

DURING February the number of television licences increased by 106,049.

14,480,562 broadcast receiving licences, including 6,863,234 for television, and 304,307 for sets fitted in cars, were current in Great Britain and Northern Ireland at the end of February, 1957.

New Midlands TV Weather Service

A NEW TV weather service for Midland viewers came into operation on Tuesday, February

19th, when for the first time an Automobile Association road weather chart was televised from the Independent Television studios at Aston Cross, Birmingham. By agreement with Associated Television Ltd., the A.A. will provide special charts showing prevailing road conditions whenever snow, ice, fog or floods affect roads within a 50-mile radius of Birmingham.

Up-to-the-minute reports of road conditions, received by radio and telephone from A.A. Patrols throughout the area, are collated in the operations room of the A.A. headquarters in Birmingham, and specially-drawn charts prepared for showing in the A.T.V. 10 p.m. news.

The new O.B. van which has been designed by the BBC Designs and Research Section. The mast at the rear is elevated in use to 45 feet.

The object of the charts is to give a general indication of the state of the roads to intending travellers.

Scottish I.T.A. Studios

A CONTRACT to supply all the television equipment for the I.T.A.'s Scottish studios in Glasgow, together with a complete outside broadcast unit, has been placed with Pye Limited.

The studio equipment will be delivered in the early summer ready for the I.T.A.'s Scottish service which is due to open on August 31st this year.

The studio equipment will include four camera chains, three telecine units, 21 monitors, and all the necessary ancilliary equipment for the control room. The O.B. unit will have three camera chains, one with a "zoom" lens attachment.

BBC Permanent Television Station for the Isle of Man

THE BBC announces that, after consultation with the Broadcasting Committee for the Isle of Man, it intends to build the permanent Isle of Man television station at Carnane, near Douglas, on or close to the site of the temporary station which has been in operation there since December, 1953.

It was planned originally to build the permanent station on the top of Snaefell Mountain, from where great geographical coverage could be achieved, but recent tests have shown that there would be reception difficulties in many parts of the Douglas area where viewers are at present getting good reception from the nearby temporary station. It is expected, however, that the permanent station now to be built at Carnane, together with the BBC's station at Divis, Northern Ireland, and the permanent transmitting station to be built at Sandale in Cumberland, will provide a strong television signal to well over 90 per cent. of the island's population.

The necessary approvals to build the station at Carnane are being sought and work on it will proceed immediately. It is hoped that it will be possible to complete it before the end of 1957.

First Scottish Commercial TV Station

GOOD progress has been made with the initial stages of the first Scottish television station of the Independent Television Authority, sited at Blackhill, Lanarkshire. Latest reports show that construction of the transmitter building has been progressing satisfactorily, and the mast has reached a height of 200ft.

Marconi's Wireless Telegraph Company Ltd. are supplying the vision and sound input equipment, the transmitters, feeder cables, mast and aerial array at Blackhill. Installation of the transmitters, comprising duplicated 7½/10kW vision transmitters and 2½kW sound transmitters will begin in March. They are the same type as those which Marconi's have supplied for the existing I.T.A. transmitting stations at Croydon (London), Winter Hill (Lancs.) and Emley Moor (Yorkshire).

The aerial will be a twin eight-stack array mounted on a mast 750ft. high, which will begin radiating as a sixteen-stack high-gain aerial.

Big Advertising Campaign

A LARGE-SCALE advertising drive, their first of the year, was recently launched by Kolster-Brandes Ltd. During the six-week campaign, advertisements for K.B.'s latest TV model, the "New Queen" appeared in national, Sunday and London evening papers and in about 40 top provincials.

The advertisements, mostly 11in. double-column size, are a complete departure from those generally used by other radio and television manufacturers in that this new 17 in. table model, selling at 75 guineas, is described technically as well as for appearance.

The position of Kolster-Brandes as an associate firm within the vast Standard Telephones and Cables organisation is being emphasised to back K.B. reliability claims.

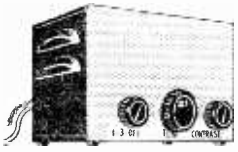
There are eleven pin-pointed technical details used to boost the new model. Among these are "speaking picture realism from front-facing speaker," "improved type deflector coils to give high definition and perfect focus," "printed circuit section for increased reliability," and "circuit employing 16 miniature valves, power pentode valve, mains rectifier, 3 germanium diodes and selenium rectifier."

BAND 3 T.V. CONVERTERS

12 *months' guarantee.* 1/6 *extra C.O.D.*

For I.T.A. London, Birmingham, Winter Hill, Emley Moor, Glasgow. Superhet or T.R.F. State B.B.C. Pattern rejector fitted. All fully wired, aligned and ready for use. All with power pack, knobs, aerial switching, metal rectifier and 2 valves 12AT7. Direct switching from B.B.C. to I.T.A. Fine tuning on front.

DON'T FIDDLE at the back of your set, our converters have rubber feet to stand on top where you can reach.

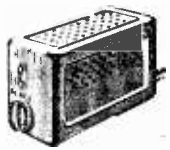


£4.7.6 (p. & p. 2/6)

With metal cabinet as illustrated. Stove enamel grey hammer finish.
Or Walnut cabinet, or Lizard Rexine, **£4.17.6** (p. & p. 2/6).
Or chassis, i.e., less cabinet, **£4** (p. & p. 2/6).
Variable attenuator, 7/6 (p. & p. 1/-).
Aerial Splitter, 8/- (p. & p. 1/-).
Band III Aerials, mast mounting :
3-element, 27/- ; 5-element, 35/- ; 8-element, 55/-.
Low-loss Co-axial, **8d.** yard.
Tinted Perspex Screens (by I.C.I.).
14½in. by 11in., **4/6.**
17½in. by 13½in., **6/6.**
22in. by 17in., **10/-.**
All 3/16in. thick. All 2/- extra p. & p.

