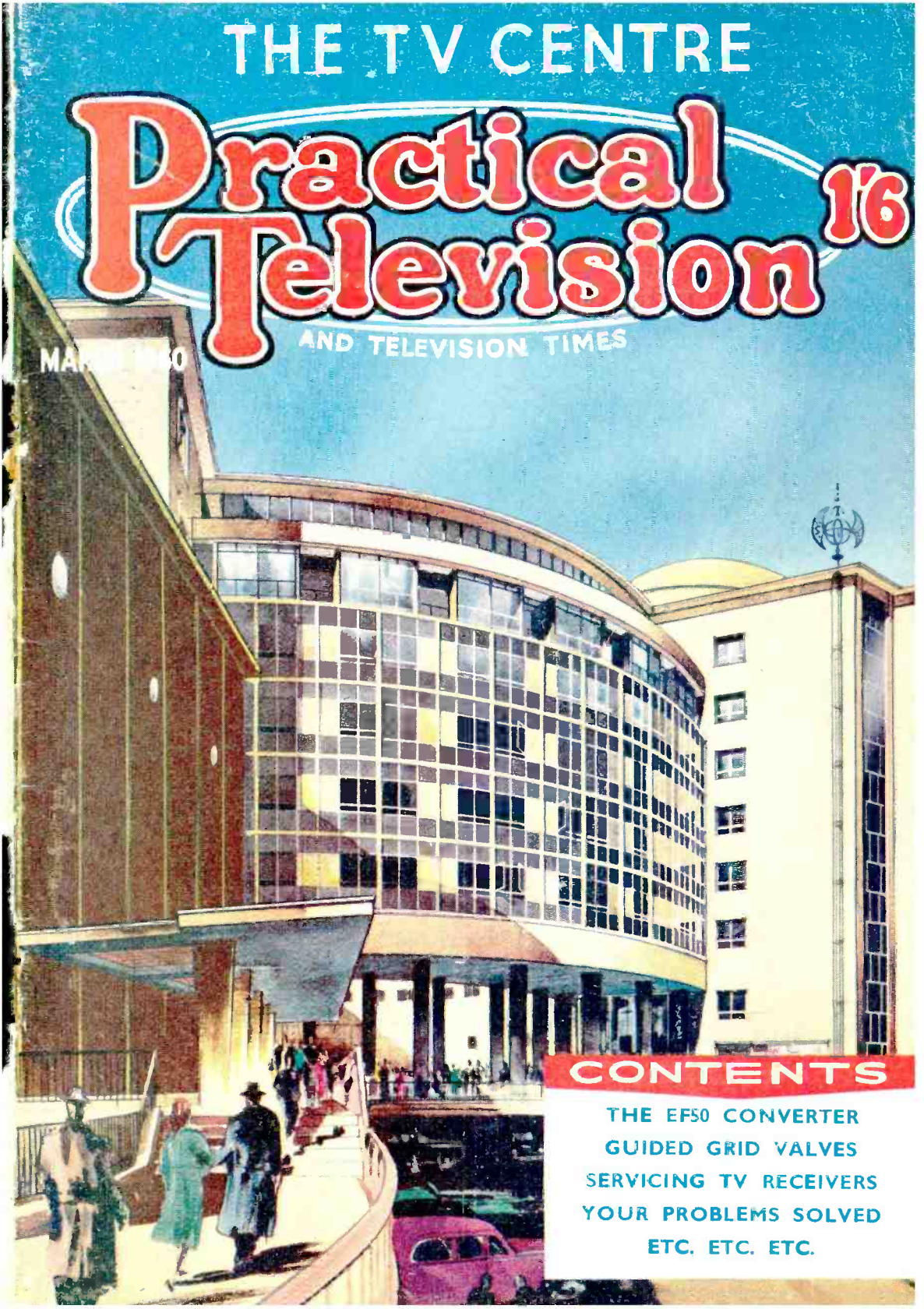
THE TV CENTRE

Practical Television

1/6

AND TELEVISION TIMES



CONTENTS

THE EF50 CONVERTER

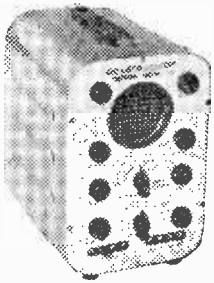
GUIDED GRID VALVES

SERVICING TV RECEIVERS

YOUR PROBLEMS SOLVED

ETC. ETC. ETC.

D.C. OSCILLOSCOPE



A.C. MAINS 200-250 VOLTS

SIMPLIFIED SERVICING PROBLEMS WHEN USING THE

'TESTGEAR' SCOPE

3in. D.C. OSCILLOSCOPE

Engineered to precision standards, this high-grade instrument is made available at the **lowest possible price**, incorporating the essential features usually associated with luxury instruments.

This "**SCOPE**" will appeal particularly to Service Engineers and Amateurs. **A high gain, extremely stable differential Y-amplifier** (30 mV/C.M.). Provides ample sensitivity with A.C. or D.C. inputs. Especially suitable for **measurement of transistor operating conditions** where maintenance of D.C. levels is of paramount importance. Push-pull X amplifier; Fly-back suppression; Internal Time-base Scan Waveform available for external use; **pulse output** available for checking **T.V. Line O/P Transformers**, etc.; Provision for external **X I/P** and **CRT.** Brightness Modulation. Size 10in. high, 6¾in. wide. 9in. deep. Wgt. 11¼ lbs. **£15.15.0.** plus P. & P. 7/6, or 30/- deposit, plus P. &P. 7/6 and 12 monthly payments of **26/6.**

FULL 12 MONTHS' GUARANTEE INCLUDING VALVES AND TUBE.

ALIGNMENT ANALYSER TYPE MC12

A.C. mains 200/250V. Provides: "**Wobbulator**" (**Swept Frequency**) **operation**, for FM/TV alignment linear frequency sweep up to 12 Mc/s. From 400 kc/s-80 Mc/s. **Capacitance Measurement.** Two ranges provided 0-60pF and 0-120pF. **Special Facility** enables true resonant frequency of any tuned cct, I.F. transformer, etc., to be rapidly determined. Cash price **£6.19.6,** plus 5/- P. & P. H.P. terms 25/- deposit plus 5/- P. & P. and six monthly payments of 21/6'

WOLSEY 3-ELEMENT FOLDED DIPOLE

I.T.V. Aerial less mounting bracket for External use, complete with 12 yds. of coaxial cable, 15/-; 4 element, 17/6; 5 element, 25/-. P. & P. on above, 3/6.

E.H.T. Smoothing Condenser 500 p.f., 18 KV. D.C. working, **1/6**

LINE E.H.T. TRANSFORMER

By famous manufacturer. 14 Kv. Complete with built-in line and width controls. Winding for EY51 Rectifier. **19/6** Plus P. & P. 2/6

LINE E.H.T. TRANSFORMER

With built-in line and width control and winding for EY51. 14 KV. Scan coil, 90° deflection, on ferrite yokes. Frame O.P. transformer 500 pf. 18 KV. smoothing condenser. Can be used for 14in., 17in. or 21in. tubes. Complete with circuit diagram.

29/6 Plus 4/- P. & P.

Focus Magnet suitable for the above (state tube). **10/-** Plus 2/6 P. & P.

17in. PERSPEX MASK, 8/6. Plus 2/6 P. & P.

F.M. TUNER UNIT

Permeability tuned, by famous German manufacturer. Coverage 88-100 Mc/s. Complete with ECC85. size 4in. x 2in. x 2in.

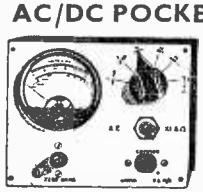
25/- P. & P. 1/6. Circuit Diagram 1/-. FREE with Unit.

10.7Mc/s. I.F. and Discriminator Coil, 4/- pair.

MAINS TRANSFORMERS

All with tapped primaries. 200-250 volts. 0-160, 180, 200 v., 60 ma., 6.3 v. 2 amps. **10/6.** 320-0-320 v. 75 ma., 6.3 v., 2.5 amp., 5 v., 2 amp., **10/6.** 280-0-280. 80 ma. 6.3 v. 2 amp., 6.3 v. 1 amp., **10/6.** Postage and packing on the above, 3/-.

AC/DC POCKET MULTI-METER KIT

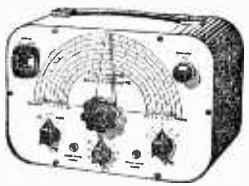


Comprising 2in. moving coil meter scale calibrated in AC/DC volts, ohms and milliamps. Voltage range AC/DC 0-50, 0-100, 0-250, 0-500. Milliamps 0-10, 0-100. Ohms range 0-10,000. Front panel, range switch, wire-wound pot (for ohms zero setting), toggle switch, resistor and rectifier. In grey hammer finish case.

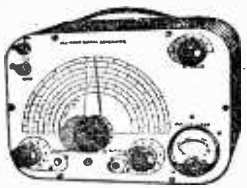
19/6 Plus P. & P. 1/6 Built and tested 7/6 extra.

Point to point wiring diagram 1/-, free with kit.

SIGNAL GENERATORS



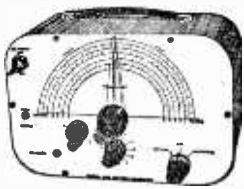
£6.19.6 or 25/- deposit and 6 monthly payments of 21/6. P. & P. 5/- extra. **Coverage 100 Kc/s-100 Mc/s on fundamentals and 100 Mc/s to 200 Mc/s on harmonics.** Metal case 10in. x 6¼in. x 5¼in.. grey hammer finish. Incorporating three miniature valves and Metal Rectifier. A.C. Mains 200/250. Internal Modulation of 400 c.p.s. to a depth of 30%; modulated or unmodulated R.F., output continuously variable. 100 milli-volts. C.W. and mod. switch, variable A.F. output. Incorporating magic-eye as output indicator. Accuracy plus or minus 2%



Cash £4.19.6 or 25/- deposit and 4 monthly payments of 21/6. Plus Postage and Packing, 5/-.

Coverage 120 Kc/s-84 Mc/s. Metal case 10in. x 6¼in. x 4¼in. Size of scale, 6¼in. x 3¼in. 2 valves and rectifier. A.C. mains 230-250 v. Internal modulation of 400 c.p.s. to a depth of 30%. modulated or unmodulated R.F., output continuously variable. 100 milli-volts. C.W. and mod. switch variable A.D. output and moving coil output meter. Grey hammer finished case and white panel. Accuracy plus or minus 2%

SIGNAL & PATTERN GENERATOR



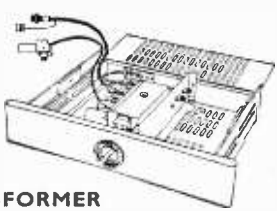
£6.19.6. P. & P. 5/-.

Or 25/- deposit. P. & P. 5/- and 6 monthly payments of 21/6. Coverage 7.6 Mc/s.-210 Mc/s. In five bands, all on fundamentals, slow motion tuning audio output. 8 vertical and horizontal bars, logging scale. In grey hammer finished case with carrying handle. Accuracy ± 1% A.C. mains 200-250 v.

CHANNEL TUNER

Will tune to all Band I and Band III stations. BRAND NEW by famous manufacturer. Complete with P.C.C. 84 and P.C.F. 80 valves (in series). **I.F. 16-19 or 33-38.** Also can be modified as an aerial converter (instructions supplied).

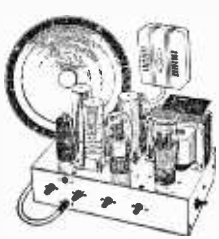
Complete with knobs.



22/6 Plus 3/6 P. & P.

HEATER TRANSFORMER

To suit the above, 200-250 v., 6/-, Plus 1/6 P. & P.



8-WATT PUSH-PULL AMPLIFIER

COMPLETE WITH CRYSTAL MIKE AND 8in. LOUDSPEAKER

A.C. mains 200-250 v. Size 10¼in. x 6¼in. x 2¼in. Incorporating 6 valves. H.F. pen., 2 triodes, 2 output pens and rectifier. For use with all makes and type of pick-up and mike. Negative feed back. Two inputs, mike and gram., and controls for same. Separate controls for Bass and Treble lift. Response flat from 40 cycles to 15 Kcs., +2 db; 4 db down to 20 Kcs. Output 8 watts at 5% total distortion. Noise level 40 db down all hum. Output transformer tapped for 3 and 15 ohm speech coils. For use with Std. or L.P. records, musical instruments such as Guitars, etc. **£4.19.6** Plus P. & P. 7/6.

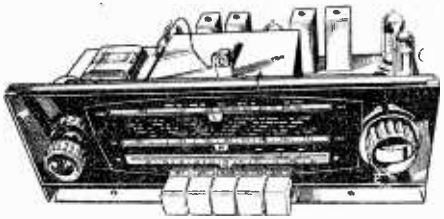
Or 20/- deposit Plus P. & P. 7/6, and 4 monthly payments of 23/-.

RADIO & T.V. COMPONENTS (Acton) LTD.

23, HIGH STREET, ACTON, LONDON, W.3.

All enquiries S.A.E. GOODS NOT DESPATCHED OUTSIDE U.K.

BRAND NEW AM/FM (V.H.F.) CHASSIS AT £13.6.8. (P. & P. 10/-)



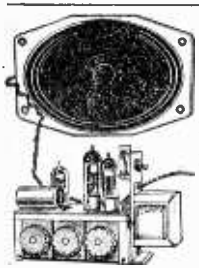
Why buy a F.M. Tuner at the same price?
Tapped input 220-225 v. and 226-250 v. A.C. ONLY.
Chassis size 15 x 8½ x 5½ in. high. New manufacture.
Dial 14½ x 4 in. in gold and black.
Pick-up. Extension Speaker, Ae., E., and Dipole sockets. Five "piano" push buttons—OFF, L.W., M.W., F.M. and Gram. Aligned and tested. With all valves & O.P. Transformer. Tone-control fitted.
Covers 1,000-1,900 M.: 200-500 M.: 88-99 Mc/s.
Valves EZ80 rect., ECH81, EF89, EABC80, EL84, ECC85. Speaker & Cabinet to fit chassis, 47/6.
10 x 6 in. ELLIPTICAL SPEAKER, 20/-.

TERMS:—(Chassis) £4.16.8 down—10/- carr.—and 6 Monthly Payments of 30/-, or with Cabinet & Speaker £5.9.2 down and 7 Monthly Payments of 32/-.

We are specialists in ITA Converters. Our converters give direct switching ITA to BBC, metal rectifier, co-axial plug. Can be fitted in 5-10 mins., and need no alteration to your set. ALL AREAS. ALL SETS. ALL CHANNELS. 12 months' guarantee (3 months on valves).

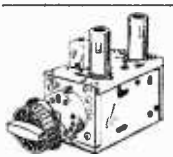
"READY TO USE" ITA CONVERTER

Separate gain controls. Valves PCF80 and PCC84. Switch positions ITA (1)—ITA (2)—BBC. Bakelite moulded cabinet 8½ x 4 x 6 in. £5.5.0. P. & P. 3/-.



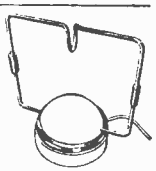
3-VALVE AMPLIFIER (INCL. RECT.) Capable of giving 6 watts. Mains and output transformers. Valves ECC81, EL84 and Rect. 3 Controls, volume, bass and treble. On/Off switch. Fully guaranteed. Chassis size 6½ x 3 x 2½ in.; with 7 x 4 in. elliptical speaker or 6½ in. round (Goodmans); state which.

Only 67/- (3/- P. & P.)



BRAND NEW INCREMENTAL TURRET TUNER by famous manufacturer for 35 to 38 Mc/s with knobs. Valves PCC84 and PCF80, or valves UCC84 and UCF80. LAST FEW DOZ. REDUCED ONLY 40/-.

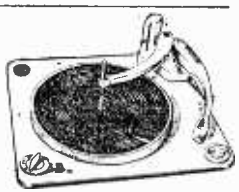
ITA TABLE TOP AERIAL



An ITA table top aerial with amazing performance. The Wolsey Hi-Q at 19/6 (2/6 post). Gives good reception up to 20 miles, and has cross-over unit in base with socket for BBC aerial.
Same model but very slightly tarnished for ONLY 12/6 (2/6 post).

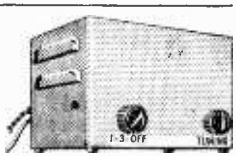
PERSPEX UNSCRATCHED. (Post 2/- each or 6 post free.) 12½ x 9½ x ¼ in. clear. 4/6; 14½ x 11 x ¼ in. clear. 5/-; 15 x 12 x ¼ in. tinted. 6/-; 17 x 13½ x 3/16 in. clear, 7/-. (Also 15 x 12 in. slightly scratched at 3/-.)

AUTOMATIC RECORD CHANGERS. COLLARO CONQUEST with manual play also. Turnover crystal pick-up. 4-speed. A.C. mains 200-250 v., see illus.



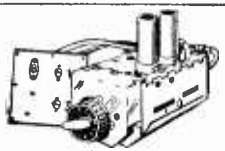
£7.10.0 (5/- P. & P.)

For the last 50 ITA Converters of this type (Brand New and Fully Guaranteed) we will accept the "Below Cost" figure of ONLY 60/-. (3/- P. & P.) Reduced from £4.7.6.
Two valves ECC81—grey hammer finish—Switch positions OFF, ITA, BBC. Own Power supply. BUY IT NOW.



60/- (3/- P & P.)

THE BRAYHEAD TURRET TUNER, £7.7.0 post free. Complete with booklet and fitting instructions. State set and model No. when ordering.
Converts your 5-channel BBC only set to receive ITA as well.