HERE IT IS

A SUPERB "ADD-ON" CONVERTER



Designed and made by a world-famous organisation regardless of expense. Tunable over the whole of Band I and Band III to give one Band I and two Band III stations at the turn of the switch. Acts as Two-valve Pre-amplifier on Band I. Valves PCC84 and PCF80. No drift. In Moulded Bakelite Cabinet, 8½in. x 4½in. x 6in. high. With full operating instructions. Built-in Power Pack added by us. Separate gain controls for I.T.A. and B.B.C. Not recommended for T.R.F. receivers, owing to danger of re-radiation by receiver.

£5.12.6 (plus 2/6 p. & p.) C.O.D. 1/6 extra.

SAME CHASSIS also available for mounting inside your set. Full Instructions. Shorting Plug, Valveholder and Screen and Marked Dial supplied. Without Power Pack and without Moulded Cabinet, **£3.19.6** (plus 2/6 p. & p. and 1/6 C.O.D.).

A CHEAPER YET EFFICIENT BAND III CONVERTER in Walnut Cabinet, size 9in. x 6in. x 5½in. Available at **£4.7.6** (p. & p. 2/6, 1/6 C.O.D.). Chassis by another well-known T.V. manufacturer and incorporates Power Pack Valves PCC84 and ECC81. Direct switching I.T.A. to B.B.C.

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PRImrose 9090

FOR ONLY 6d. EXTRA PER ORDER WE WILL INSURE YOUR VALVES AGAINST DAMAGE IN TRANSIT. ALL UNINSURED PARCELS AT CUSTOMERS' RISK.

0Z4	6/-	6AC7	6/6	6F14	14/-	6X5GT	6/6	12Q7GT	8/6	57	8/6	D63	5/-	EC35	8/6	EZ35	6/6	N150	10/6	SP4(7)	15/-	VI307	5/-
1A3	3/-	6AC7M	6/6	6F16	9/6	6Z4/84	12/6	12SA7	8/6	58	8/6	D77	6/6	ECC81	8/6	EZ40	8/-	N151	9/-	SP42	12/6	VLS402A	
1A5	6/-	6AG7	12/6	6F17	12/6	6Z5	12/6	12SC7	7/6	61BT	12/6	DAC32	11/-	ECC82	7/6	EZ41	10/6	N309	11/6	SP61	3/6		£3
1A7	12/6	6AJ8	8/-	6F32	10/6	6/30L2	15/-	12SG7	7/6	618PT	15/-	DAF91	7/6	ECC83	9/-	EZ80	8/6	N329	9/-	TH30C	25/-	VMP4G	15/-
1C2	9/-	6AK5	5/-	6F33	12/6	7A7	12/6	12SH7	5/6	72	4/6	DAF96	9/6	ECC84	12/-	EZ81	10/-	N709	10/6	TP22	10/6	VP2(7)	12/6
1H5	11/-	6AK8	7/6	6G6	6/6	7B7	8/-	12SJ7	8/-	77	8/-	DC90	7/-	ECC85	9/6	GZ30	8/6	OC3	9/-	U16	12/-	VP4(7)	15/-
1L4	6/6	6AL5	6/6	6H6G	2/6	7C5	8/-	12SK7	6/-	78	8/6	DF33	11/-	ECC91	5/6	GZ32	12/6	OD3	9/-	U17	12/6	VP13C	7/-
1LD5	5/-	6AM5	5/-	6H6M	3/6	7C6	8/-	12SQ7	8/6	80	8/6	DF91	7/-	ECF80	12/6	GZ34	14/-	P61	3/6	U22	7/6	VP23	6/6
1LN5	5/-	6AM6	9/-	6J5G	5/-	7H7	8/-	12SR7	7/6	83	8/6	DF96	9/6	ECF82	12/6	H30	5/-	PABC80		U25	13/6	VP41	8/6
1N5	11/-	6AQ5	7/6	6J5GTG	5/6	7Q7	8/-	12Y5G	7/6	83A2	15/-	DH63	8/6	ECH35	9/6	H63	12/6		15/-	U31	9/-	VP133	12/6
1R5	8/6	6AQ8	10/-	6J5GTM	6/-	7Y7	8/6	12Y4	10/6	150B2	15/-	DH76	8/6	ECH42	10/-	HK90	10/-	PCC84	8/-	U50	7/6	VT61A	5/-
1S5	7/6	6AT6	8/6	6J6	5/6	7Y4	8/-	14R7	10/6	210LF	3/-	DH77	8/6	ECH81	8/-	HL13C	7/6	PCC85	12/6	U52	8/-	VT501	5/-
1T4	7/-	6B4	6/-	6J7G	6/-	8A8	12/6	14S7	14/-	807	6/6	DK32	12/6	ECL80	9/-	HL23	10/6	PCF80	7/-	U76	8/-	W76	8/6
1U5	7/-	6B7	10/6	6K7G	5/-	8D3	9/-	19H1	10/-	866A	12/6	DK91	8/6	EF6	10/6	HL41	7/6	PCF82	11/6	U78	7/-	W77	5/6
2A3	12/6	6B8G	4/-	6K8G	8/-	9D2	3/-	20D1	12/7	885	10/6	DK92	9/-	EF36	4/6	HL133DD		PCL82	12/6	U142	8/6	W142	9/-
2P26	4/-	6B8M	4/6	6L1D3	10/-	10C1	15/-	20L1	13/6	956	3/-	DK96	9/6	EF37A	9/-		12/6	PCL83	12/6	U150	8/-	W150	9/6
2U13C	7/6	6BA6	7/6	6L6G	9/-	10C2	15/-	25L6GT	8/-	1203	7/-	DL2	15/-	EF39	6/-	HVR2	20/-	PEN40DD		U152	9/-	WD142	
2X2	4/6	6BE6	7/6	6L7M	8/-	10F1	15/-	25Z4G	9/-	5763	12/6	DL33	9/6	EF40	11/6	HVR2A	8/-		25/-	U153	9/-		10/6
3A4	7/-	6BJ6	8/-	6L18	13/-	10F9	11/6	25Z6GT	9/6	7193	5/-	DL92	7/6	EF41	9/6	KL35	8/6	PEN46	6/6	U154	7/6	X61	12/6
3A5	7/-	6BW6	7/6	6N7	8/-	10LD3	8/6	27	7/6	7475	7/6	DL94	8/6	EF42	12/6	KT2	5/-	PL81	11/6	U251	15/-	X65	10/-
3B7	8/6	6BW7	10/-	6Q7G	8/6	10P13	17/6	28D7	7/-	9002	5/6	DL96	9/6	EF50(A)	7/-	KT33C	10/-	PL82	9/-	U319	7/6	X66	11/6
3D6	5/-	6BX6	10/-	6Q7GT	9/-	12A6	6/6	30	7/6	9003	5/6	DL810	10/6	EF50(E)	5/-	KT44	7/-	PL83	11/6	U329	15/-	X79	12/6
3Q4	9/-	6BY7	8/6	6R7G	8/6	12AH7	8/-	30C1	12/6	9006	6/-	E1148	2/-	EF54	5/-	KT63	6/6	PM2B	12/6	U404	8/6	X142	10/-
3Q5GT	9/6	6C4	7/-	6S7	8/-	12AH8	10/6	30F5	15/-	AC/PEN	6/6	EA50	2/-	EF73	10/6	KTW61	7/-	PM12	4/-	U709	11/6	X150	10/-
3S4	7/6	6C5	6/6	6S7G	6/6	12AT6	10/6	30FL1	15/-	AC/HL/		EA76	9/6	EF80	8/6	KTZ41	6/-	PM12M	6/6	UABC80		XY W10	6/6
3V4	8/6	6C6	6/6	6S8T	6/-	12AT7	8/6	30L1	12/6	DDD	15/-	EABC80	7/6	EF85	7/6	KTZ63	6/-	PY80	9/-		11/6	XFY12	6/6
5U4	8/-	6C9	8/-	6S7	8/-	12AU7	7/6	30P12	13/6	AC/P4	8/-	EAC91	9/-	EF86	12/6	L63	6/-	PY81	9/-	UAF42	10/6	XH(1.5)	4/-
5V4	10/-	6C9	12/6	6S8GT	5/6	12AX7	9/-	31	7/6	AL60	10/-	EAF42	10/6	EF89	10/-	LN152	10/-	PY82	7/6	UB41	12/7	XSG(1.5)	4/-
5X4	10/-	6C10	10/6	6SL7GT	8/-	12BA6	9/-	33A/158M		AP4	7/6	EB34	2/-	EF91	9/-	LN309	12/6	PY83	9/6	UBC41	8/6	Y63	7/6
5Y3	7/6	6CH6	7/6	6SN7GT	7/6	12BD6	10/-		40/-	ATP1	3/6	EB41	8/-	EF92	5/6	LZ319	7/-	QP21	7/-	UBF80	9/6	Y65	10/6
5Y4	10/-	6D6	6/6	6S87	7/6	12E1	30/-	35/51	12/6	AZ31	12/6	EB91	6/6	EL32	5/6	MH4	5/6	QP22B	12/6	UCH42	10/-	Z152	12/6
5Z3	12/6	6F1	15/-	6U5G	7/6	12H6M	3/-	35A5	11/-	B309	9/-	EBC33	7/6	EL41	10/6	MHL4	7/6	QP25	6/6	UF41	8/-	Z63	6/-
5Z4	8/6	6F6G	6/6	6U7	8/6	12J5GT	4/-	35L6GT	9/-	B329	10/6	EBC41	10/-	EL42	11/-	ML6	6/6	QS150/15		UL41	10/-	Z66	20/-
6A8	10/-	6F7	10/6	6V6G	7/-	12J7GT	11/-	35Z3	10/6	BL63	7/6	EBF80	9/6	EL81	15/-	MU14	8/6		10/6	UL46	15/-	Z77	9/-
6AB7	8/-	6F8	10/6	6V6GT	7/-	12K7GT	8/6	35Z4GT	8/-	CK523	6/6	EBF89	9/6	EL84	10/6	N77	5/-	R12	10/6	UU9	8/-	Z719	12/6
6AB8	10/-	6F12	9/-	6X4	7/-	12K8GT	14/-	35Z5GT	8/6	CK525	6/6	EC52	5/6	EL91	5/-	N142	10/-	SD6	12/7	UY41	8/6	Z729	12/6
								41MP	12/6	CV63	10/6	EC54	6/-	EM34	10/-								
								41MTL	7/6	CV85	12/6	ECC31	15/-	EM80	10/6								
								50C5	10/-	D1	3/-	ECC32	10/6	EY51	10/6								
								50L6GT	8/6	D42	10/6	ECC33	8/6	EY86	10/6								

Terms of business :—Cash with order or C.O.D. only. Orders value £3 or more sent post, packing free. Orders below £3 please add 6d. per valve. C.O.D. orders :—Minimum fee, including post and packing, 3/-. We are open for personal shoppers, Mon.-Fri. 8.30-5.30. Sats. 8.30-1 p.m.