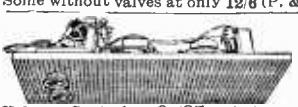
ITA AERIALS clipping to existing mast 1-2 in. dia. 3-element, 27/-; 5-el., 35/-; 9-el., 55/-; Loft mounting. 3-el., 20/-; 5 el., 27/6; Combined single BBC and 5-el. ITA. 75/- with chimney lashings; Co-axial cable semi-air-spaced. 8d. yd. or 20 yds., 12/6. Aerial and cable prices carr. paid.

---

50 SILVERED MICA AND CERAMIC CONDENSERS, 10/-. 50 RESISTORS. 5/-. ALL NEW.

NEW WAXED TUBULARS, 350 v. or above. 3 of each. .001, .002, .005, .01, .02, .05, .1 mF. Total 21 for 4/6, post paid.

NEW ITA AND BBC TUNER. By well-known manufacturer for superhet TVs with 35-38 Mc/s I.F. For all areas; covers all 13 channels. Switch gives BBC and two ITA selections. Suits G.E.C. sets BT4543, 4544, 5146, 5147, 5543, 5642 and 6641 without alteration. Easily adapted as aerial converter, and instructions can be provided free. Has ITA and BBC co-axial sockets and separate gain controls.
WITH VALVES PCF80 and PCC84. 22/6 (P. & P. 3/-).
Some without valves at only 12/6 (P. & P. 3/-).



GRAMOPHONE AMPLIFIER with 5 in. SPEAKER. On Fabric-covered Baffle 12½" x 5". Mains and Output Transformers. Metal Rectifier. ECL82 Valve. Tone and Volume Controls. On/Off switch. Plenty of Volume. Fully Guaranteed. Two Knobs supplied. Ready to play. Useful for Stereo.

ONLY 57/-, post 3/-

BEREC "PIONEER" RADIO IN MAKER'S CARTON. Valves DK96, DF96, DAF96, DL96. Berec Ever-Ready Battery B103. 18/6 extra. Two Short Wavebands 2.5 to 7 Mc/s and 6.5 to 17 Mc/s. Cabinet, 12" x 7½" x 6". ONLY £4.15.0 (2/6 p. & p.). In kit form with instructions and fully wired coil pack. Two Short Wavebands £4. One M.W. and S.W. £4.5.0. Plus 2/6 p. & p. Separate items supplied.

Delivery by return. C.O.D. 2/- extra. Terms: Cash with order or one-third down and balance plus 7/6 (up to £7.10.0) in four equal monthly payments. Balance over £7.10.0 add 1/- in £1 and pay in not more than 6 monthly payments. See special terms for A.M.-F.M. chassis. All new goods unless stated. Send 6d. for 16-page catalogue.

GLADSTONE RADIO 58A HIGH STREET, CAMBERLEY, SURREY. Tel. 22791

or callers to 3 Church Road, Bristol 5 Tel. 51207 (Camberley closed Sats.)

Practical Television

& TELEVISION TIMES

Vol. 10 No. 114 EVERY MONTH MARCH, 1960

Editorial and Advertisement Offices:
PRACTICAL TELEVISION
George Newnes, Ltd., Tower House,
Southampton Street, Strand, W.C.2.

Phone: Temple Bar 4363
Telegrams: Newnes, Rand, London.
Registered at the G.P.O. for transmission by Canadian Magazine Post.

SUBSCRIPTION RATES
including postage for one year

Inland - - £1.2.0 per annum
Abroad - - £1.0.6 per annum
Canada - - 19s. per annum

CONTENTS:

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

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

EUROVISION

THE interchange of live television programmes between European countries has developed rapidly since the early attempts made in 1954, and the communication engineer has been presented with some interesting technical problems. Exchanges first took place in 1952 and 1953 and earlier in August 1950 when the BBC carried out two outside broadcasts from Calais. This was the first occasion on which television had been brought to British viewers from outside the United Kingdom. The first programme to be simultaneously broadcast in two countries, France and Great Britain, took place in July 1952. This was made possible by the development of apparatus for converting from the French 819-line picture to the British 405-line picture and by the extension of the French television network as far as Lille, thus reducing the number of temporary radio links which had to be installed to connect Paris with London.

In 1954 a proposal was put to, and approved by, the Administrative Council of the European Broadcasting Union that the Union should assume responsibility for planning and supervising programme interchanges. With the increasing complexity of Eurovision, a technical co-ordination centre was needed, and this was established in Brussels in January 1956. Initially its function, as its title suggests, was largely passive but its functions became progressively more active as time went by. The Eurovision control centre, as it is more now correctly styled, is now analogous to the national centres which control the various national networks.

In recent years radio-link equipment using decimetric and centimetric waves has made possible a much more reliable system of vision links. Methods of measuring and assessing distortion on long links have now been drawn up and adopted and methods have been devised for reducing and correcting this distortion. Improvements are continually being made although a more sophisticated method of transcription from one line standard to another is still needed.

The development of Eurovision has shown how the engineer, by facilitating the exchange of ideas between countries, can improve co-operation on the international plane. A few sporadic exchanges have taken place with the countries of Eastern Europe and it seems likely that permanent links between Western and Eastern Europe will be set up in the near future. The handicap in the establishment of a similar television link with North America is likely to be its cost but meanwhile a scheme for the slow speed transmission of film over the transatlantic telephone cable has already been operated.

Only a matter of ten years ago, no communication engineer could have predicted the continental coverage of television; it is to be hoped that in ten years from now the coverage will be world wide.

Our next issue, dated April, will be published on March 22nd

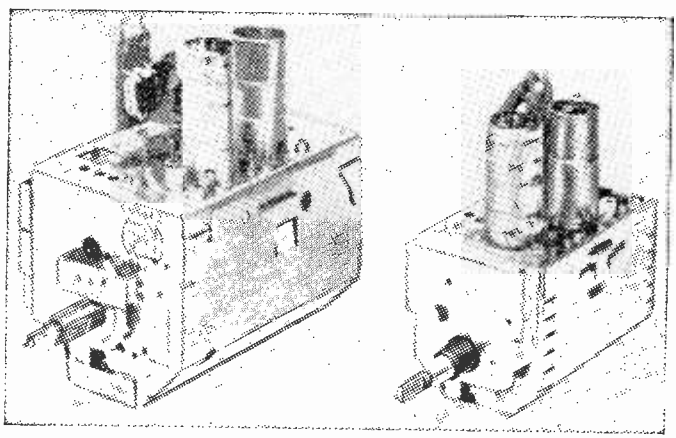
Guided Grid Valves

A NEW TYPE FOR HIGH GAIN

THE trend in modern television design is to reduce the size of components and receivers so that entertainment can be obtained without the apparatus taking up valuable space. The size of picture tubes is gradually being reduced so that the large screen types need only shallow cabinets. Reductions in the sizes of other sections of the receiver, such as I.F. strips and time base units have been made, but it is only recently that the design engineers have begun to make smaller tuner units.

New Turret

Several new British designs have been announced which are now widely used and a new turret tuner is now being marketed in the U.S.A. and is substantially smaller than other current types. The reduction in size is obtained for the most part by using a new type of valve known as a "guided grid" valve. The new miniature turret occupies only a quarter of the volume of earlier tuners but has a superior performance and, with suitable coil strips, can be used for UHF reception. The tuner is the product of Standard Coil Products Co. Inc., and the R.F. amplifier valve was developed as a result of the co-operative effort of R. C. A. Eland, Director of Research of Standard Coil Products, and two of the major American valve manufacturers. The new valve—a 6ER5 or 6ES5—is used in the R.F. amplifier stage in an improved version of the neutralised triode or Neutrode circuit. Additional elements are included in the valve and are connected to the screen grid. These elements are termed by the inventor "the guided grid," and act as shield plates which draw no current (Fig. 1). Their inclusion in the valve reduces the anode-to-grid capacitance, thereby increasing the anode impedance. Radiation from the local oscillator into the aerial circuit is also reduced and with the increased anode impedance the coupling coil in the anode circuit is less heavily damped. As a result, the signal-to-noise ratio of the tuner is improved and its gain is considerably higher.



The tuner on the left uses conventional valves while the smaller tuner on the right uses a frame grid valve.

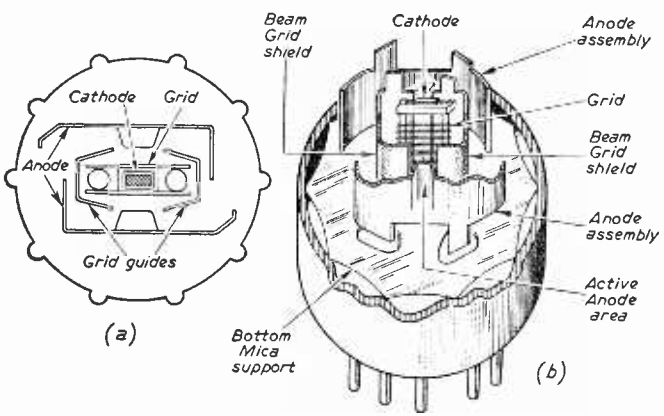


Fig. 1.—Internal construction of guided grid valves.

Although guided grid valves are not available here as yet, no doubt British manufacturers will introduce suitable types in the future. The introduction of frame grid valves in this country has enabled substantial improvements to be made in TV front end design. With these new valves excellent reception can be obtained with simpler, neater, and less bulky tuners and the increase in efficiency enables reception to be obtained even at the limits of the fringe areas.

The EF50 Converter

AN INEXPENSIVE HIGH-GAIN UNIT

IN a large number of published designs there is a feeling by the user that more gain is required, but there is no means of "turning up the wick" apart from adding an I.F. or R.F. amplifier to the converter. With the circuit about to be described, in a low-lying city, 30 miles from the transmitter, the gain can be increased until the picture goes negative, and this is not a swamp area, as a five element array is necessary for a good picture. The grain is not normally noticeable at usual viewing distances, and the picture is very sharp and clear, with full transmitted bandwidth.

Contrast Controls

Readers with contrast controls in the first R.F. stages of their receivers would be wise to fit one in the last I.F. or video output stage, and then the first R.F. stage contrast would become the sensitivity control and in most cases could be left at maximum, and the new control finally operated to obtain correct contrast on BBC programmes and left alone. By this method the sound on the BBC is not affected and, more important, neither is the sound output from the converter affected. With no perceptible oscillator drift, and the contrast controls arranged as above, the writer is in a rather fortunate position of only having to turn the band switch to change the programmes, no other adjustments being required to brilliance or contrast controls.

The writer, although just in the service area a mile uphill from a city centre, is living in an awkward spot where five element aerials are necessary, and only a mile away on higher ground strong signals of Band III are obtained on an ordinary BBC "H" aerial by using the third harmonic (Channel 4 and 8).

Converters with modern valves specially designed for Band III work quite satisfactorily here, but it is difficult to make a conventional circuit work with EF50 valves. Many circuits were tried such as EF50 R.F. and EF50 osc./mix, two earthed grid triodes EC54s in cascode, and EF50 osc./mix, two EF54 R.F. stages and EF50 osc./mix, but none was really satisfactory until R.F. mixer and separate oscillator were tried, and even then the signal was very poor until the R.F. cathode decoupling condenser was removed and regeneration was controlled by a variable potentiometer. The signal then improved 100 per cent. At first glance, by removing the condenser the characteristics of the EF50 are altered: the transit time, gain, mutual conductance should drop and feedback be introduced. In fact, the whole thing should be a dead loss on Band III, but in this case it is not so. Theoretically it should

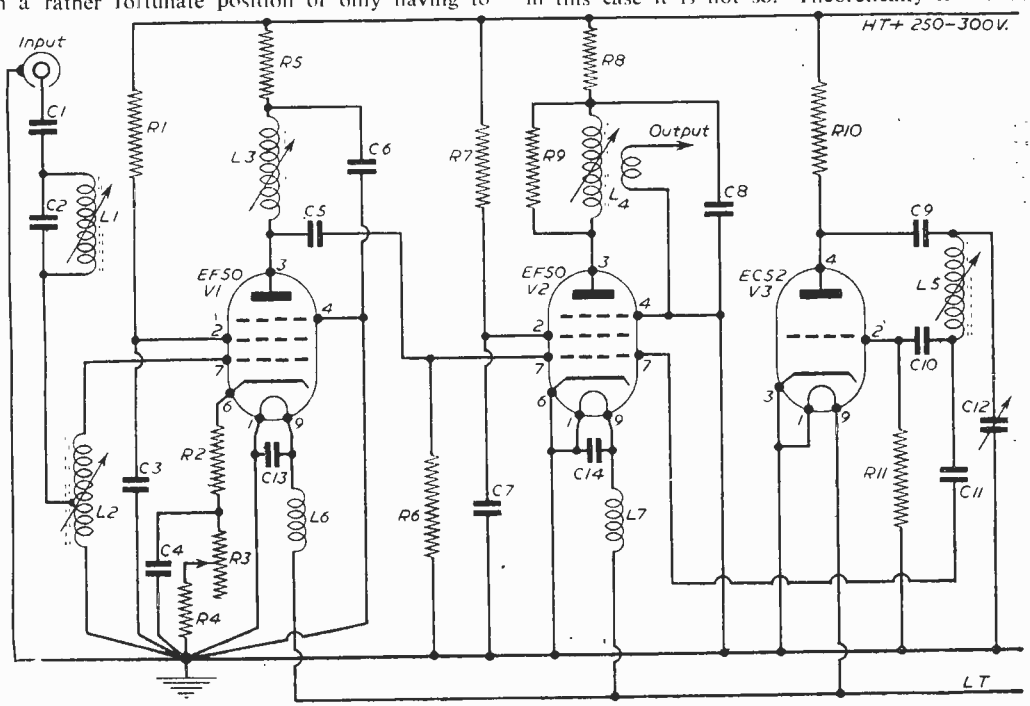


Fig. 1.—The complete circuit diagram.

work more efficiently with a low capacity of about 50pF than without one, and a low resistor, but in practice this was not so.

The design requires to be well thought out in advance to keep the wires from the components to a minimum of ¼in. if possible. This is very

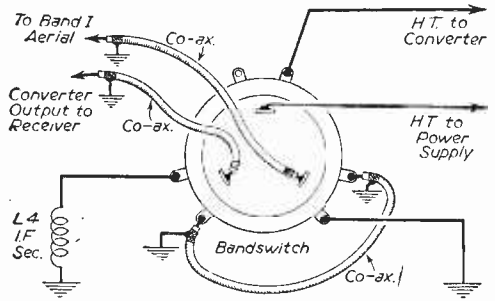


Fig. 2.—The wiring of the bandswitch.

important, and great losses can occur if the wires are ¼in. or more in certain parts of the circuit. With these valves the screened grid decoupling condenser C3 is one example in the first stage. The wire from this condenser to chassis should be as short as possible, and must be to the same tag as the earthy end of the first R.F. coil L2. The same applies to R2 which must be wired close to the cathode pin, as it is part of the tuned circuit. On C4 the earthy end wire must be very short, and taken to the same chassis tag as C3.

The first stage in converters seems to be the most critical and if weak signals are encountered the design of this stage is usually responsible. The mixer and oscillator stages are not critical provided reasonable precautions are taken.

Power Supply

The set will work quite well with lower gain on 200V, but at 250V, or higher, the gain is considerably increased. The converter has worked satisfactorily at 300V up to 45 miles from the transmitter,

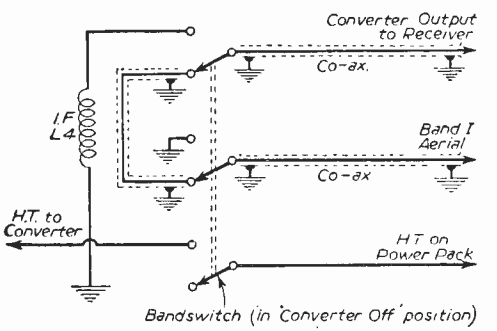


Fig. 3.—Circuit of the bandswitch.

and may be satisfactory beyond this mileage under suitable receiving conditions. Raising the H.T. from 240V to 300V appears to have very little effect on the volume of sound but the vision is very much affected. The L.T. is 6.3V at 1A. The power pack is isolated from mains for safety, and transformer fed.

The Circuit

This is a three valve arrangement using an EF50 as R.F. amplifier, an EF50 as the mixer, and an EC52 (VR137) as the oscillator. The circuit is designed for 80Ω co-axial input. Capacitor C1 in the aerial lead has a marked effect on signal strength and helps to improve matching to the input. A value of 1000pF was found to give best results, but as this is rather higher than usual a variable trimmer can be wired in its place if desired to find the correct value to suit individual cases. This feeds into a filter circuit L1 and C2 and to the grid input coil L2, which is tapped ½ turn from the earthy end.

No improvement was found by winding a separate primary over L2 for the aerial input,

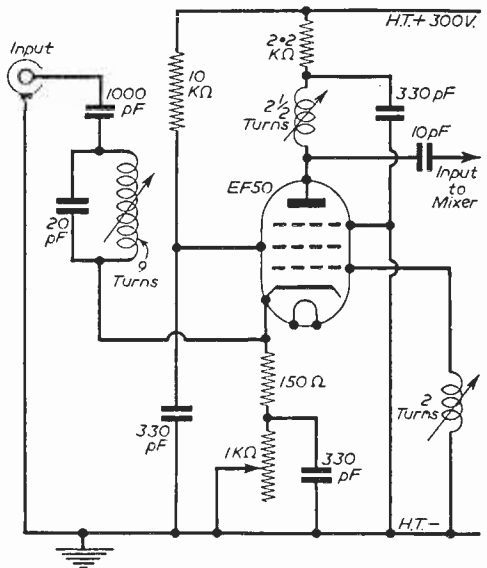


Fig. 4.—An alternative circuit for the input stage.

although a separate primary of 2 turns will be required for correct input matching if the cable is 300Ω.