We can supply any valve not listed. Phone or send 2½d. stamp for quotation.

All valves new, boxed, tax paid, and subject to makers' guarantee. First grade goods only, no seconds or rejects. All orders received by first post despatched same day. S.A.E. for free complete list with terms of guarantee and conditions of sale.

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).

INTERFERENCE

SIR,—As a keen reader of PRACTICAL TELEVISION and also as a keen amateur radio transmitter, I am very surprised that you have printed so little about the various forms of interference met with in television reception.

Not only interference from R.F. welding, neon signs, and the like, but innocent interference caused by the fundamental from amateur stations. I have no patience with amateur stations which cannot reduce their harmonic output, but an amateur suffering from the proximity of poorly designed TV receivers that seem to accept any signal between 1.8 Mc/s and 144 Mc/s is in a very unfortunate position, particularly as no representations to the set owners by any authority will usually convince them that their set could possibly be at fault.

Surely the fitting of high-pass filters cutting off below 35 Mc/s to 40 Mc/s could be included as an integral part of your very fine designs and of all new commercial designs.

As one who has constructed a number of high-pass filters very cheaply, I cannot be convinced that cost has anything to do with the omission of these filters from commercial sets. —J. S. BENNETT, G3KLC (Stamford).

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.

AN ELUSIVE FAULT

SIR,—Servicing a Marconi VCR52a, I was very puzzled by the behaviour of the frame. There was a fair raster, the picture having a top fold-over and cramped bottom. The height and hold controls had little effect. I traced the frame circuit and everything seemed in order, although I had no means of seeing the main fault at that time.

On removing the grid cap from the frame oscillator valve, the frame did not collapse. I then removed the valve. There was no change! What was going on? I removed the output valve and substituted a new one. There was no frame! I did not know what to suspect. Surely the new valve was not faulty? I replaced the old one and checked voltages. There was nothing on the cathode. The new one showed the normal bias voltage. The old one had a heater-cathode short circuit to the non earthed side of the heater.

Everything was now clear. The valve was picking up a frame frequency from the six-volt A.C. supply and giving a frame of sorts! The oscillator also was not working. The only thing left here was the transformer. I reversed the primary leads and, with the new valve, obtained a perfect picture.

Someone had previously replaced the frame oscillator transformer and wired it in reverse. —W. H. EDMUNDS (Hornchurch).

INTERFERENCE CURE WANTED

SIR,—Having noticed many problems solved by you or a reader, I wonder if anyone in the country can answer the following.

During the winter months we are unfortunate enough (so far as TV reception is concerned) to have a fun fair stationed approximately 100 yards from the house. Furthermore, it is situated between us and the transmitter at Wenvoe. In all fairness to the proprietor, he has suppressed everything possible, with the exception of the "Dodgem cars" which have stumped even the G.P.O. engineers.

The supply is generated, 110 volts D.C. (the fair is mobile), and the root of all evil is the "Dodgem cars." One contact is made by a spring blade on to a chicken wire ceiling whilst the second is made to the metal floor. The spring blade scraping along the chicken wire causes numerous sparks, thus blotting out the picture on about 30 sets in the immediate area. This happens every Saturday evening, the only night of the week when the whole family can get together. Perhaps someone might find an answer or suggest some ideas which we can try.— E. DANIELS S. Wales).

RADAR INTERFERENCE

SIR,—With reference to the letter from your reader in Gravesend, I also get this interference on a T.R.F. receiver; I do not think it is confined to superhet receivers.

Do we need to work so far afield as Iceland for the cause of this trouble though?

This trouble appears to be so widespread that it cannot surely have escaped the attention of the authorities. It seems that they are turning a deliberate deaf ear. Or is there one law for the domestic hair dryer and another for service radar equipment? —I. D. MOFFRAM (Aylesbury).

ONE-WAY GLASS

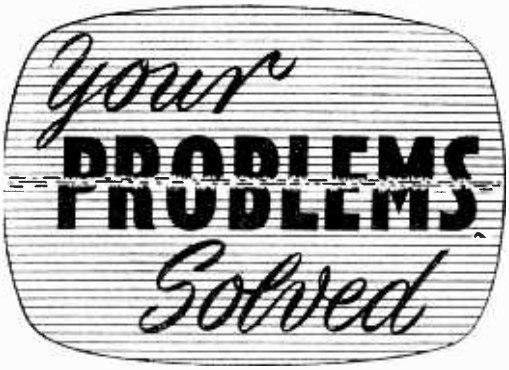
SIR,—We have tried unsuccessfully to obtain one-sided glass as used in the kiosk on ITV programme, "64,000 Question."

May we use your publication in the hope that one of your readers can indicate a source of supply, as we have tried everywhere unsuccessfully.—J. BARRY (Farnworth).

AUTOMATIC PICTURE CONTROL

SIR,—The arrangement of A.V.C. which is now fitted to most television receivers has been termed automatic picture control, but it does not carry out a function which interests me. In my situation I have an outside aerial which was installed when I only had BBC to look at. With the advent of the I.T.A. I bought a multi-element Band III aerial and installed this in the loft. As a result I get a slightly weaker picture (and sound) on Band III than on Band I.

I wonder if any of your many experimentally inclined readers can suggest any way of automatically controlling Band I without too much circuit alteration.—F. GREATOREX (Hendon).