The cathode is not decoupled in the usual way, but C4 is connected between R2 and R3 and the gain controlled by R3. By omitting the usual condenser direct from the cathode to the chassis, feedback is introduced, and also the input resistance increased, thus reducing the damping on the tuned circuit. As the input resistance of the EF50 is only a few hundred ohms at 200Mc/s, losses would be considerable if 1,000pF was introduced into the cathode circuit. The EF54 has an input impedance of some 700Ω at 200Mc/s, and this valve gives an improvement over the EF50 for V.H.F. work. The EF54 has the suppressor grid connected internally to the cathode, and was not found as suitable for this circuit as the EF50. Leaving the cathode completely unbypassed reduces the mutual conductance slightly but this seems to be well compensated by an increase in input resistance.

The output of V1 goes direct to C5, the coupling condenser, and to the mixer grid.

COMPONENTS LIST for Fig. 1

R110k	C1—0.001μF
R2—150Ω	C2—20pF
R3—300Ω	C3—330pF
R4—200Ω	C4—330pF
R5—2.2k	C5—10pF
R6—100k	C6—330pF
R7—100k	C7—330pF
R8—2.2k	C8—330pF
R9—4.7k	C9—50pF (neg. temp. co-efficient)
R10—10k	
R11—27k	C10—15pF
	C11—2pF
A11—½W	C12—0.20pF
R10—1W	C13—100pF
	C14—100pF
	C1—Var. or Mica.
	All others ceramic.

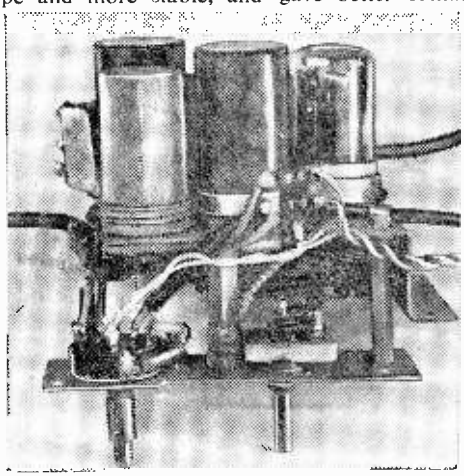
The oscillator V3 is very stable, and no drift was perceptible from the moment of switching on to switching off, even after several weeks' use, which is most unusual at these frequencies. The oscillator is not the usual Colpitts type as the Hartley type was found to be better. This valve operates with two condensers, C9 and C10, to couple the oscillator coil L5 to V3. C9 has negative temperature coefficient. C12 is the manual oscillator trimmer. The output from the oscillator is taken through C11 and fed into the mixer grid.

Output

The converted output is taken from the I.F. transformer secondary (which is in the anode circuit of V2), and after switching is fed into the receiver.

The 330pF decoupling condensers were found to be adequate. Larger ones up to 1,000pF were tried and can be used without affecting performance. All the other condenser and resistor valves must remain as stated. "Red" Sylvania EF50s were found to be much better than the "silver" type and more stable, and gave better contact, especially the spigot which is of different metal and does not oxidise so rapidly.

Ceramic valveholders were used to reduce losses. The sockets are silvered and turn black. Some of this can be removed with carbon tetrachloride, and a flat nail file very lightly passed up and down the sockets a few times removes the rest. Do not forget the centre spigot hole, and pinch the spigot contacts together. Clean all the valve pins the same way and make sure the aluminium ring on the valve base which holds the spigot is making good contact with the valve can, as both these parts film over with age.



The completed converter

Screening

At the start all the stages were screened from one another and screens were also placed across the valveholders. All this screening was removed

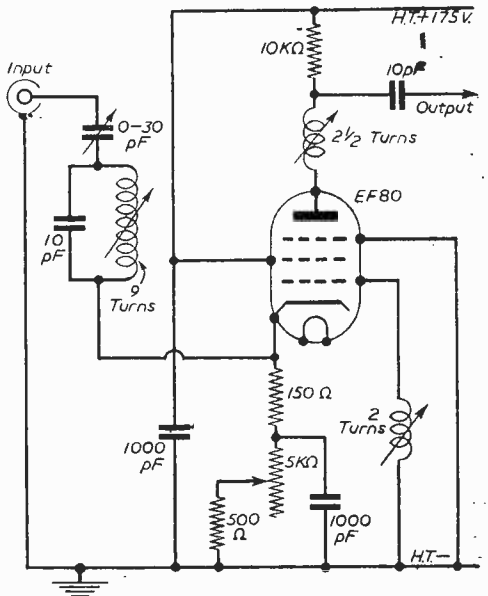


Fig. 5.—Circuit for an EF80 input stage.

piece by piece and now only coils L1 and L4 are "canned," with no ill effect on performance.

The valveholder bolts are longer than usual and pass through the valve retainer ring, the valveholder collar, the chassis, and, underneath, the solder tag, nut, Aladdin coil former, washer and nut. This enables the coils to be as near as possible to the valves. On coils L2, L3, L5, only one bolt was required when the thick wire was soldered in place. No holes were drilled through the chassis for the cores as these were found not to be necessary. Coils L1, L4 were held by two bolts each and screened to prevent BBC pick-up.

The formers are ¼in. Aladdin with purple cores. When the converter is working satisfactorily the cores can be removed and a thin piece of elastic inserted down the inside of the former and the cores put back. This is necessary, especially if the cores of L2, L5 are loose.

Wind the coils on ¼in. control spindle and press them on to the formers; as the formers are slightly over ¼in. the coils make a tight fit.

The heater chokes are wound on a thick knitting needle (plastic) which is also used for trimming purposes after filing to a screwdriver tip.

In weak signal areas increase R9 across L4 to 6k or remove it. It should be left in circuit wherever possible.

Patterning

BBC and ITV co-ax cables running side by side from the aerials have not been found to be the cause of patterning on ITV unless the cables have been cut or joined or extended. If the BBC cable is cut or extended use a proper cable joiner, not tape, as the cable inner must be screened. The Band I co-ax must always be shorted out when receiving ITV, or pronounced patterning will result. Switching the inner co-ax out of circuit or removing the plug is not effective.

Keep the output leads from the converter away from A.C. wiring in the power pack and mains wiring.

The filter coil L1 will overcome patterning from the BBC being fed into the unit. If patterning is experienced on BBC, fit a switch in the H.T. lead from the converter power supply or in the mains lead. This is usually switched out automatically when the band switch is operated.

Although an ordinary 3-pole 3-way switch is used without screening, no patterning will be experienced if co-ax is used liberally. Connect the co-ax screening to the nearest possible points of the chassis or solder them to the metal pillars on the switch framework.

Wiring

The lead between the converter and the receiver should be as short as possible to prevent BBC pick-up causing patterning.

(*Continued on page 298*)

COIL DATA

Channel	L1	L2	L3	L4 Pri.	L4 Sec.	L5	L6	L7
1	11	2	2½	11	3	5	10	10
2	10	2	2½	10	3	5	10	10
3	9	2	2½	9	2	5	10	10
4	8	2	2½	8	2	5	10	10
5	7	2	2½	7	2	5	10	10
	Close wound 28 s.w.g. s.c.	Space diam. wire tapped ½ turn earthy end 22 s.w.g. enamel	Space diam. wire 22 s.w.g. enamel	Close wound 28 s.w.g. s.c.	Close wound 28 s.w.g. s.c. spaced ⅛ from primary		Close wound 26 s.w.g. enamel self-supporting	Same as L6

¼in. Aladdin formers with purple cores.

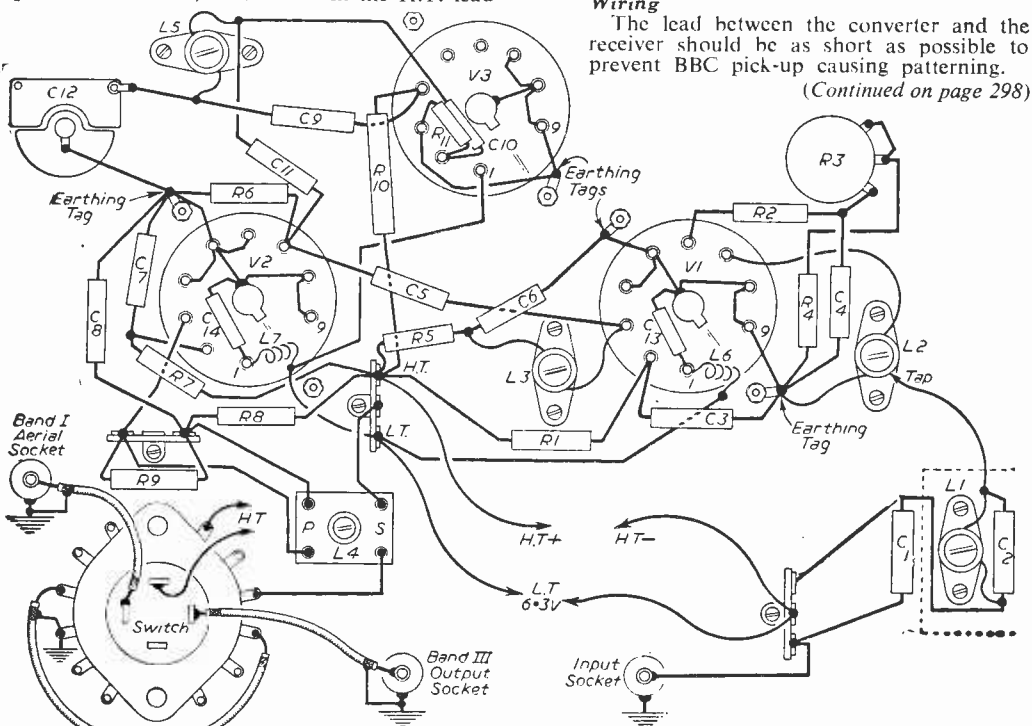


Fig. 6.—The complete wiring diagram of the converter.

Short Cuts with a Multimeter

PRACTICAL SERVICING HINTS

By L. E. Higgs

TELEVISION fault-finding with a multi-range meter calls mainly for voltage tests of valve feeds, occasional mains voltage checks and continuity of circuits, windings, components, etc. Quite properly, these constitute the bulk of diagnostic procedure. There are, however, a number of checks and uses of the meter that can speed up the tracing of faults and in some cases save the requirement of another instrument or of tests by substitution, particularly when the internal resistance of each volts range is appreciated and allowed for in tests.

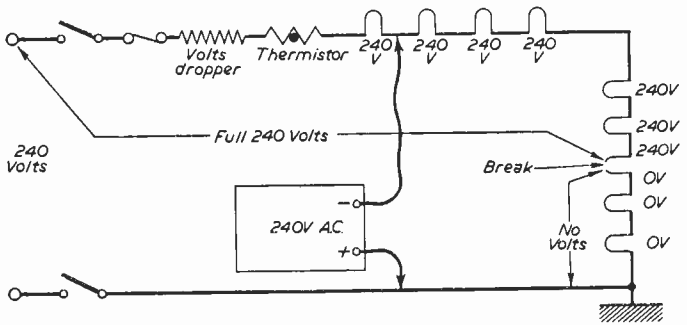


Fig. 1.—Testing heater chains.

Heater Chain Test (Fig. 1)

Many newcomers to fault finding when confronted with an open circuited heater chain start to withdraw the valves (not always one at a time) and test the heaters for continuity until the defective valve is found. This is sometimes the best way with certain sets. Generally, however, the possible damage to valve pins, top caps and air pips and the incompleteness of the test which omits the thermistor, volts dropper, fuses, switch and the possibility of a bad heater connection, makes the A.C. voltage test better if the connections to valves and parts are accessible. Here, the negative of the meter (500V A.C. range) is clipped on to the chassis and, with the other prod, the mains is traced along the volts dropper, through the thermistor, valve chain and from heater to heater until the break is detected. This often only takes a minute or so and there is no disturbance of the circuit and even inaccessible valves can be tested if the mains potential is found further down the heater chain. Should two or three valves be left untested by this method, then check them on the ohmeter.

Current Ranges (Fig. 2)

The understandable reluctance of the harassed engineer to make current tests with their associated bother of switching off, breaking the circuit, connecting up, testing, and repair afterwards, if the test shows to be uninformative, makes the current ranges in quick servicing the least used.

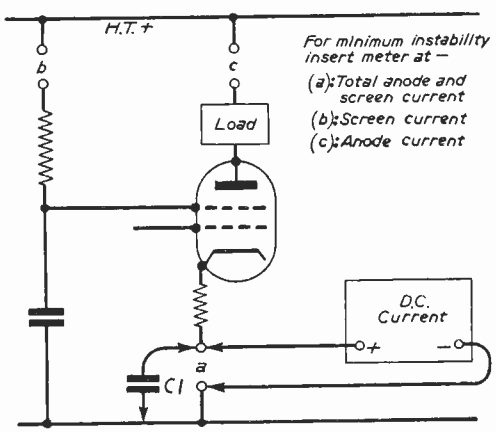


Fig. 2.—Measuring valve currents.

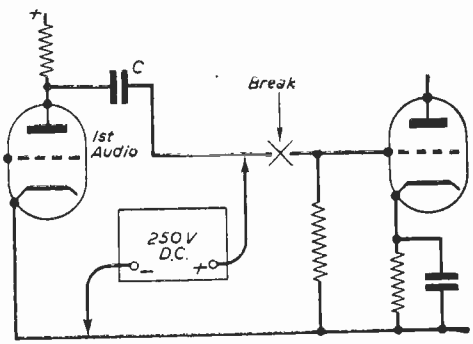


Fig. 3.—Testing coupling capacitors.

However, there are places where vital currents can be measured with no trouble: remove the fuses and substitute the meter. The fuses of some receivers give the line time base current: heater chain current (alternating): total receiver drain. A number of anode currents can be deduced easily by measuring the drop across known resistor loads by Ohm's law.

Always insert the meter at the earthy end of valve circuits and if instability is suspected owing to the disturbance then decouple with a capacitor across the circuit break—not across the meter terminals despite the convenience of this.

D.C. Volt Checks

Do not forget to check the cathode voltage, where applicable, after checking the anode and screen potentials. The voltage across the cathode resistor can be very informative, and from it, the total valve current (screen plus anode) can be deduced easily by Ohm's law.

Leakage Meter (Fig. 3)

When a positive potential shows on an output valve grid, a leaking coupling capacitor, valve gas or inter-electrode shorts can be responsible. By making only one disconnection to the coupling capacitor, at the grid side, the grid can be isolated and by placing the meter (250V D.C. range) between the end of the capacitor and chassis, no voltage should show after the initial charging kick. A slight steady positive voltage proves a leaky capacitor almost as well as a megger test. If the condenser proves normal, a blob of solder from the iron makes good the only circuit disturbance.

Detuning Effects

Most of us make allowance for the meter drain when measuring in high impedance circuits, yet I am still surprised when checking an AVC voltage first with a 1000Ω/V meter and then with a valve voltmeter. One showed approximately 10V, on tune, using the 400V range, yet the valve voltmeter

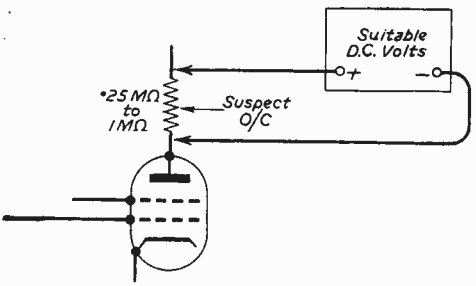


Fig. 4.—Using the meter as a substitute for a high resistance.

read 35V. Some of this difference was due to a detuning effect on the output tuned circuit caused by the meter leads. Always beware of the capacitive effect of the prod lead when probing R.F., I.F. and oscillator circuits or the frequency sensitive sections of the time bases in TV.

Substitute Resistor (Fig. 4)

The D.C. voltmeter can be used to advantage as a substitute grid leak, a high anode, or screen, resistance just by bridging it across the suspect component and switching to the appropriate range. If you need 0·5M, ½W, then switch to 500V on a 1000Ω/V meter or 25V on a 20,000Ω/V meter, but of course, start as usual with the highest volts range first and work down, in case too high a potential is dropped across the meter. Once a quick test like this proves the part faulty or eliminates it, work can continue. There is no need to find a substitute part, fit it in and probably remove it again.

Audio Tracer (Fig. 5)

To save switching on the 'scope or reaching for the phones, just to make sure a line or frame oscillator is functioning, or to monitor the presence of a video waveform on the cathode of a dead picture tube, try linking the top of the volume control to the point of test (preferably at a low H.T. potential), again using the 1000V D.C. range. This high resistance to a high gain point allows sufficient waveform to the volume control to give a clear audio indication in the speaker and any

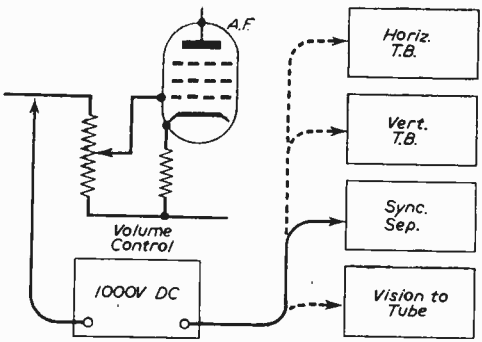


Fig. 5.—Monitoring audible waveforms by using the audio stages of the receiver.

D.C. present is made virtually harmless through this high leak. This is a good quick check to see if a circuit point has an audibly indentifiable waveform present or not—and using only this convenient high meter resistance on its own flex leads, missing sync can often be traced.

APC Controls

The ohms range can be used when working on TV for purposes other than continuity and resistance measurements.

When checking the operation of an AGC line, switch on the meter to the ohms range, clip it to the chassis and touch the suspect line terminal with the probe. If the I.F. stages are biased back, the application of this low positive D.C. meter voltage will raise the gain and, if a reduction test is required in a line normally negative, then reversing the meter connections will show whether the control line is effective and the missing or excessive control voltage can be traced back. Manual contrast control lines can also be tested in this way as can missing bias on limitor diodes.

Electrolytics

Electrolytic capacitors can be tested (out of circuit) with the high ohms range, by connecting the meter, with correct polarity to the capacitor and observing the violence of the charging kick. A final high resistance reading shows a low leakage factor. With a little experience of various values and working voltages this method gives a quick check of electrolytics before fitting them into a circuit.