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

DEFIANT 17in. MODEL

I am having trouble with my 17in. Defiant TV set. The defect takes the form of fading after switching on. The picture may be on for 10 minutes and then both sound and vision fades out completely. Some time ago it could be brought back instantly by just touching the trimming screws in the tuning unit. Now it has no effect. I have to switch off and wait for 10 minutes and switch on when sound and vision will be O.K. again. This might take place as many as six times, when it will give no more trouble for the rest of the evening. The tube is now over two years old and the brilliance is not as bright as it was. I mean it is a much softer picture. It does not give the "punch."—David Colquhoun (Glasgow, S.W.1).

It is very difficult to name any particular valve or component and the fault could be caused in any of the first three stages of the receiver. Tapping these three valves and their associated coils and components may quickly reveal the source of the trouble, but it is quite likely that the fault is more obscure and requires systematic tests in order to establish the cause of the trouble. The aerial system and input circuit should not be above suspicion.

EKCO T.141.B

I have a Ekco 12in. table model television, the same chassis as you gave in your May, 1955, No. 9 servicing series, but mine does not have the separate radio part to it. Just the 18 valves. Valves No. 5, 7, 8, 14 and 15 SP41. I wonder if you could please tell me where to look for the following fault :

When the set has been working for approx. one hour both sound and vision go off as though set is switched off. After a time the set comes on again on its own, it will go on and off at intervals all the time, but sometimes it stops on longer than others.—F. Walker (Nr. Boston).

We understand from your letter that the receiver fails completely at intermittent periods. This we take to mean that the valve heaters do not glow and no current appears to be reaching the set at all. This could only be a mains supply fault and the on/off switch should be suspected, as should the mains (receiver) socket connections. If only the sound and vision is lost but the receiver continues to pass current and emit the usual whistle from the line timebase, check the far end valves on the right side and their connections and also the aerial plug, etc.

BUSH TV12A

Further to your letter of January 25th, in reply to mine of the 14th, I have carried out tests as suggested by you (valves PL38, PY31, EF50, small transformer, 120 k. resistor, width control tested and found to be in order) but to no avail.

The picture had collapsed to 1in. in width. I now find also that when the brightness control is advanced the picture increases in width and then fades completely. At this stage there is no filament voltage on valve EY51, e.g., low EHT.

The line output transformer between the anode of PL38 and cathode PY31 is O.K. With regard to continuity, also continuity of the small transformer in the EY51 circuit appears in order.

All components associated with the following valves, EF50, PL38, PY31, EY51 and the rectifying valve P230, have been checked and found to be in order.

As the forementioned trouble appears to be a transformer in the line output stage not detectable by ordinary continuity tests on my meter, would you kindly suggest which of these transformers (3) would cause this trouble and therefore requiring replacement ?—R. Blacknell (S.E.22).

The line output *scanning* transformer is at fault. This is in the rounded can beneath the separate EHT winding. This transformer is easily obtainable, either from a Bush dealer or from Direct TV. Replacements, 134-136, Lewisham Way, New Cross, S.E.14.

H.M.V. 1808

Please would you assist me to find the fault with my TV receiver ? I have an H.M.V. 1808, passed on to me but not in full working order. I found glass envelope on V.10, Osram U.35, was cracked. This was replaced, and after a few checks sound came through at good strength with a slight buzz but no vision. Tube face did not light up and no raster, also no line whistle was heard. Sound was only possible with contrast turned to extreme right.

I have been able to acquire a service sheet and all voltages are reasonably correct. Have checked line transformer for breaks, also resistance ; these seem to be correct.

C25 and 26 were replaced. This cured the slight buzz on sound. Line and frame coils showed a voltage reading, but no spark was present at C.R.T., and could not get any voltage measurement on meter using Taylor 77 amp., at 3,000 volt. position. Since starting investigations tube heater has failed and I have been offered a 12in. G.E.C. 7101A, but I cannot find any data as to voltage and current. Present tube is 13 volts, 0.3 amp. This is a series set.

EA50, V.13, is shown on the sheet on the R.F. section of chassis but cannot locate this on the set, but I do not think it has any bearing on the trouble as it appears to be in sound section.

I have been reading Servicing Series in "Practical Television." 1954, and it would seem that B.36 is

(Continued on page 495)

the chief offender, but I do not wish to buy valves needlessly.

Should the G.E.C. tube be usable, what base alterations are necessary ? Present tube is B-7-B.—E. Purkiss (W.12).

You should check the 25 kΩ horizontal hold slider element. This is probably fractured.

If the control is in order and the resulting positive voltage is being passed via the 330 kΩ resistor to the blocking transformer, check the windings of this transformer and if in order replace the B36. The G.E.C. 7101A is a 12in. tube with a .3 amp. heater (the voltage is not important, but is 6.3 volts).

It has an international octal base and an external conductive coating requiring a chassis connection. It will perform reasonably well in the 1808. The EA50 is replaced by a small red and black metal rectifier on the front end tag strip (under chassis).

COSSOR 925

Whilst viewing the other evening, the picture was partially obscured by two further pictures overlapping the first picture. I attributed this primarily to time-base trouble, but have had no success in locating same. Could you, therefore, assist me to find the trouble ?—H. A. Cross (Dover).

Unfortunately you do not state whether the multiple pictures are one above the other or side by side. In any event, change the 6SN7GT (beneath tube) and if the fault continues and the pictures are one on top of the other, check the 2.2 MΩ resistor in series with the centre contact of the vertical hold control. If the pictures are side by side check the resistor in series with the horizontal hold control.

ULTRA VT9-17

Until recently, about 45 seconds after switching on the picture would appear at its full brightness, but now after the same time lag, the picture appears on the screen but is barely visible and about ½in. short top and bottom. During the next 1½ minutes the picture slowly comes up to its full brightness and size and remains perfect during the whole time the set is on. Can you suggest a reason please ?