Resolution

3MC/S DEFINITION IS NOT ALWAYS AN ADVANTAGE

By J. K. Lockyer

THE "goodness" or quality of a picture is determined its definition, and by this we mean the faithfulness of the reproduction as compared with the original. We have a homely parallel in the pictures produced in periodicals. If a picture from a newspaper or magazine is closely examined with the aid of of a magnifying glass, it will be seen to be constructed from a large number of elemental dots. In the dark areas the dots are very close together while in the lighter areas they are farther apart.

The dots are produced by the photographic process employed in making the plates for printing. In high-speed presses using fairly coarse paper such as newsprint the dots are larger and fewer in number; we cannot have too many dots as the process of printing at high speed on this class of paper would clog the plate and a very blurred reproduction would result.

Detail

When the speed of printing is slower and very finely graded paper is used then the dots can be made smaller and there will be many more of them. The practical result of this is that a picture produced on newsprint is lacking in fine detail.

The important point to note is that where the dots are smaller, a greater number are required to cover a given area, and the smaller the dots (or in other words the greater the number of picture elements) then the greater is the detail produced.

A similar reasoning exists in TV practice. For example, a receiver which has very good definition will show the strings attached to the puppets in a puppet show; a receiver with inferior definition will not show the strings and the viewer just does not see them and the puppets appear to be entirely self-activated.

In order to arrive at some standard of quality it has been stated that if the horizontal resolution is equal to the vertical resolution then satisfactory definition is achieved.

Estimating Bandwidth

In the 405 line system using interlaced scanning we have in each half cycle 202½ lines. Of these lines 14 are taken up for synchronising purposes, leaving a total number of 188½ lines containing picture intelligence. Therefore, in each complete interlaced picture we will have a total of 377 lines containing picture intelligence.

In other words our picture is actually 377 lines high. The ratio of width to height is 4 : 3, or we can say that each line is 4/3 times as long as the height of the picture. If there are 377 lines we can say that the vertical dimension contains 377 elements and one line should therefore contain:

$$\frac{4}{3} \times 377 = 503 \text{ elements.}$$

Our line will therefore be divided into a total of 503 elements, half of which will be black and the other half white. We can represent the white squares as positive pulses and the black squares as negative pulses; the result is an alternation which is something like a sine wave. There will, therefore, be a total of:

$$\tfrac{1}{2}(503) = 256\tfrac{1}{2} \text{ cycles for each line.}$$

Now there are 377 lines in the active picture so the total number of cycles in each picture is:

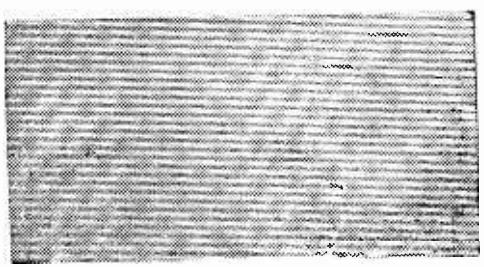
$$256\tfrac{1}{2} \times 377 = 96{,}700 \text{ cycles.}$$

The number of complete frames transmitted each second is 25 and there will therefore be a total of:

$$96{,}700 \times 25 = 2{,}417{,}500 \text{c/s.}$$
$$= 2.4 \text{Mc/s approx.}$$

From the above it will be seen that we could have adequate definition for a bandwidth of only 2.4Mc/s. Unfortunately there is one flaw in the argument and that is in interpreting the square-wave formation representing the black and white squares directly into a simple sine wave. In actual fact the square-topped waveform contains an infinite number of harmonics and to obtain a good approximation the bandwidth would have to be in the region of 3.0Mc/s wide.

This is obviously not practical; the total number of picture elements is taken as if the whole of the lines were active lines which gives a frequency of about 2.75Mc/s.



An example of a well-interlaced scan.

Resolving the 3Mc/s Bars

In order to obtain the best definition from the signal transmitted, it should be possible to align the set to that the 3Mc/s bars are visible.

For the majority of home constructors the only time available is on Saturday mornings and quite a large number of Saturdays are required before it is possible to complete the job. It is a fairly simple matter to resolve the 1Mc/s bars and not at all difficult to resolve the 1.5Mc/s bars. The 2.0Mc/s bars are a little more difficult and the 2.5Mc/s bars require a great deal of patience. The 3.0Mc/s bars are rather difficult, and while many commercial receivers will show those of 2.5Mc/s they do not reveal the 3.0Mc/s bars.

Factors Affecting Bandwidth

It is important to remember that there are factors other than the tuning stages which affect the bandwidth. It is possible for the tuning stages to

(*Continued on page 308*)

Making Slot Aerials

EASILY INSTALLED IN THE LOFT

By J. B. Lancaster

AS the number of television transmitters increases many more viewers are getting better signals by virtue of the increase in signal strength in their locality. However, the increased signal strength often brings other problems with it, not the least being the production of "ghost" signals which can often completely spoil reception.

The slot aerial is a very effective antidote to ghost troubles besides being one of the best types of aerial to erect in a loft where space is restricted, and more and more amateurs are investigating the possibilities of them.

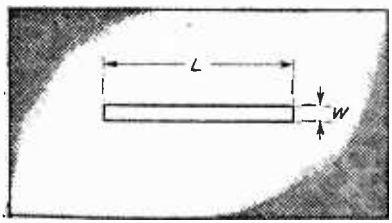


Fig. 1.—Simple slot aerial.

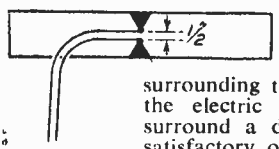


Fig. 2.—Connecting the feeder.

In Band III they are also received with favour and, because of the smaller dimensions, outdoor slots are a practical possibility.

Polarisation

Whether a wave is vertically or horizontally polarised is determined solely at the transmitter, the deciding factor being the plane in which the aerial is situated.

If the aerial is placed vertically, then the field will be vertically polarised and vice versa.

It is important to note that when receiving a signal the maximum results are obtained when the receiving aerial is placed in the same plane as the sending aerial. For a vertically polarised signal this means that the receiving dipole must be mounted vertically.

A rod aerial uses the electric part of the electro-magnetic wave; we can say it uses the electric field. The cap-transmitted wave consists of two fields, one being electric and the other being magnetic. It is possible to make an aerial which will make use of the magnetic field.

Length

Fig. 1 shows the scheme. Here we have a metal plate in the centre of which is cut a slot. The length of the slot "L" determines the wavelength to which the aerial will tune and is made the same length as a normal dipole. The width of the slot has a bearing on the bandwidth of the signals received but is not over critical and can be in the region of 9in.-12in.

The dimensions of the material surrounding the slot should be sufficient to cover the electric and magnetic fields which would surround a dipole and the minimum figure for satisfactory operation can be taken to be in the region of one-fifth of a wavelength.

The slot can be taken to have similar characteristics to that of the complementary normal dipole which is in the form of a strip.

Another interesting point is that the surrounding material need not be of solid construction; the aerial will work quite effectively if an open mesh material such as chicken wire is used.

It should be noted that the slot aerial uses the magnetic part of the electro-magnetic field and as

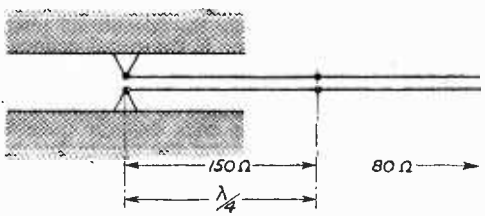


Fig. 3.—A matching section.

Table I: Overall size of wire netting.

Channel	Length	Width
1	15ft 0in.	5ft 0in.
2	14ft 0in.	5ft 0in.
3	12ft 0in.	4ft 6in.
4	10ft 0in.	4ft 0in.
5	9ft 0in.	4ft 0in.
8	3ft 6in.	1ft 6in.
9	3ft 6in.	1ft 6in.
10	3ft 6in.	1ft 6in.
11	3ft 6in.	1ft 6in.

Table II: Length of slot.

Channel	Length
1	10ft 10in.
2	9ft 4in.
3	8ft 6in.
4	7ft 9in.
5	7ft 3in.
8	2ft 5¼in.
9	2ft 5in.
10	2ft 4in.
11	2ft 3½in.

this at right angles to the electric field the slot must be mounted at right angles to the normal dipole. For *vertical polarisation*, then, the slot should be mounted *horizontally* and vice versa.

The material in which the slot is made can be of very simple form and ½in. chicken wire will be found quite suitable.

Connecting the Feeder

At the centre of the slot we have an impedance of about 500 ohms, which is approximately the impedance of a triple folded dipole.

For correct matching 600 ohm balanced twin feeder should be used. Connection can be made at the centre as shown in Fig. 2, triangular metal plates (brass or copper or tin) being fitted at the centre of each inner edge. The distance between the ends of these pieces should be ½in.

Where the receiver uses a different feeder input (usually 80 ohm instead of 600 ohm), then a

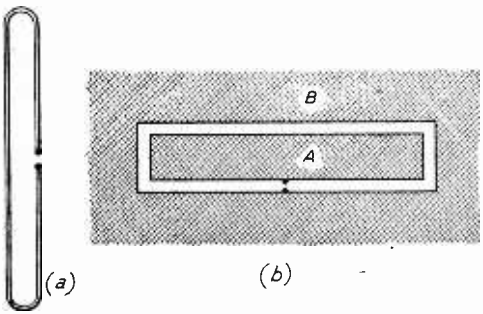


Fig. 5.—(a) A folded dipole; (b) A folded slot.

matching stub or transformer must be used. A simple method is to use a quarter wavelength section of 150 ohm balanced twin cable connected between the 80 ohm feeder and the aerial as shown in Fig. 3.

Fig 4 shows the method of connecting coaxial cable. The cable has its sheath removed to expose the outer conductor. Cut the inner polythene so as to leave about 6in. of the inner conductor available, and then there should be sufficient bare outer conductor so that it can be fitted along one half of the slot. (The length of this portion will vary with the length of the slot and hence the wavelength it is desired to receive.) It is important that the outer braid should not touch the aerial at any other point than along the bottom edge of the slot as shown in the diagram.

Soldering

In order to make good contact, the braided outer cover should be bound and soldered at intervals along the bottom edge of the slot at not more than 12in. between the points. It is a good idea to strengthen the edges of the slot all round by the use of heavy gauge copper conductor, especially if chicken-wire netting is used.

The braided outer cover goes along one half of the slot. In the centre of the other half is fitted a length of stout copper wire or rod of brass, copper or duralumin. It is fitted so as to lie halfway between opposite edges of the slot, one end being central in the slot and the other end ½in. from the vertical edge.

Stout copper wire is used to connect the rod to the slot edges at intervals of not less than 1ft as shown in the diagram.

The centre conductor of the coaxial cable is connected to the rod at the central position.

This method of connection overcomes the objection of balance-to-unbalance conditions and the matching of 80 ohm coaxial cable to the 500 ohm slot.

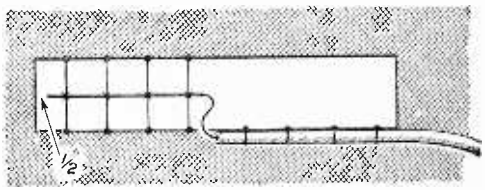


Fig. 4.—Connecting coaxial cable.

Folded Slots

When a normal dipole is folded the impedance is *increased* four times. When a slot is folded the impedance is *reduced* by a quarter. Therefore, where space is available, a simple method of reducing the impedance of the slot is to fold it.

In Fig. 5(a) we have shown the elements of a folded dipole and in Fig. 5(b) the elements of a folded slot. The centre section "A" must be insulated from the outer "B" and this involves difficulties with mechanical construction.

At the U.H.F. range such application becomes more practical and slots can be arranged in curtain arrays as shown in Fig. 6.

Practical Slot Construction

The construction of slot aerials is of the simplest degree. All that is necessary is a quantity of wire netting with some copper wire or rod and some solder.

The overall measurement of the chicken-wire netting is given in Table I and the slot dimensions in Table II for Band I.

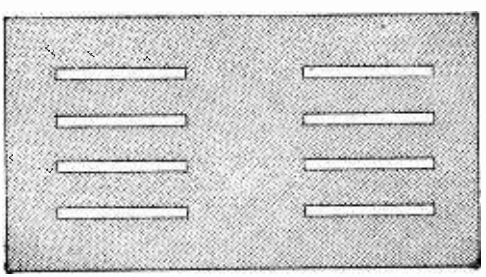
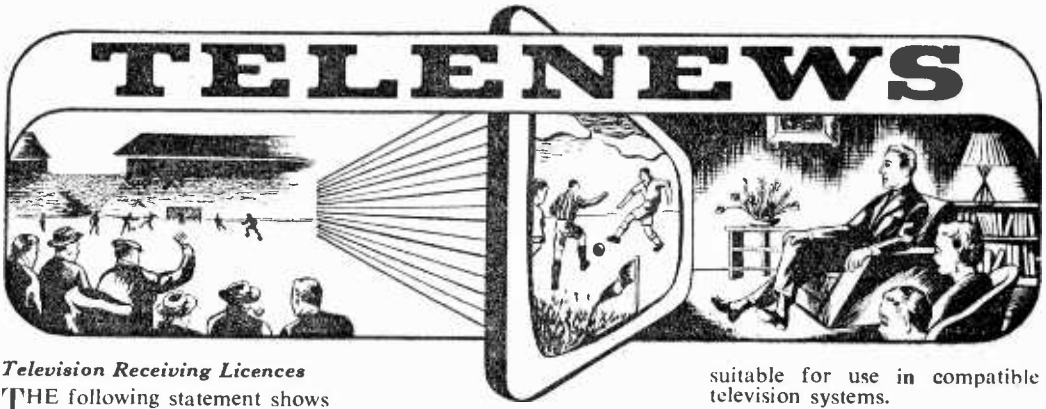


Fig. 6.—Curtain slots.

Use ½in. chicken wire, though 1in. can be used if to hand. Cut the overall dimensions as given in the tables, and if the dimensions cannot be accommodated within the width of the wire, then two pieces can be joined together provided copper wire is used, which is tinned and is soldered at **every** possible point.



Television Receiving Licences

THE following statement shows the approximate number of Television Receiving Licences in force at the end of December, 1959, in respect of television receiving stations situated within the various Postal Regions of England, Wales, Scotland and Northern Ireland.

Region	*Total*
London Postal	1,773,581
Home Counties	1,347,013
Midland	1,546,367
North Eastern	1,654,684
North Western	1,356,349
South Western	842,682
Wales and Border Counties	602,443
Total England Wales ..	9,123,119
Scotland	859,839
Northern Ireland	131,461
Grand Total	10,114,419

Cardiff TV Centre

BBC TV in Wales is now fully technically equipped for television. At the television studio centre in Broadway, Cardiff, are two studios, a scene dock, wardrobe, make-up room and eight dressing rooms, as well as the associated technical areas. Television from the Welsh studio began in 1955, but recently the facilities have been re-equipped. The first programme from the new centre was broadcast just before Christmas.

Colour for China

ONE of the latest E.M.I. colour television cameras left the Hayes headquarters of E.M.I. Electronics Ltd., recently en route for China. With the camera went control equipment and a Rank-Cintel large screen colour projector, which together form a complete closed circuit installation. It is the first colour television equipment to be exported to China by a British company. Designed specially for a wide range of industrial, medical and scientific applications, as well as for broadcast studio use, the colour camera incorporates several outstanding features. It is of an entirely new British design, and uses three vidicon tubes, and a novel optical system to give an improved quality even under difficult lighting conditions. It carries a lens turret with four positions, and the optical system has been designed so that the maximum amount of light falls on the photo-conductive surfaces of the vidicons.

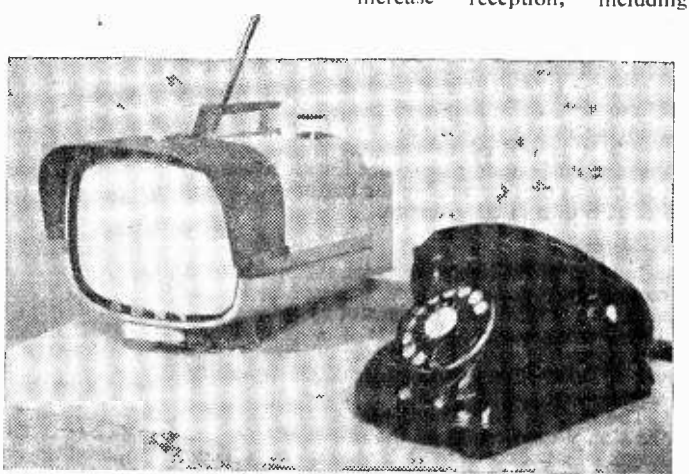
Notable for lightness and small size, it also has the advantage of being cheaper and easier to operate than the more elaborate Image Orthicon camera. Capable of producing broadcast quality simultaneous colour television signals on either 405, 525 or 625 line standards, the camera is suitable for use in compatible television systems.

Amateur TV Convention

THE fifth Amateur Television Convention, arranged by the British Amateur Television Club, will be held in the Conway Hall, London W.C.1, on Saturday, 10th September, 1960.

Educational TV

THE Radio Corporation of America has recently completed a survey made at the request of the Dominican Republic Government on the possibility of using television in the drive to end illiteracy. For the survey, R.C.A. has had the advice of several education experts. Improvements which could be introduced into the present television system to increase reception, including



The Sony Corporation of Japan announced recently a portable transistorised TV Receiver which is claimed to be ready for mass production. It has an 8in. screen and the tuning covers 14 channels. Its weight is just over 12½lb.

three new relay stations, have been suggested. Programmes will range from the purely technical to the educational and cultural. R.C.A. has studied the life and interests of the people so that programmes of human interest and of educational value can be sent out.