Another slight fault which I have noticed for a longer period, is that it is sometimes impossible to remove the picture from the screen by fully reducing the contrast control, both on Band I and Band III. —E. W. Tribbick (Winchester).

We would advise you to change the U801 H.T. rectifier. This will no doubt result in a full-size picture resolving in the normal time.

With reference to the restricted range of the contrast control, check the 2.2 MΩ resistor in series with the centre tag of the control and pin 5 of a 20D1 valve. If the resistor is in order check the PCC84 valve (the control grid of which sometimes becomes positive with respect to chassis).

SOBELL MODEL T224

Without any warning the picture of this set suddenly shrank to 2in. wide, and then for a second or two there were two pictures superimposed on each other about 1in. wide, after which a thin horizontal line appears. I have checked frame transformer and frame oscillator transformer, and there are no shorts. Also, I have changed frame-oscillator valve ECL80 for a new one, but no improvement.—J. Emmerson (Rochester).

Check the continuity of the frame-scanning coils and then the resistors associated with the framehold and height controls, and the controls themselves.

PYE VT4

I have a Pye TV receiver, model VT4, and I have lost the vision and no illumination of the screen. On testing I find no H.T. ; EY51 checked and O.K. (heater does not glow) ; PL81 checked and O.K. ; PY81 checked and O.K.

Can only now suspect line transformer. Is it possible to test this ? Would like a diagram, if possible, and resistance of windings to check against. Sound on the set is perfect. Picture was perfect when the fault developed, but two days before breakdown some distortion of the picture took place. Interference went cross the screen.

I can hear line whistle and this varies on altering line hold control.—R. F. Dunning (S.E.23).

The line output transformer appears to be at fault, and there is no way of checking this by normal means (the windings will appear to be in order, if tested).

We would advise you to obtain a new transformer. A service sheet is not necessary. All connections can be made from above and provided these are clearly marked when removed, no difficulty should be experienced.

SOBELL TS17

When I switch the set on the picture comes on very faint and after a period becomes clear. After a time the picture and screen goes blank and then after a brief period back comes the picture. This sometimes happens two or three times during the evening, but again at times the picture is O.K. all the time. I have replaced eight of the valves—the following : PY82, PY81, PL81, ECL80, EB91 and the three EF80s. The picture tube has been tested with a meter and has been cleared, so please can you give me some idea as to what this annoying trouble is?—T. Harris (East Ham).

Remove the aerial plug from the receiver, turn down the contrast control and advance the brightness until a raster (illumination) is secured. If when the fault occurs the brightness of the illumination of the screen diminishes or disappears completely and cannot be restored by further advancing the brightness control, suspect trouble in the EHT circuits. Check for EHT and, if necessary, replace the EHT rectifier valve. Suspect an intermittent fault in the tube.

FERGUSON 978

My fault is an inch blank space at the bottom of the screen and about ½in. at the top, the height control being fully turned up. I changed the 470K (it made no difference), so I bought two new ECL80 valves ; it made it a little better, but still not right.

When I switch the set on (from cold) the picture is 1in. from the top and 2in. from the bottom. As it warms up it slowly fills the screen top and bottom, but when it has been on for about half an hour a blank space starts at the bottom and when it is about ½in. a blank space starts at the top and then the picture closes inwards until it is ½in. at top and 1in. from the bottom, this after the set has been on for about five hours.

When I switch the set off and leave it for an hour, and then switch on again, it does not fill the screen the

same as when I switch on from cold. It opens out about ¼in. from top, ¼in. from bottom, and then when the set is warmed up it starts closing in again.

Another thing is that I have moved the vertical lever on the neck of the tube as far as it will go to the left, so as I can even the spaces top and bottom. If I move the lever to the middle, the picture is O.K. at the top, but 2in. at bottom.

The width of the picture is all right, but some nights there is a thin blank space down each side of the screen, and when that happens the blank spaces at the top and bottom are worse.

The picture itself is good, but when people are on the heads and bodies are right, but the legs are short. I can see the raster line start at the top, but at the bottom the line spaces close up until it goes into a bright line—at the top of the blank space at the bottom of the screen.

My set is working on 220/230 volts with 228-volt mains.—N. Holden (Smethwick).

This sympton is nearly always caused by a fault in V12 or V13, the frame timebase ECL80 valves. It is sometimes necessary to try several valves and select the one which gives best results, bearing in mind that the symptom to a small degree occurs on most specimens as the result of increase of resistance of the frame coils as the temperature in the receiver rises.

Other causes of the trouble are : value alteration of R44 or R47, value decrease of C49, and poor insulation resistance in C46.

STELLA ST6414U

The receiver is a Stella ST6414U operating on Band I, Channel 3, Norwich.

I would be pleased if you could give me some details of a type of filter required to cut out V.H.F., i.e., number of turns and values of condensers and whether you would consider it satisfactory wired on to the aerial input panel or whether a filter may be required at the aerial itself as well.—C. D. Bedford (Leicester).

The Stella is probably responsive on Band II as the result of the second harmonic of its local oscillator heterodyning with the interfering signal and giving rise to the vision and/or sound I.F.

We regret that we are unable to supply constructional details of a filter, but the trouble can usually be overcome by the use of a simple stub rejector consisting of a section of coaxial feeder cut to the appropriate length and connected to the aerial input of the receiver. The interference investigation section of the Post Office are willing to assist with matters of this kind.

P.T. CONVERTER

I have built the P.T. converter, but so far have had no signal. When switched to Band III, Band I sound can be heard at varying strength when the core of coils 7 and 8 is moved up or down. I have checked the circuit and the valves are new. I am certain the coils are wound right. My H.T. supply from a separate power point is 175 volts. Is this enough ? Moving the core of the coil L6 has no effect on the screen, neither has any of the others. The set I have is a Murphy V204. I have recently changed the sound-output valve (6P25), as the sound during the evening tended to die away and focus blurred. The sound is now O.K., but I still have a black border round the picture approximately ½in. Sometimes this tends to right itself, but more often it does not.

I have a circuit diagram. Could you please advise me what to do? The only instrument I have is an A.C./D.C. multi-range meter.—P. Jackson (Leamington Spa).

Make sure that sufficient Band III signal is being applied to the converter for successful operation. In this respect check your aerial system, preferably on a receiver (or converter) known to be working on Band III.

If all is well in this connection and you are certain that the unit is properly wired and designed according to the instructions, suspect misalignment of the local oscillator. In case of difficulty in obtaining a suitable instrument for checking this, your dealer may be willing to align the unit for you for a small charge.

G.E.C. BT1746

The set uses a Mullard MW36-24 tube and I want to change this with a type MW36-44.

Can you say if this is possible and what changes, if any, will be required to the base connections, please ? —J. Teale (Leeds).

This substitution would probably prove successful, though no definite information is available in this respect with regard to your receiver. The MW36-44 features a filter screen and generally requires more E.H.T. voltage than the original tube to give the same brightness of picture. The second anode is connected to pin number 7 and the third anode is brought out to the side connection for application of E.H.T. The first anode is connected to pin number 10 as the original tube and the remaining connections are also the same.

PYE LV30

I have replaced, firstly, PL38, then PZ30, but am now experiencing fuse blowing at rear of receiver. The PZ30 flashes in its interior prior to the blowing, and has indications of a short-circuit possibly. Can you suggest a further replacement regarding a condenser or resistance to correct this fault ?—F. C. Dunster (S.W.19).

Check the condition of the main electrolytic capacitors, as the increased output of the new valve may now have provoked failure of these. Also check the condition of the surge limiting resistors in the PZ30 anode circuits. Ensure that the replacement valve is in good condition.

G.E.C. BT5145. C.R.M. 121A

I have purchased a TV set second-hand, and with the exception of the under-mentioned defects it is not too bad. The C.R.T. is being run from an isolating mains transformer on 2-volt A.C. tapping.

My mains here being just under 200 volts A.C., the round fibre focusing screw has to be turned full out towards tube base.

1. Defect. Viewing can only be in darkness.

2. The horizontal lines are cramped at the bottom, faint, and finally disappear at bottom of screen.

3. Left side of screen, border of test card C non-existent.

The heads of speakers on the screen are elongated.—H. Turner (Southsea).

The vision R.F. channel is oscillating. Check the condition of the associated valves and decoupling capacitors. Check the alignment.

SETS & COMPONENTS

BRAND NEW. RF26, 27, **27/6**; RF24, 25, **10/6** (post 2/6). I.F.Amp.178, 13 mcs., with valves (used), **15/6** (p. 2/6). Indicators, 62A, 21 valves, good cond., **55/6** (carr. 7/6). 1FTs, 10/13mcs., canned, new, **1/3**. Metal Rectifiers: 240v 30mA **3/6**, 600v 30mA **6/-**, 1,000v 30mA **7/6**; 500v 500mA **10/-**. Wafer Switches: 1 pole, 11 way, 2 bank, 6p., 2w., 4b. **3/6**; 3p., 3w., 3b.; 4p., 2w.; 11p., 6w., 5b.; 2p., 6w.; 1p., 8w.; 1p., 1w. Chokes, LF, Ferranti screened, 10H, 120mA **7/6**, 10H 200mA **8/6**, 5H 200mA **4/6**, 10H 60mA **4/6**. R1155 Tuning Drives, "N" type, brand new, **10/-**; Muirhead SM Drives, 4in., 0/100 dial, **7/6**. HF Chokes, Eddystone type, 4 pie, **1/6**; dual coil, **1/3**. Belling 5 and 7 pin plugs-skts., **1/6** pair. Good Valves: EF50, 6AC7, EF36, EF39, VR65A, each **2/6**. Terms: c.w.o.; immediate despatch. S.A.E. for lists/enquiries. W. A. BENSON, 136, Rathbone Rd., Liverpool, 15.

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I.T.V. CONVERTERS from **£3/19/6**, self-contained, guaranteed. H.P. without fuss. Aerials from **14/6**. Trade enquiries invited. G. A. STRANGE, Dept. P, North Wraxall, Chippenham, Wilts.

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TELEVISION, 9in. models, **£7/10/-**; 12in. models, **£15**; all makes; working; carriage paid. TOMLINS, 127, Brockley Rise, Forest Hill, S.E.23.

GUARANTEED TELEVISION, 12in. models, first-class picture, 5-channel, **£26** each, carriage paid. THE GRAMOPHONE SHOP, 19-21, Brockley Rise, Forest Hill, S.E.23.

TELEVISION, 12in. Televisions, **£13/10/-** each, carr. paid. TOMLINS, 127, Brockley Rise, Forest Hill, S.E.23. (FOR 5497.)

5-CHANNEL TELEVISIONS: 12in. screen Ferguson 988, Ekco 161, etc., **£25** each. A good selection of 12in. T/Vs (London), 100% condition, from **£15**; 9in. from **£7**. Also 12in. T/Vs, slight faults, from **£7**, 9in. from **£4**. TYLER TELEVISION, 63, Lee High Rd., Lewisham, S.E.13. (LEE 5979.)