The Dominican Republic Ambassador in Washington, in welcoming the report on behalf of his Government, said that as well as bringing the benefits of a higher level of education to the Republic it was hoped that other countries in the world with similar problems would be able to make use of the full R.C.A. report.

Appointments

MR. H. J. Walters, Senior Public Sales Representative, has been appointed an Assistant Sales Manager for the Public Sales Division of Belling and Lee Limited, with effect from 1st January, 1960.

His duties include the supervision of the field activities of all technical sales representatives in the division, the training of new representatives and the introduction of new products. Mr. Walters will also represent the Sales Director at certain trade functions throughout the country.

Mr. C. R. B. Townend, M.A., A.C.A., Secretary of Belling and Lee Limited, has been appointed to the board of Executive Directors with effect from 1st January, 1960.

TV for "Oriana"

PASSENGERS in the Orient Line's new 40,000-ton luxury liner Oriana will be able to enjoy local television programmes at ports of call throughout the world, and closed-circuit telecine and live television programmes while the ship is on the high seas.

Oriana will be the first passenger vessel in the world to be equipped with a completely co-ordinated internal and off-air television service. The order for the entire system has been negotiated by the Marconi International Marine Communication Co. Ltd., acting on behalf of Marconi's Wireless Telegraph Co. Ltd., who have designed and engineered a unique marine television installation, enabling standard and unmodified television broadcast receivers to be used for reception of local transmissions in any part of the world.

The installation provides for the reception of television broadcasts employing the 405-line system used in Britain, the 625-line system used in Australia and the greater part of Europe, and the 525-line system used in the United States, Canada, Japan and some South American countries.

ITA Appointment

THE Rt. Hon. Reginald Bevins, M.P., Postmaster General, has made the following appointment to the Independent Television Authority.

Sir (Frederick) Lucius O'Brien, from 1st January, 1960, to 29th July, 1964.

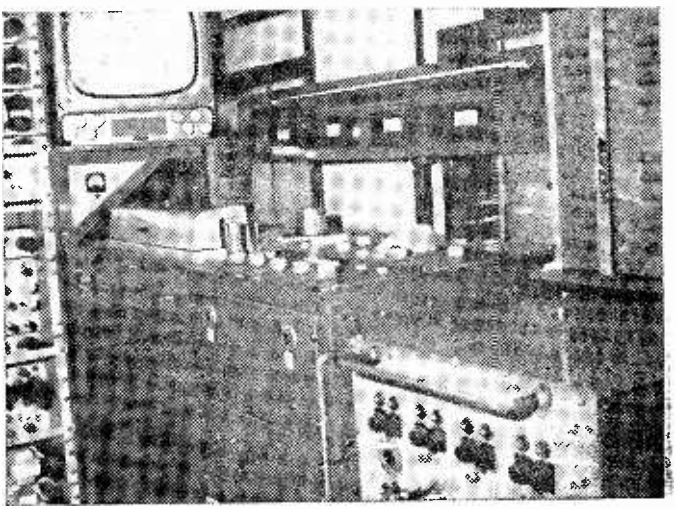
The appointment of Sir Lucius O'Brien fills the vacancy caused by the expiry of the term of office of Lt. Col. Arthur Chichester.

Sir Lucius will make the interests of Northern Ireland his special care.

TV Traffic Control

CLOSED circuit television, which enables one policeman to control four busy traffic lanes at West Drayton, Middlesex, went into operation recently. The television system has been specially designed by E.M.I. Electronics Ltd., to operate under all weather conditions, and will be used to assist the police in traffic control while road widening work is in progress. Without the aid of television three policemen would have been required to regulate traffic. The point duty policeman is able to watch traffic conditions on two roads, which he would not otherwise be able to see, on a monitor screen set up in a special police box.

The television camera has been mounted on a lamp standard twenty feet above ground. To protect it from rain and frost, the camera is enclosed in a special weather-proof housing. Even under difficult lighting conditions, the highly-sensitive camera is able to relay good quality pictures to the police box. The installation is expected to be in use for about a year, during the reconstruction of a railway bridge spanning High Street and Station Road, West Drayton. Closed-circuit television was chosen because there was no other effective way of controlling the intersections during periods of heavy traffic. When traffic is comparatively light, the signals will operate automatically on a "time shared" basis.



Many of the independent television companies have facilities for the use of videotape recordings. Granada have rehoused an Ampex TV recorder in a small console for mobile use. The interior of the videotape recording vehicle is shown above.

Western Summit TV

RELAYING PICTURES TO AMERICA

FOLLOWING the successful relay of pictures of President Eisenhower from Turkey through the BBC to New York using cable film, the BBC is co-operating with the National Broadcasting Company of America on another news enterprise.

During the Western Summit Conference in Paris from December 19th to 21st, 1959, the BBC provided technical facilities to enable the NBC to show recorded news pictures to American viewers in the quickest possible time.

Recordings

The pictures were sent from Paris, using the French television standards of 819 lines, 50 fields per second, over the Eurovision circuit to the British Post Office terminal of the cross-Channel radio link at Tolsford Hill near Folkstone. From this point the signals were transmitted over BBC super high frequency radio links to the Crystal Palace television station and from there to the BBC's Research Department at Kingswood Warren, Surrey. Here the pictures were converted to American television standards of 525 lines 60 fields per second on equipment which has been specially developed by the BBC. The picture signals at the converted standards were then transmitted by radio link via Crystal Palace to London Airport where they were recorded on video magnetic tape equipment together with the associated sound signals which were fed from Paris by line. The recordings were then dispatched by transatlantic plane direct to New York. In addition film material can be transmitted over the transatlantic telephone cable by the BBC's cablefilm process.

Thus video tape recordings and short film sequences of the events in Paris were made available to the NBC in New York with the minimum of delay. Pictures recorded in Paris in the morning were on the American screens in the early evening.

These arrangements were in operation during the period, December 17th to 22nd.

As a safeguard against breakdown most of the radio links were duplicated and others had reserves which could be brought into service at short notice. In addition the pictures and sound were recorded on video tape at American standards by the BBC's Research Department at Kingswood Warren as well as at London Airport and these duplicated recordings were despatched to London Airport by fast road transport.

Standards Conversion

The equipment for converting the vision signals from the French 819 lines 50 fields per second standard to the American 525 lines 60 fields per second standard, on which this video recording operation depended, has been developed by BBC engineers along similar lines to that which they pioneered for the conversion of European television standards to the British television standard for Eurovision. In this case, however, there was the additional problem of the different field frequencies to be solved.

The conversion was carried out by displaying the pictures at the original standards on a picture tube which was scanned by a television camera operating on the required standards. The low frequency flicker, caused by a small difference in the field frequencies of the original and converted pictures, which may have been present when converting from European to British standards was smoothed out by use of a display tube phosphor having a sufficiently long after-glow. In converting from European to American standards the difference in field frequencies gave rise to a flicker at 10 cycles per second, which could not be eliminated in this way without intolerably bad portrayal of moving objects. This problem was overcome in the BBC standards converter by means of a new technique which reduced the flicker to a satisfactory level by adding to the converted picture a correcting signal which was applied so as substantially to remove the flicker.

Cablefilm

For the BBC cablefilm transmissions the pictures were fed from Paris over the Eurovision circuit to the Post Office terminal at Tolsford Hill near Folkstone. Here the vision signals were converted from French to British television standards and then fed to Alexandra Palace where the 16mm optical film telerecordings required for cablefilm process were made.

The new cablefilm system was developed by the BBC for transmitting short film sequences over the Atlantic telephone cable and was first brought into use on June 18th, last year, on the occasion of H.M. the Queen's departure from London and arrival in St. John's, Newfoundland, for her Canadian tour. The system achieves the necessary economy in bandwidth so as to be within the capacity of the Atlantic cable first by restriction of horizontal and vertical definition and by transmitting only alternate frames, and secondly by reduction of the transmission rate so that one complete picture is transmitted over the transatlantic cable every eight seconds, i.e., at one hundredth of the normal rate. Thus a half-minute film sequence is transmitted every 50 minutes. There is some loss of picture quality in the process, but the system makes it possible for short film sequences to be transmitted and reproduced in much shorter time than it takes to fly a film across the Atlantic.

Voltage Regulation

DETAILS OF THE METROSIL

By G. K. Crossland

SEVERAL readers have written to us recently to ask for details of the uses and operation of Metrosils. In view of this interest, it is felt that a short article in this connection would be of general interest to constructors and experimenters. The Metrosil is an element possessing a non-linear volt-ampere characteristic, produced by Metropolitan-Vickers Electrical Co. Ltd.

Properties

For general use, the Metrosil takes the form of either a round or square rod, or a disc, and appears very similar to an ordinary carbon resistor. As opposed to an ordinary resistor, however, which follows Ohm's law, the current in the Metrosil can be made to rise approximately 20 times simply by doubling the voltage across it: and further, by trebling the applied voltage the current increases

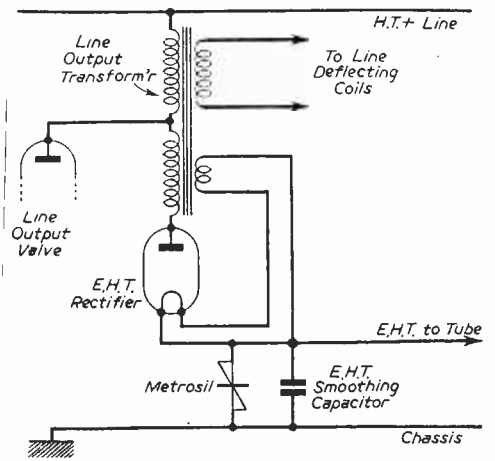


Fig. 2.—Using the Metrosil to improve EHT regulation.

by approximately one hundred times. This property of the Metrosil is shown in graphical form by Fig. 1, and can be expressed mathematically as $I = KEa$, where I is the current, E the applied voltage, and K and a are constants.

The value of K depends mainly on the physical characteristics of the element, while (a) is mainly dependent on its make-up. A normal Metrosil element has a value (a) of 4 or 5, which means that the current in the element varies as the fourth or fifth power of the applied voltage. (R. W. Sillars, "Metrosil" "The Metropolitan-Vickers Gazette," July, 1944.)

Before proceeding it should be mentioned that, as opposed to a Thermistor, a Metrosil is primarily a voltage operated device and, for normal application, use is not so frequently made of its inherent negative temperature-coefficient, although in

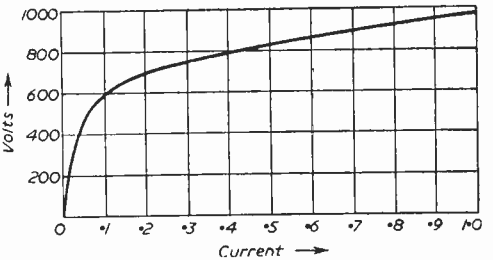


Fig. 1.—The non-linear characteristic of the Metrosil.

certain circuits it may be desirable to allow this characteristic to compensate for the positive temperature-coefficient of a copper coil which might also be included in the network.

Applications

A typical application for Metrosil in a television set is shown in Fig 2. Here the element will be seen to occupy the position of a bleeder resistor in the EHT system. It does, in fact, load the EHT system to a varying degree, but the actual magnitude of loading depends on the voltage. If, for instance the voltage tends to rise as a result of a reduction in beam current—caused by a reduction in the overall brightness level of the picture—the voltage across the Metrosil will also rise, and as a consequence it will pass more current. This rise in EHT current will, therefore, counteract the rise in voltage, and in this way maintain a fairly even EHT loading, irrespective of beam current. A similar effect will, of course, occur should the picture become brighter, and the EHT voltage have a tendency to fall.

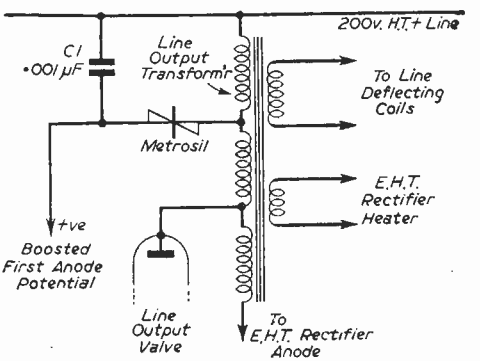


Fig. 3.—Obtaining a boosted first anode potential.

H.T. Boost

Another application of this versatile element is an aid to obtaining a first anode potential for a tetrode picture-tube. A potential here in the region of 300V or more is desirable to provide optimum focus, and in certain sets 200 to 250V represents the maximum D.C. voltage available.

A suitable pulse voltage can often be found on one of the inductive components associated with

the line timebase. This voltage can be rectified by a Metrosil and used quite successfully as a first anode potential. Fig. 3 shows a typical circuit of this arrangement in which the pulse voltage is picked up from a tapping on the line output transformer. This produces about 200V above the H.T. line potential across C1.

It is often possible to obtain a pulse potential of suitable magnitude from the blocking oscillator transformer or from a feedback winding on the line output transformer, while in certain cases the voltage which is developed across the line deflecting coils can be used. In all cases, however, the relevant voltage is in the form of a pulse which is developed in the line output stage during the line flyback.

Pulse-voltage rectification takes place mainly owing to the relatively low A.C. impedance, as opposed to D.C. resistance, of Metrosil. This characteristic can also be used to advantage in the cathode circuit of a video amplifier valve. Fig 4 shows such a circuit in which the Metrosil acts successfully as a bias resistor, but owing to its low A.C. impedance it tends to prevent the feedback of inverse video voltages. It can, therefore, be compared in operation to a bias resistor bypassed by an infinitely large value capacitor to minimise attenuation at the low video frequencies.

In conclusion it should be mentioned that the three briefly described Metrosil applications must not be considered exhaustive, for in the field of electronics generally it has hosts of applications, some of which it is hoped may now appear obvious to the experimenter.

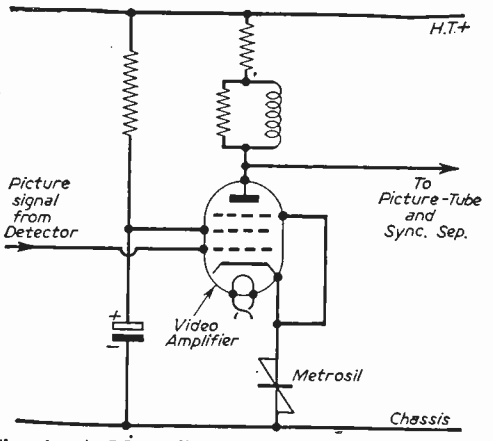


Fig. 4.—A Metrosil in the cathode circuit of a video amplifier assists in maintaining a linear response.

THE EF50 CONVERTER

(Continued from page 288)

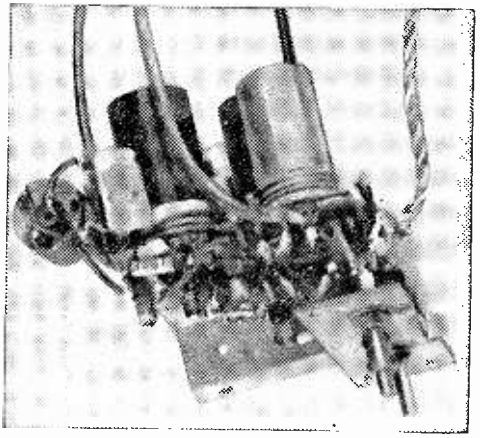
Keep the wiring short and wire components right to the valveholder where possible, especially V1. When "earthing" V1 spigot, solder the wire at the bottom of the spigot tag nearest the valveholder. Position R2 to be at least ¼in. above the chassis.

Alignment

Turn down the gain control at least a quarter of the way. Switch on the converter, place the Band I aerial lead on the grid of V2 and tune L4 for maximum vision. Remove the aerial, plug in the Band III aerial and set C12 and the cores of L1, L2, L3 all midway and L5 on a level with the former top. Tune L5 slowly and rock C12. Vision may be received in two positions of the core of L5 but there is only one where sound and vision are received together; this is the correct one. Tune for maximum sound, then tune L2. This tuning may be a little sharper than might be expected, and if the gain is set too near maximum, the removal of this core or the aerial may cause V1 to oscillate to give a bright plain raster, and no signal will be received. Keep tuning L2 and L5, and when a signal is received tune L3 for maximum vision. This coil tunes rather broadly. Now tune L4 for maximum vision, and turn the core slightly towards the sound if necessary and increase the gain with R3. Now tune L1 if patterning is experienced: this may not seem to have much effect, as it tunes broadly, but it removes BBC patterns. Finally set C12 oscillator trimmer for maximum sound.

The gain control was a 300Ω wire-wound midget pot, as it was to hand, but it can be 500Ω or up to 1kΩ, but then R4 is omitted, the slider being taken direct to chassis.

For those who like to experiment, the circuit in Fig. 4, with EF50 valves, has slightly less gain. Do not omit the condenser in the aerial lead.



A view of the complete converter.

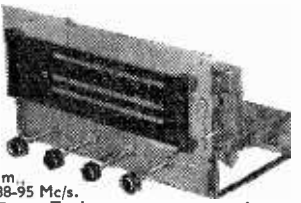
With the EF80 it works exceptionally well on low voltages (Fig. 5). About 10pF seemed about right for matching in the aerial lead; a postage stamp trimmer was used. This matching was found to be very important for this valve, as the impedance of the valve is altered and mismatching takes place when the aerial is taken to the cathode. The EF50 requires 1,000pF aerial condenser, but this can be varied to suit individual requirements.

7-VALVE AM/FM RADIOGRAM CHASSIS

TRS

Surplus Bargain Offer

Valve Line up : ECC85, ECH81, EF89, EABC80, EL84, EM81, EZ80.