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ALL TYPES OF VALVES REQUIRED for cash. State quantity and condition. RADIO FACILITIES LTD., 38, Chalcot Road, N.W.1. (PRImrose 9090.)

WANTED, Valves EY51, 6CH6, 10F1, PL81, KT61, 6F1, FW4/500, 20D2, 20F2, 10P14. Prompt cash. WM. CARVIS, LTD., 103, North St., Leeds, 7.

VALVES

BRAND NEW guaranteed Valves. 6SL7GT, 6SA7GT, 5U4G, **8/-**; 6SJ7GT, 6SN7GT, **7/6**; 6B4G, 6SK7GT, **5/6**; 2X2A, **4/6**; 6H6, **2/6**; many others. Ex new Receivers. Condensers and Resistors. Mica, Silver Mica, Micamold, Ceramic, etc., some short ends but mostly on tag boards, fine mixture of useful values, 100 for **8/-**; s.a.e. for list, etc. H. W. JAMES, 175, Brettenham Rd., Walthamstow, E.17.

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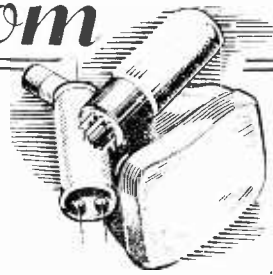
MATHEMATICS RADIO/TV COURSE of 6 lessons **21/-**, single **4/-**. TUTORIAL MATHEMATICS, 200, Buchanan St., Glasgow, C.1.

News From the Trade

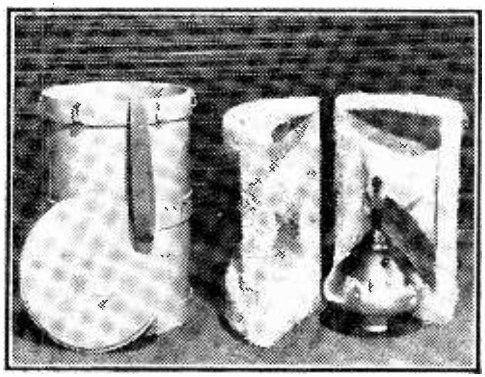
New Safety Pack for TV Tubes

A NEW packaging technique which ensures the safe transit of fragile cathode-ray tubes and magnetron valves has been devised by Venesta Limited, the leading packaging concern, in conjunction with Evans Bellhouse Ltd., manufacturers of "KEB" wood-wool packs.



The basis of the new technique is a specially-designed Venesta plywood barrel, fitted with "KEB" packs moulded both internally and externally to save as much weight as possible while maintaining maximum protection.

The barrel used is of 4 mm. plywood and measures



The new packing for TV. tube transit by Venesta

31½in. deep by 19in. diameter. It has 3in. external double bands at the top and 3in. external single bands in the middle and at the bottom. Internal 2in. lining hoops are fitted in the bottom of the barrel, while the barrel-top is held securely in position by six patented Griffith fasteners. The barrel is treated internally with Cuprinol weatherproof coating.

Moulded wood-wool of a suitable density, treated with formaldehyde, which prevents mould growth, is used for the two-piece interior liner.

The principal user of the new-style pack is the Ministry of Supply, on whose behalf A.C. Cossor Ltd. manufacture and pack the cathode-ray tubes and magnetron valves. Completed packs are sent to the Ministry of Supply depot at Malvern, from whence they are shipped to destinations in Britain and abroad for use in a wide variety of electronic equipment.

In this connection, so successful has the new pack proved that experiments are now being conducted into its adaptation for packing a number of other fragile products, particularly those which are sent overseas.—Venesta, Limited, Vintry House, Queen Street Place, London, W.1.

Aerialite Trilead Triplexer

THIS three-band filter is primarily intended either to combine the signals from separate Band I, II and III aerials, for use on a receiver with a common input socket, or to separate the signals from a combined aerial for use on receivers with separate input sockets.

It is provided with clamps and terminals for securing the separate cable downleads and has an aerial socket for connection to the common output lead. The filter is intended for indoor mounting on wall, window-sill, or skirting board. The length of connecting leads to or from the filter is not critical and may be as long or short as desired or convenient.

Band I and Band III filters are broad band, low pass and high pass, respectively, and function without adjustment over all channels in these bands with a negligible insertion loss. The Band II filter is a series resonant circuit with a response wide enough to cover the entire F.M. band, again without adjustment and with negligible insertion loss.

The filter may be used in a variety of ways with combined aerials (e.g., twin band arrays) or with combined TV and F.M. aerials, or alternatively with receivers on which the F.M. and TV sockets are separate.

This Triplexer retails at 13s. 6d.—Aerialite Ltd., Hargreaves Works, Congleton, Cheshire.

Taylor 'Scope, Model 31A

THIS oscilloscope is of a particularly robust nature and has been designed primarily to meet the requirements of television and radio service work, but its versatile features and advanced performance make it also very suitable for use as a general purpose instrument.

A flat-faced cathode ray tube 4in. diameter is utilised. A hard valve timebase is provided covering the wide range of frequencies from 10 c/s to 500 kc/s and can be operated either free running or triggered. Horizontal and vertical amplifiers with push-pull output are provided. The latter is of high gain and has a frequency range extending from a few cycles per second to 6 Mc/s, while both amplifiers have outputs corresponding to several screen diameters.

These features make it readily possible to examine all kinds of waveforms, including pulse types of short duration and also to extend them for detailed examination. —Taylor Electrical Instruments, Ltd., Montrose Avenue, Slough.

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