3 waveband and switched gram positions. Med. 200 m.-500 m. Long 1,000 m.-2,000 m., VHF/FM 88-95 Mc/s. **4 Controls.** Vol., On-off, Tone, Tuning, Wavechange. P.U., Ae. and E., and speaker sockets. Magic eye tuning. Philips continental tuning insert with permeability tuning on FM, and combined AM/FM IF transformers, 460 Kc/s and 10.7 Mc/s. Dust core tuning all coils. Latest circuitry, including AVC and Neg. Feedback. 3 watt output. Sensitivity and reproduction of a very high standard. Chassis size 13¾in. x 6½in. Height 7½in. Edge illuminated glass dial 11¼in. x 3½in. Vertical pointer, Horizontal station names, gold on brown background. A.C. 200/250 v. operation.

£13.10.0 *Carr. and Ins. 5/-. Complete with 4 knobs walnut or ivory to choice.*

We are sorry to cause our customers disappointment, but existing orders have already exhausted present stocks of the above. A new replacement chassis, virtually identical, will be available from early February, price unchanged.

RE-GUNNED TV TUBES

New Reduced Prices!

And now 12 months' Guarantee!

12in.	£6	17in.	£8.10.0
14in.	£7	21in.	£10.10.0
15in.	£7.10.0	*Carr. and Insur.* 10/-.	

All tubes Rebuilt with new Heater Cathode and Gun Assembly—reconditioned virtually as new! Full 6 months' unconditional Guarantee. As used by our own Service Dept. Comprehensive stocks—quick delivery. **10/- part exchange allowance on your old tube.**

RECORD PLAYER CABINETS

Contemporary styled, rexine covered cabinet in two-tone fawn and brown, or mottled red with white polka dot. Size 18½ x 13½ x ht. 8½in., fitted with all accessories, including baffle board and anodised metal fret. Space available for all modern amplifiers and autochangers, etc. Uncut record player-mounting board 14 x 13in. supplied.

Cabinet Price **£3.3.0.** Carr. and Ins. 3/6.

2-valve AMPLIFIER Mk. 2

Latest developed circuit giving a higher fidelity response and greater output (2-3 watts) using twin stage valve ECL82 and neg. feedback Tone Control. Complete with knobs, etc., wired and tested ready to fit in above cabinet.

ONLY £2.17.6. P. & P. 1/-.

6in. speaker and matching transformer. 22/-. P. & P. 1/6.

SENTERCEL RECTIFIERS. E.H.T. Type Flyback Voltages. K3/25 2 kV., 5/-; K3/40 3.2 kV., 6/9; K3/45,3.6 kV., 7/3; K3/50 4 kV., 7/9; K3/100 8 kV., 13/6. **MAINS TYPES.**—RM1, 125 v. 60 mA., 4/9; RM2, 125 v. 100 mA., 5/6; RM3, 125 v. 120 mA., 7/6; RM4, 250 v. 250 mA., 16/-; RM4B type 270 mA. 17/6; RM5, 250 v. 300 mA., 21/-.

SPEAKER FRET.—Expanded Bronze anodised metal 8 x 8in., 2/3; 12 x 8in., 3/-; 13 x 12in., 4/6; 13 x 15in., 6/-; 24 x 12in., 9/-, etc.

Listed above are only a few items from our very large stock. Send 3d. stamp today for Complete Bargain List.

VALVES

FULLY GUARANTEED — NEW REDUCED PRICES

1R5, 1T4	7/6	DAF96	9/-	EF80	9/6	PCF82	10/6
185	7/6	DF96	9/-	EF86	13/6	PCL83	12/6
3S4, 3V4	8/-	DK96	9/-	EF91	8/6	PL81	12/6
5Z4	9/6	DL96	9/-	EL41	10/6	PL82	9/6
6K7	5/6	EABC80	9/6	EL84	9/6	PL83	11/6
6K8	8/6	EBC41	9/6	EM81	9/6	PY80	7/6
6Q7	8/6	ECC83	9/6	EY51	10/-	PY81	9/6
6SN7	8/6	ECC84	10/6	EY86	10/-	PY82	7/6
6V6	7/6	ECF80	11/6	EZ80	7/6	PY83	10/6
6X4	7/6	ECF82	11/6	EZ81	7/6	U25	12/6
7C5	9/-	ECH81	10/6	MU14	9/6	U191	12/6
7Y4	8/6	ECL80	10/6	PCC84	10/6	UCH42	10/6
35L6	9/6	ECL82	11/6	PCF80	10/6	UF41	10/-

Send for List.

SPECIAL PRICE PER SET

1R5, 1T4, 185, 3S4 or 3V4	27/6
DK96, DF96, DAF96, DL96	35/-
6K8, 6K7, 6Q7, 6V6, 5Z4 or 6X5	35/-

COAX 80 OHM CABLE.

Stand ⅛in. diam. Low Loss Semi-Air Spaced Aeraxial.

SPECIAL REDUCED PRICES

20 yds. 12/6, p. & p. 1/6; 60 yds. 32/6, p. & p. 3/-; 40 yds. 22/6, p. & p. 2/6; All other lengths 8d. per yard.

Coax Plugs 1/-, Sockets 1/-, Couplers 1/3, Cable End Sockets 1/6, Outlet Boxes 4/6.

TRANSISTOR 'ONE-WATT' AMPLIFIER

6 v. Battery operated

Latest Push-Pull, 4 Transistor circuit giving full 1 watt Output into standard 3 ohm speaker. Good sensitivity and improved freq. response. Neg. feedback. Var. Tone and Volume Controls. Chassis Size 6¼in. x 3¼in. x 1¼in. Current consumption 10 mA quiescent—250 mA at 1 watt.

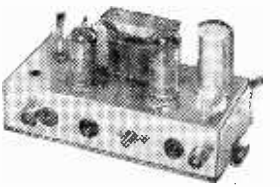
2 matched GEC GET15 Transistors... 42/- pr.
2 GEC GET3 Transistors ..... 21/- pr.
Driver Trans. 8/6
Output Trans. (to 3 ohms)..... 10/6

Complete Kit of Parts incl. circuit etc. less speaker. ONLY **99/6** P. & P. 2/6.

Circuit and instruction booklet 1/6 post free.

VOLUME CONTROLS

10,000 ohms—2 Megohms. All long spindles. Morganite Midget type. 1¼in. diameter. Guar. 1 year. Log or Lin. Ratios. Less Sw. 3/-. D.P. Sw. 4/9. Twin Ganged controls, ¼ meg., ½ meg., 1 meg., less Sw. 8/9 ea.



BAND 3 TV CONVERTER

All channels 7-13 (180-205 Mc/s).

Mk. 2 Model. Latest cascode circuit using ECC84 and EF80 valves. 18db gain over standard circuits. Built-in Power Supply 200-250 v. A.C. Size 6¼in. x 3in. x 4in. Simple to fit—only external plug-in connections. Wired and aligned ready to use. Only 79/6, P. & P. 2/6.

B1-B3 changeover Sw. and BBC Aerial Socket fitted and wired, 8/- extra.

Band 3 Aerials. Single Dipole with 4 yds. cable, 13/9, 3 Element Beam, 25/-, 5 Element, 32/6, etc. B1-B3 Crossover Units, 7/6.

RECORD PLAYER BARGAINS

NEW RELEASE by E.M.I.—4-speed Single Player Unit fitted with latest stereo and monaural Xtal cartridge and dual sapphire stylli. Auto stop and start. A fidelity unit and bargain buy at only **£6.19.6.**

BSR—UA8 Model.—4-speed autochanger with crystal turnover cartridge, etc., wired for stereo, Bargain **£6.19.6.**

Garrard—Latest RC121/D/Mk 2—fitted with GC8 Xtal cartridge, plug-in monaural head. Auto/manual selector, etc. The connoisseur's choice for audio perfection. Bargain 10 gns.
Plug-in stereo head GC8/10 £2 extra.

All above are *brand new, fully guaranteed* models. Carr. and Ins. 4/6.

Comprehensive bargain range of Collaro, B8R and Garrard Units in stock. Send for comprehensive bargain lists.

C.R.T. Heater Isolation Transformers

New - Improved types—mains prim. 200/250 v. tapped.

All isolation Transformers now supplied with alternative *no boost plus* 25%, and *plus* 50% boost taps, at no extra charge.

2 v.	2A type	12/6	(P. & P. 1/6)
6.3 v.	.6A ,,	12/6	,,
10.5 v.	.3A ,,	12/6	,,
13 v.	.3A ,,	12/6	,,

Other voltages available at same prices.
Small size and tag terminated for easy fitting.

JASON FM TUNER UNITS

(87-105 Mc/s)

Designer-approved kits of parts for these quality and highly popular tuners available as follows.

STANDARD MODEL (FMT)—as previously extensively advertised. COMPLETE KIT, 5 gns., post free. Set of 4 spec. valves, 30/-, post free.

LATEST MODEL (FMT2)—attractively presented shelf mounting unit to enclosed Metal Cabinet with Built-in Power Supply. COMPLETE KIT, £7. p. & p. 3/6. Set of 5 spec. valves, 39/6.

NEW JASON COMPREHENSIVE F.M. HANDBOOK, 2/6 post free. 48 hr. Alignment Service, 7/6, p. & p. 3/6.

TYGAN FRET (Murphy pattern) 13 x 12in., 2/-; 12 x 18in., 3/-; 12 x 24in., 4/-, etc.

SPEAKERS P.M. 3 ohm 2½in. Elac, 16/6. 3½in Goodmans, 18/6. 5in. R. & A., 17/6. 6in. Celestion 18/6. 7 x 4in. Goodmans, 18/6. 8in. Rola, 20/-. 8in Special Cone G'mans, 21/6. 10in. R. & A., 25/-

Terms: C.W.O. or C.O.D. Kindly make cheques, P.Os, etc., payable to T.R.S. Post/Packing up to ½lb. 7d. 1lb. 1/1, 3lb. 1/6 5lb. 2/-, 10lb. 2/9.

Hours: 9 a.m.-6 p.m. 1 p.m. Wed. Open all day Saturday.

TRS

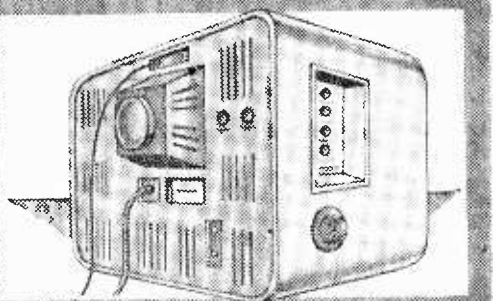
RADIO COMPONENT SPECIALISTS (Est. 1946)

70 BRIGSTOCK ROAD, THORNTON HEATH, SURREY (*THO* 2188)

50 yards Thornton Heath Station.

Buses: 130A, 133, 159, 166 and 190

Servicing Television Receivers



No. 53—THE FERGUSON 992T SERIES

By L. Lawry-Johns

(Continued from page 230 of the February issue)

THE previous article dealt with EHT faults and we now deal with timebase and linearity faults.

Striations

Vertical rulings down the left side of the picture should direct attention to R35 which is a 910Ω resistor across the linearity coil. This should not be confused with B.K. effect in the PL81 which produces one ragged vertical line on the left side. Severe interference producing a more violent white ragged borded with lines shooting across usually denotes a discharge associated with the EHT winding on the line output transformer and the discharge can often be seen occurring where the lead to the EY51 anode comes up, looking between the PL81 and the PY81.

Raster Present. No Picture. Sound O.K.

Readers often write in to say that although they have traced the fault to a defective V5 video amplifier, and that this had a short and that the damaged resistor (grid leak 3.9k) has been replaced, there is still no picture signal. The answer to this one is that the short has damaged the OA60 (OA70) crystal diode detector which is located inside the I.F. coil can next to the video amplifier. This small component is clearly marked; it is white with one red end. Note the connection of the red end.

Raster Present. No Picture or Sound

Check aerial and cable connections and then replace the ECC81 (V2). Check H.T. to the V1 stage (EF80) plus 7 and 8, H.T. to V2 plus 1 and 6.

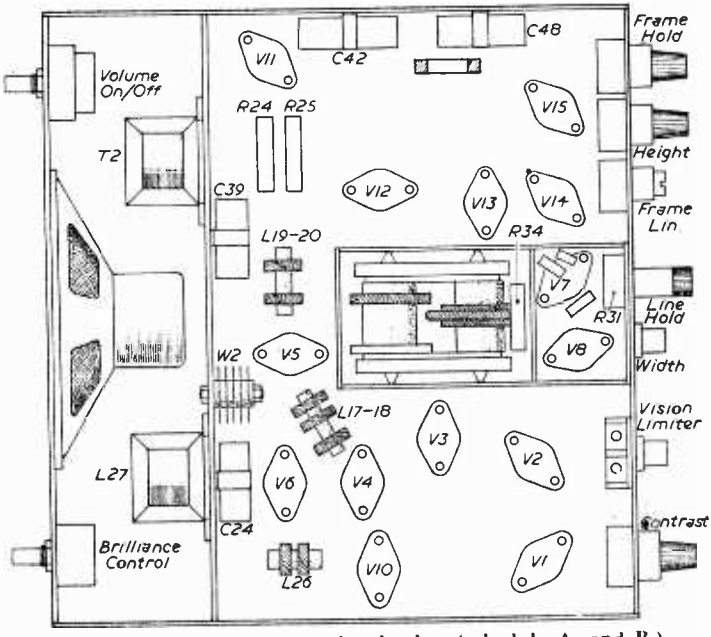


Fig. 5.—Simplified underchassis view (schedule A. and B.).

Picture O.K. No Sound

Check EBF80 and H.T. to screen and anode.

Distorted Sound

Check 3.3M (orange, orange, green) resistor to EB91 (V6) noise limiter diode, and EC180 (V11).

Loud Howl

Check 50μF electrolytic capacitor, pin 3 to chassis (C39). If this is open-circuit, feedback occurs between the pentode and triode sections.

Frame Faults

Vertical lock at one end of its travel, frame still revolving. Check ECL80 valves V12 and V13. If still defective check 220kΩ resistor (red, red, yellow) to hold control, 470kΩ (yellow, violet, yellow) to pin 2 of V13.

Persistent jitter unaffected by controls. Check both V12 and V13 and the capacitors of 0.02μF, 500pF and 0.1μF.

Compression at Bottom, Top Expanded

Check V12 and V13, 0.1μF, 0.05μF, 0.01μF capacitors and associated components.

Loss of Height, Frame Hold, etc.

Check C48, 50μF capacitor from pin 3 of V13 to chassis.

No Raster or Signals at all

Valves lighting up. Check R74 and R75, 40Ω wire wound resistors. What usually happens is that one resistor fails leaving one PY82 and the other resistor to carry the full load. This may result in the other resistor overheating and failing, giving the above symptoms.

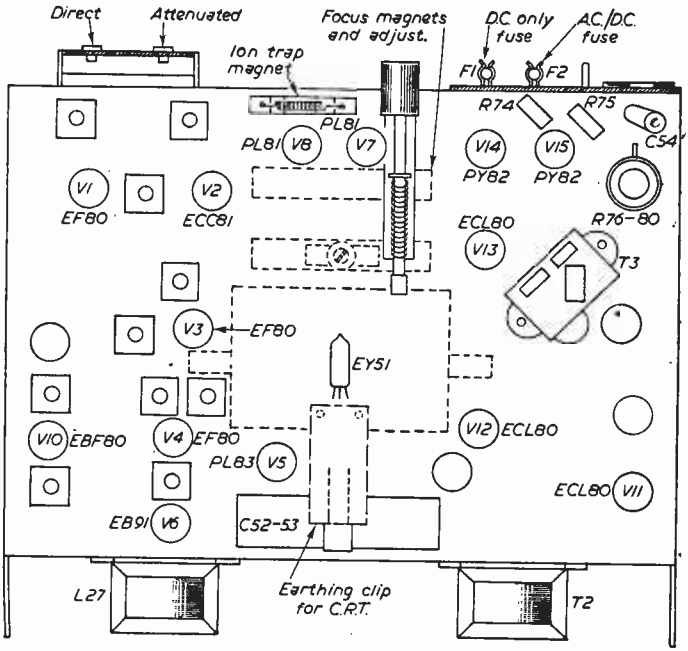


Fig. 6.—Layout (schedule A. and B.).

No Signals. No Valves Glowing

This normally results as a valve heater becomes open-circuit (or the tube heater), the thermistor (CZ1) being cracked or broken or a section of the mains dropper being open circuited (R78-R79-R80). This fault is not always easy to trace unless a voltmeter is available which would enable the mains voltage to be followed from the fuse, through the dropper, thermistor and through the heater chain V15-V14-V7, etc., to the point where the voltage is absent. On most valve bases the heater pins are 4 and 5, 4 and 4 on the EB91, 1 and 12 on the tube. On the ECC81 base, 4 and 5 are joined, pin 9 being the other heater (centre tap) connection. If a voltmeter is not available, use a neon screwdriver to trace the voltage, but first ensure that the chassis is not "live." If it is, reverse the mains leads. The neon will glow at the A.C./D.C. fuse on the dropper and along the heater chain until the break occurs.

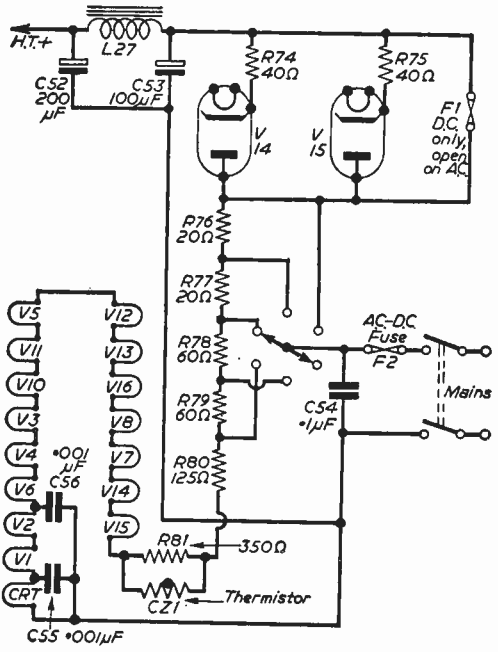


Fig. 7.—H.T. and L.T. circuits.

Distorted Picture Hum on Sound

Check C52-C53. Note, however, that when C53 is open-circuit the H.T. voltage drops to a low figure and the signals are normally absent.

D.C. Fuse

In areas of low voltage D.C. mains only, a fuse can be inserted into the D.C. fuse holder to short out the rectifiers and surge resistors and thus avoid the voltage drop across them. Note, however, that the polarity of the mains must be very strictly observed and it must be made impossible for the mains plug to be reversed. Failure to observe this warning will result in severe damage as the mains is applied direct to the H.T. line when the D.C. only fuse is occupied.

Conversion

The Ferguson type A tuner was intended for use with the schedule E 992T series and the schedule B 998T. The Ferguson type B1 was intended for use with 992T series schedule A to D and 998T schedule A.

As these tuners are not now available, the Clydon P16H or the Brayhead 16s can be directly fitted, following the instructions provided. The surplus Pye type 47 can also be used with the unit wired in and the I.F. output applied across the ECC81 cathode resistor, suitably modified, the oscillator section being rendered inoperative. The V1 EF80 is removed, the H.T. derived from pin 8, the heater supply from pins 4 and 5. The I.F. is sound 19.5Mc/s. Vision 16Mc/s.

Tube Faults

As mentioned last month, some of these models are fitted with ion trap magnets held by a fibre strap. On all occasions when no picture, or a faint, dim, picture only can be obtained, it is wise to check that the fibre band has not snapped and caused the ion trap magnet to be displaced. The magnet should be positioned for maximum brilliance.

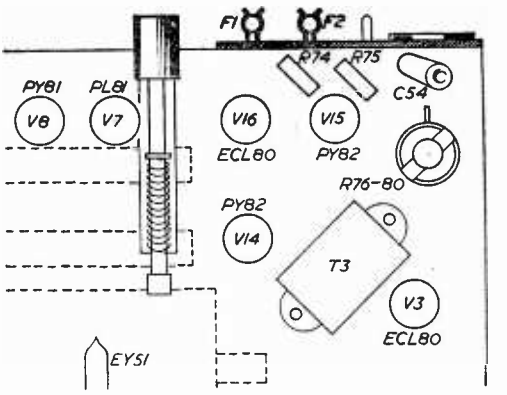


Fig. 8.—Layout of schedules C., D. and E. (see also Fig. 6). On all late models, V5 is an EF80.

TIMEBASE FAULTS

G.E.C. MODELS BT1748, BT2747, BT8246

By G. J. King

THE timebase circuits of these receivers are easily followed and only the circuit of the frame amplifier stage is shown (Fig. 1). The most common faults which develop are set out below together with their remedies.

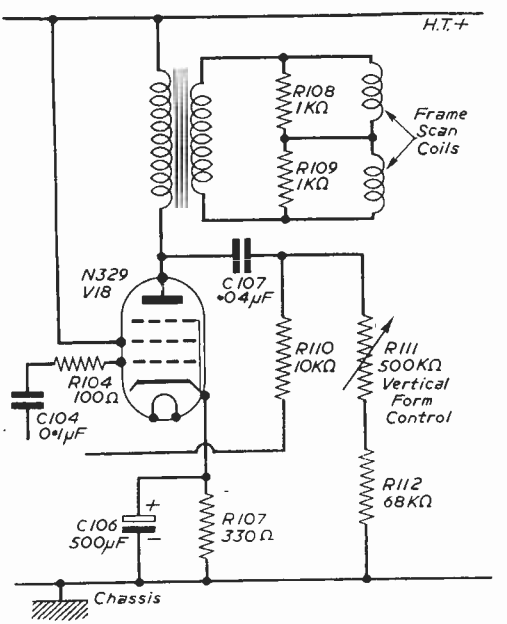


Fig. 1.—The frame amplifier section of the G.E.C. BT1748 series. Intermittency of C107 can result in frame bounce.

Frame Bounce

If this symptom is accompanied with the height varying in a somewhat random manner, it would be as well to check the condition, preferably by substitution, of the feedback capacitor in the frame amplifier section. This is the 0·04μF capacitor (C107) in the frame amplifier circuit in Fig. 1.

Excessive Height

This effect may be present with poor frame linearity which cannot be corrected by adjustment to the frame linearity controls. If this is so, a check should be made to the 500μF capacitor (C106) connected across the cathode resistor of the frame amplifier valve (see Fig. 1). A short-circuit in this component is usually responsible.

Weak Line Lock

In some cases of this symptom, especially if the smaller resistors and capacitors associated with the sync separator and line oscillator appear to be normal, poor insulation of the windings of the windings of the line oscillator transformer gives the trouble. It is rather difficult to prove such a fault by a series of tests, and it is nearly often necessary to check the transformer by substitution.

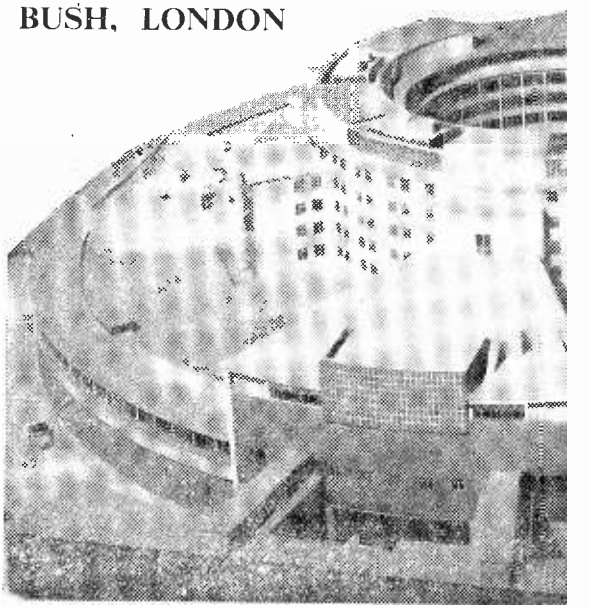
After transformer replacement, it may be discovered that the line hold control is at the end of its range. This can be balanced, however, by disconnecting the 100k resistor (R116) which is in parallell with an 18k resistor (R68), the pair being connected from one side of the line hold control to receiver chassis.

Similar trouble is sometimes produced by a fault developing in the 300pF capacitor connected between the control grid of the N339 line amplifier valve and chassis. A substitution test in this case is desirable.

THE TV CENTRE

THIS NEW HEADQUARTERS FOR THE BBC IS SITUATED IN SHEPHERD'S BUSH, LONDON

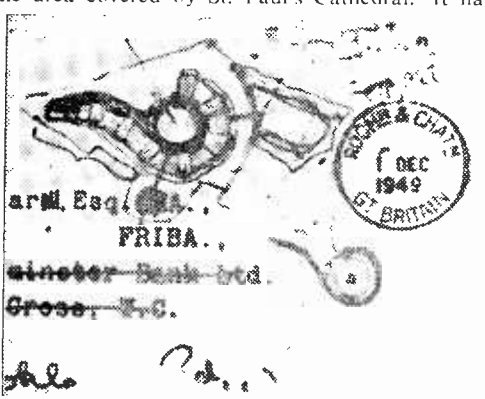
THE modern building now under construction in Shepherd's Bush, London, to be known as the BBC Television Centre, will give the BBC the first studios especially built for television productions. As many readers may know, since 1936, the BBC Television Service has used converted premises. When the television centre is completed it will be the largest TV headquarters in Europe. The site occupies some 13 acres and the building will consist of a large main block, containing seven studios and several hundred offices; a scenery block; a restaurant block; a works block; and eventually a "spur or tail" running from the main block. The scenery block and certain of the offices in the main block are already in use. More of the offices in the main block will be brought into service in the near future and it is expected that the first studio will be ready for operation by the middle of this year. Following the completion of the main and restaurant blocks, the work block will be constructed, but so far no detailed planning for the spur has yet been made. The cost of building the mains block and works block and completing the restaurant section will be in the order of £10 million including technical plant and wiring.



This view (of a model of the TV centre) is from [illegible] and future "[illegible]

Main Block

This structure is now well advanced. It is a circular building covering 3½ acres, nearly twice the area covered by St. Paul's Cathedral. It has an inner ring going up to the seventh floor and outside this ring radiating from it are the studios and the central wedge. The ring encloses a circular garden, some 150ft in diameter, in centre of which will be a fountain and sculpture. The size of this block can be judged from the fact that it will include more than 2,500 doors.



The design for the BBC television centre began when Mr. Graham Dawbarn, C.B.E., M.A., F.R.I.B.A., sketched on an envelope when discussing the project with Mr. M. T. Tudsbery, the BBC's Civil Engineer.

The Studios

The layout of the studios has been so designed that the additional requirements in ventilation, lighting, power supply, for colour television can be accommodated when required and is evidence of the planning which has gone into the development of the centre. Four of the studios will be bigger than any television studio now in use in Britain and each studio will have its own air-conditioning plant.

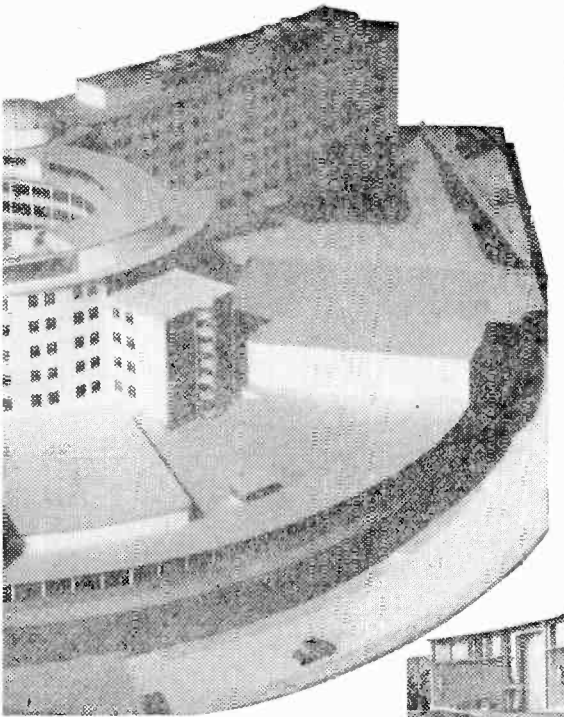
It is planned to complete studios 2, 3, 4 and 5 first. Number 3 is expected to be in service during this year and the remainder will be brought into service about the middle of this year and it is planned to complete all four by the end of 1961. Orders have already been made for the purchasing of the most advanced television camera channels (a camera channel includes a TV camera and its associated electronic equipment).

The two largest studios have a floor area of some 8,000sq. ft each compared with 6,000sq. ft. in the largest studio at Riverside Hammersmith. In these two studios there will be four working channels and one spare.

Studio One

This will be the largest—some 180ft x 100ft x 54ft high—and will have a pit, 7ft 6in. deep into which part of the floor, 50ft by 30ft can be lowered. If required it will be possible to fill this pit with water for programmes of an aquatic nature. It is interesting to note that the floor is

Th
pre
rais



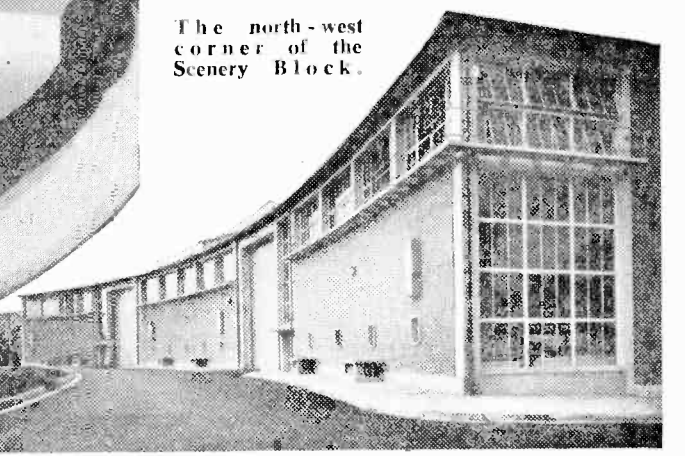
south-east and shows the main block
r."

designed to carry quite heavy loads and could be used to accommodate a circus with "a line of elephants each with its forelegs resting on the hindquarters of the one in front." This studio will be used for light entertainment and musical programmes and it will be possible to accommodate an audience of 600. The other studios are intended for general purposes (dramatic productions, talks, etc.) and Studio 6 will be so constructed that if experience shows that two small studios will be more useful, it can be divided.

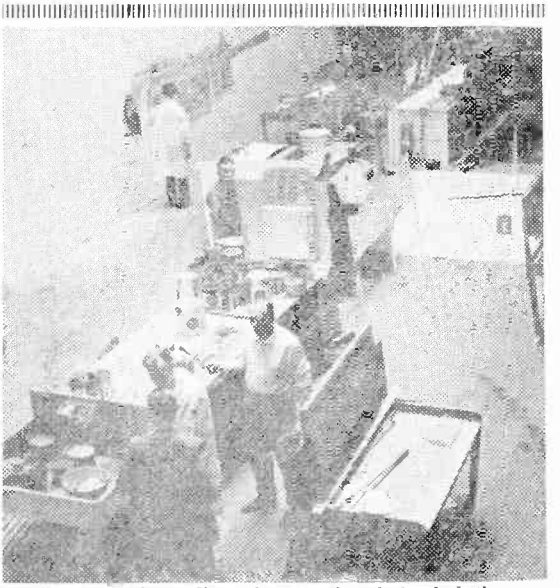
Control Room

The first and second floors of the building will house the technical areas: the studio and control rooms at first floor level in the ring look down into

The north-west corner of the Scenery Block.



each of the seven studios radiating from it. The central wedge between Studios 3 and 4 will accommodate other technical areas including Tele-Cine Presentation Suites in the central apparatus rooms. The Continental Control Point for Eurovision Programmes in this country, which is at present in Broadcasting House, will also be housed in this central wedge. The roof of this section will be used when necessary for outdoor filming.



Scenic artists' studio where painted backcloths are
ired. The studio houses six frames each of which can be
l or lowered to enable the artist to work on floor level.

Offices

From the third floor of the ring upwards to seventh floor, much of the space will be used for offices, with wardrobe section including tailoring and laundry; make-up and music departments will be at the third floor. Part of fourth floor will be used as BBC club with roof garden on the top of Studio 6.

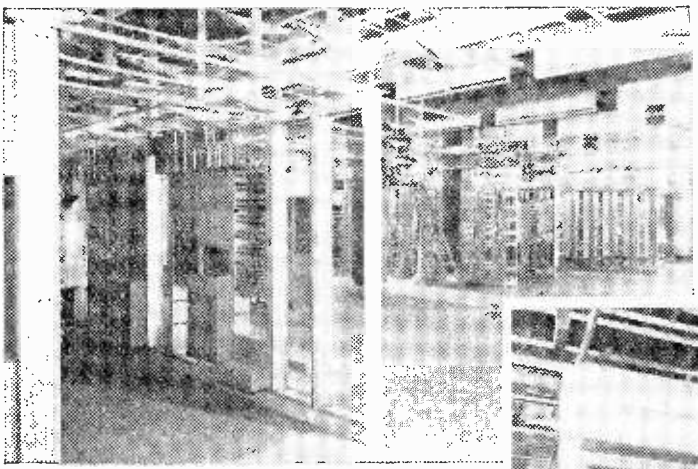
The Scenery Block

This was completed in 1953 and it includes the workshops, the lighting and scenery and properties used in stage sets in television productions, a scenery painting studio, extensive storage space for scenery and properties and about 200 offices.

At the outer end, the studios are linked by an internal runway, 25ft wide.

Along this, properties and scenery will be conveyed to the studio. These will come direct from

the Scenery Block. Supplementary lights and backcloths will be operated from a lighting gallery which will surround each studio at a high level. The Scenery Block is already in use and covers one acre. It houses the Television Design Department



General view of the sound and vision bays in the Central Apparatus Room.

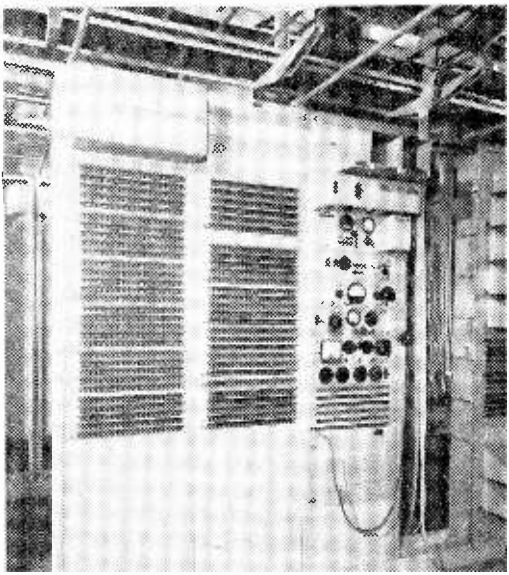
where scenery is devised and made in the adjoining carpentry and plaster shops. The scenic artists' studio (illustrated on the previous page) is used for the painting of backcloths and is 65ft high. The artists work on an intermediate platform which is about 25ft above the floor of the studio and the surface to be painted can be moved up or down electrically from a console

The Performers

On the ground floor and the basement there will be about 120 dressing rooms, with accommodation for about 550 people. These rooms are all arranged around or under the central ring, and entry to the studios is therefore through doors at their inner end. There are three assembly areas, serving different groups of studios, each with its own Green Room, tea bar, and other services. Parts of the first and second floor of the central wedge will be devoted to telecine equipment and the final check on the quality of television pictures from the studios, before they are passed on to the transmitters, will be made in "quality check rooms" which will be on the third floor. All the apparatus which can be conveniently accommodated in one central area will be in a central apparatus room also on the third floor. A major part of the area below the central lawn, which will be some 150ft in diameter, is for telerecording equipment. On the second floor of the main building will be the base technical maintenance workshops, test rooms and equipment stores. There, immediate repairs to the television engineering equipment will be carried out. The central control room will be positioned in the central wedge between studios 3 and 4. All programmes, whether they originate from inside the building, from other studios or from outside broadcasting units will pass through this control room.

Seating

Public audiences will be admitted to the studios for certain programmes and tiered demountable seating will be provided in each studio according to need. The public will be conducted around the Central Courtyard to audience entrances and then direct to the studios along wide corridors. These corridors are isolated from the dressing rooms and skirt the Assembly Areas, en



Sound jackfield and A.C. test bays.

route to the studios. Between studios are storage areas for the housing of technical equipment such as cameras and microphone booms; also for funiture and other properties when not needed on the studio floor.

At 13ft 6in. above studio floor level are the studio control rooms. These, covering vision, sound and lighting are provided within the ring ranged along the end of each studio and the control staff look down into the studio through a window running along the full width. Behind each set of studio control rooms are the apparatus rooms, and attendant first-aid repair workshops, with two small electric hoists to the maintenance workshops on the floor above.

The architect for the TV Centre project is Graham Dawbarn (Norman and Dawbarn) in association with M. T. Tudsbery, C.B.E., consulting engineer to the BBC.

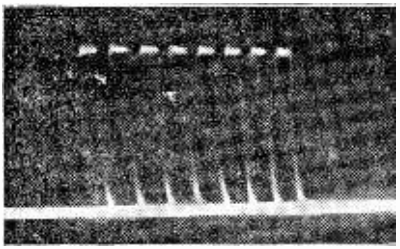
Frame Sync Separator

A STABLE, TWO-VALVE CIRCUIT

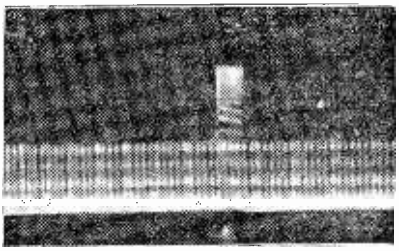
By J. Woodhead

BECAUSE of the inconstant output waveform of the normal frame pulse integrator, an accurate interlacing of odd and even frames is difficult, if not impossible, to attain.

The following method of separating the frame from the line pulses does not depend on any form of integrating network. With this kind of separator only the leading frame pulse is required for triggering the time base oscillator, although all eight are produced in the output. This does not mean that perfect interlacing is ensured, as so much depends on the accurate firing of the time base, but a definite improvement should result, even if it tends to fire erratically.



Waveform at anode of V2.



Waveform at grid of V2.

Function

The working of the circuit is fairly straightforward. A negative-going sync input is required.

V1 clips the sync pulses and reverses their phase, producing a positive-going signal at the anode. L and C3 form a combination which works as a rejector circuit for the line sync, leaving the frame pulses practically unattenuated. C2 is merely a coupling condenser.

V2 is the frame pulse separator. Working as an anode bend detector it is biased beyond cut-off, only the frame sync pulses causing anode current to flow. The bias, and thus the amplitude of the output is adjusted by R7.

Stability

The circuit is very stable in operation, the bias of V2 being set to a satisfactory point at which it can then be left, as all pulses at V1 anode will be of constant amplitude, provided the sync input to the grid is sufficient to cause clipping of the pulses.

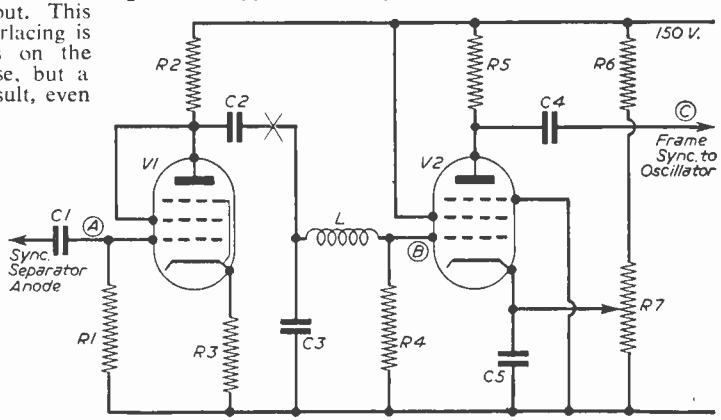


Fig. 1.—Circuit of the separator.

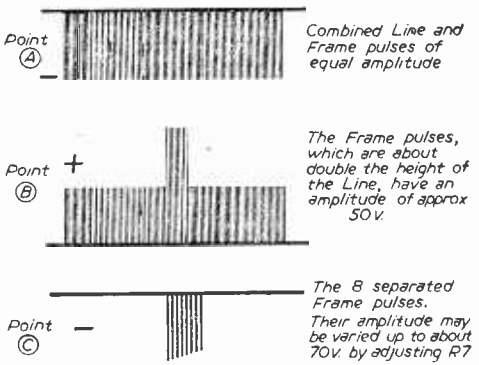


Fig. 2—Waveform at the points indicated.

LIST OF COMPONENTS

V1—6AK5 or 6AM6 for 0.3A series heater operation.
V2—6AM6.
R1—22k ½W.
R2, R5—47k ½W.
R3—150 ½W.
R4—2.2M ½W.
R6—33k 1W.
R7—10k wire wound.
C1, C2, C4, C5—0.1μF paper.
C3—300pF Mica.
2 B7G holders.
L—Wearite PHF1, longwave coil with the aerial winding removed.

For ease of insertion into an existing receiver the circuit can be built up on two small chassis, or small aluminium sheets which can be bolted to the existing chassis at convenient points. At point X, the lead can be broken and extended by up to a foot, provided it is kept away from points of interference like the line time base.

H.T. Droppers

It is left to the constructor to calculate the value of resistors for dropping the H.T. to about 150 volts from the H.T. rail of his receiver. Large value de-coupling condensers can be used to ensure that 50c/s ripple, or interference, on the H.T. line, does not affect the pulses.

These components are best fitted in the existing receiver so the unit(s) can be made as small as possible.

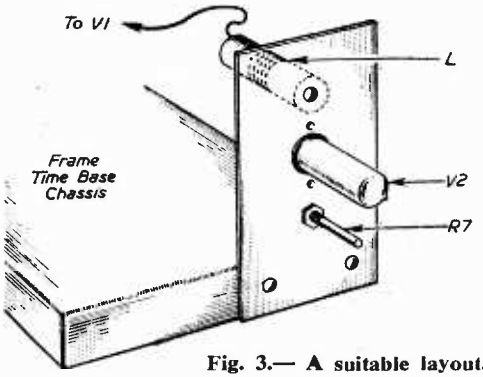


Fig. 3.— A suitable layout.

RESOLUTION (*Continued from page 291*)

embrace the required range of frequencies and yet the picture still does not show the full complement of bars.

Spot size is one factor because if the diameter of the spot is larger than the width of the bar then the bar will not be seen.

Another factor is the video output stage; it is useless for the tuning stages to be broadened if the video output stage will not pass the full bandwidth.

A further factor is the aerial system. Where highly directional arrays are used as in the fringe areas the aerial itself may not provide sufficient gain at the edges of the band it is supposed to encompass.

The range of frequencies injected into the receiver by the aerial system at a fairly even level may not cover the 3Mc/s. Much depends not only on the aerial itself but also on its proximity to local objects, the type of feeder and method of injection.

It has been the author's experience that there are very few commercial sets which will reproduce the 3Mc/s bars in true black and white.

Vertical versus Horizontal Definition

The figures for the bandwidth necessary for reasonable definition have been based on the vertical definition of the picture. We have assumed that the picture is divided into a number of horizontal lines, the total number of active lines being 377, and from this we have derived a figure for the required bandwidth.

One factor which has not been taken into account is that there is a certain distance between adjacent lines which is included in the aspect ratio of 4/3.

To obtain the optimum horizontal definition we must make it equal the vertical definition. The optimum viewing distance is where the horizontal lines comprising the picture just merge together so that line structure is not observed.

This optimum viewing distance will vary with the visual accuity of the observer; a person with good sight should sit farther from the screen than one with poorer sight.

Now here is a simple experiment which you can make yourself, if your set will resolve the 3Mc/s bars, or if you have access to one which will.

First check that the bars are received correctly and are not spurious owing to "ringing." The best method is to count the number of bars seen in each square on test card "C". The 2.0Mc/s bars should have 8 distinct black lines, those representing 2.5Mc/s should have 10, and the 3.0Mc/s bars should have 12.

Count the lines carefully to see that they are all there and, if necessary, adjust the focus on the bars and not on the horizontal lines. Normally, the 3.0Mc/s bars will be reproduced at reduced contrast, but they should be distinctly observed as individual bars.

Having verified that the bars are correctly reproduced, ignore them for the moment and then move back from the screen until the *horizontal lines* merge together so that they are no longer visible as separate lines; the background of the picture should appear complete and whole.

The position in which you are now is the optimum position for viewing for yourself. At this point observe the screen closely (without falling into the temptation of moving your head forward) and endeavour to see the 3Mc/s bars. If you cannot see them clearly then move forward towards the screen until they can be distinguished. This will be the position of optimum horizontal resolution.

Generally, you will find that to distinguish the vertical bars you will have to move forward and when you can observe them you will note that the line structure of the picture is also quite visible.

From this it follows that the optimum viewing position for horizontal resolution is not the same as for vertical resolution. As it is important that the line structure should not be observed, then if at this point the 3Mc/s bars cannot be distinguished it is *useless making the receiving circuits capable of resolving them!*

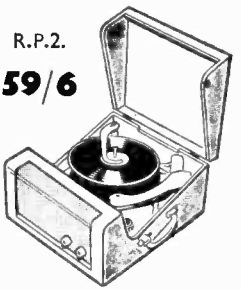
Advantages of Reduced Bandwidth

Reducing the bandwidth to a lower figure has several advantages. The most important is that the gain of the receiver is increased—a not inconsiderable factor for the fringe viewer. For fringe reception 2.5Mc/s is adequate.

The fringe viewer would do well to bear this in mind. A picture with decreased horizontal definition but increased overall clarity with absence of background mush and "snow" is much preferable to one which has a marvellous definition, but in which all action appears to take place in a snowstorm.

R.P.2.

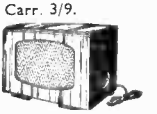
59/6



A beautifully styled cabinet. Made by a famous manufacturer. In polka dot cloth with clipped lid and carrying handle. Size 16 x 14½ x 8½ in. deep. Will take a B.S.R. Monarch 4-speed Autochanger and 7 x 4 in. elliptical speaker and most of the modern portable amplifiers. Carr. & Ins. 4/6.

EXTENSION SPEAKERS 19/9

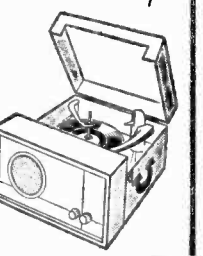
Polished oak cabinet of attractive appearance. Fitted with 8 in. P.M. speaker W.B. or Goodmans of the highest quality. Standard matching to any receiver (2-5 ohms). Switch and flex included. Ins. & Carr. 3/9.



R.P.3.

69/6

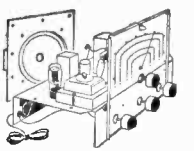
A delightful looking cabinet 14¾ in. x 17⅜ in. x 8¾ in. in 2-tone leatherette. Will take a B.S.R. Monarch 4-speed autochanger and 6½ in. round speaker. Carr. & Ins. 4/6.



MODERN 17" T/V CHASSIS 24 GNS.

COMPLETE AND WORKING

A chassis including 17 in. tube, permanent magnet speaker, 13 channel Turret Tuner (any two selected channels fitted). Other channels supplied on request at 7/6 each. 13 valves. Chassis and valves guaranteed for three months. CRT. 2 months' full guarantee. Sound I.F. 19.5 Mc/s. Vision 16 Mc/s. A.C. only. Ready and working to fit into your own cabinet. Carr. & Ins. 25/-. As above, with 14in. tube, complete and working. **£19.19.0.**



CASH PRICE
79/6

SUPER CHASSIS

5/1 initial payment & 19 weeks at 3/11

5-valve superhet chassis, including 8 in. P.M. speaker and valves. Four control knobs (tone, volume, tuning, w/change switch). Four w/bands with position for gram. p.u. and extension speaker. A.C. Carr. & Ins. 5/6.

NO DEPOSIT—INTEREST FREE—20 or 36 WEEKS TO PAY

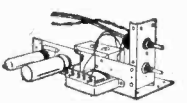
send for a FREE catalogue—full details on goods and easy payments

AMPLIFIERS

12 months' guarantee

ALL PORTABLE AMPLIFIER Mk. D.1.

59/6



Brand new. Latest design with printed circuit. Dimensions 7 x 2¼ x 5 in. A.C. only. Mains isolated 2-3 watts output. Incorporating EL84 as high gain output valve. Volume and tone controls. Knobs 2/6 extra. P. & P. 3/6.

AMPLIFIER Mk. D.2 79/6

Printed circuit. Latest design. Dimensions 7 x 2¼ x 5 in. A.C. only. Mains isolated. 3-4 watts output. Incorporating the latest ECL82 triode pentode output valve giving higher undistorted output. Volume and tone controls. Knobs 2/6 extra. P. & P. 3/6.

AMPLIFIER Mk. D.3 89/6

De-luxe model. Printed circuit. Latest design. Dimensions 7 x 2¼ x 5 in. A.C. only. Mains isolated. 3-4 watts output. Incorporating the latest ECL82 triode pentode output valve, giving higher undistorted output. Volume, treble and bass control. Knobs 3/6 extra. P. & P. 3/6.

AMPLIFIER Mk. D.5 39/6

Simple circuit employing ECL80 triode pentode output valve giving 2-3 watts output. A.C. only. Mains isolated. Single control for volume and on/off switch with knob. P. & P. 3/6.

3 TRANSISTOR AMPLIFIER 79/6

9 volts. 1 control. P. & P. 3/6.

Many other types and sizes of beautifully designed cabinets in stock at prices from 29/6 to 79/6.

U.A.8. B.S.R. MONARCH 4-SPEED AUTO-CHANGER

8/1 initial payment and 19 weekly payments of 6/11. (Cash Price **£6.19.6.**)

T.U.9. B.S.R. 4-SPEED SINGLE PLAYER, 89/6

Carr. & Ins. 5/6

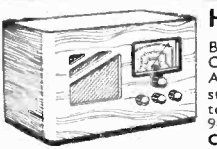
COLLARO CONQUEST 4-SPEED AUTOCHANGER

8/1 initial payment and 19 weekly payments of 6/11. (Cash price **£6.19.6.**)

COLLARO CONQUEST STEREO AUTOCHANGER

12/6 initial payment and 19 weekly payments of 11/6. (Cash price **11 guineas.**)

Carr. & Ins. on the above 5/6.



HOME RADIO 5/1 (*Initial Payment*)

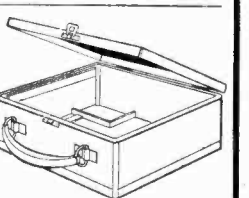
BALANCE PAYABLE AT 3/11 OVER A PERIOD OF 19 WEEKS.

A.C./D.C. Universal mains 5-valve octal superhet 3 waveband receiver can be adapted to gram p.u. In attractive wooden cabinet, 9¼ x 18½ x 11¾ in. Carr. & Ins. 4/6.

CASH PRICE 79/6

STURDY CASE, 12/6

8½ x 7½ x 3½ in. deep. Covered in burgundy and grey washable rexine. Strong clasp, hinges and handle. Ideal for portable radio chassis or transistor set. Can be adapted as a record carrying case to hold 18 seven-inch long-playing records. P. & P. 2/6.



DUKE & CO. (Dept E.3.)

621/3 Romford Road, Manor Park, E.12. · ILF 6001/3

Siting TV Aerials

ALIGNING AERIALS FOR OPTIMUM RESULTS

By P. J. Clark

AERIAL siting is a relatively simple procedure on Band I, and in many instances it is only necessary to set the aerial on a predetermined compass bearing. This procedure is generally adequate in service areas and in near fringe areas where little interference and ghosting is experienced.

In extreme fringe areas or where ghosting and interference is troublesome, however, the task may not be quite as simple. Here it often pays either to site the aerial for maximum pick-up, maximum signal-to-noise ratio, or for minimum ghosting. The trouble is, of course, aggravated to a large degree where a complex multi-element array is necessary, owing to its relatively small angle of pick-up.

In cases such as these, some form of contact between the man on the roof and an operator at the receiver is most desirable, as then the array may be readily rotated for the best picture.

Now that Band III is open, many multi-element Band III aerials are being installed. These aerials, owing to their high gain and large number of elements, possess an extremely narrow angle of pick-up, considerably less than any Band I aerial of the multi-element variety.

Critical Positioning

With certain arrays of this kind it is necessary only to swing it a matter of 5 to 10 degrees to pass right across the acceptance angle and thus go from a point of minimum pick-up to a maximum pick-up and then again to a point of minimum pick-up, even if an accurate compass bearing can be obtained at the site in relation to the transmitter, it is most difficult and in some cases almost impossible to set the aerial within such a fine tolerance.

This is particularly marked in areas of very low signal strength, where it is quite feasible to install the array by compass and then discover later that the picture is well below expectations. In a lot of cases of poor Band III pictures investigated in the fringe area by the writer, the trouble has been caused solely by inaccurate aerial siting. In some extreme cases no picture at all could be obtained until the array was rotated just a matter of degrees!

Clearly, then, something more than purely verbal contact is required between the receiver operator and the aerial rigger. A telephone can be a great help, of course, but some more definite means of setting the aerial is almost essential.

A Solution

Several experiments have been carried out by the writer in an endeavour to find a simple solution to the problem. It was first thought that the obvious solution simply involved running a length of twin cable from across the receiver's low-impedance loudspeaker tags to an A.C. voltmeter or audio output meter conveniently situated in proximity to the aerial.

This method was tried by adjusting the receiver to give a readable indication on the meter during a test-tone transmission. The aerial could undoubtedly be adjusted to provide a peak reading, but three main drawbacks were observed.

First, it was soon discovered that a steady test-tone transmission is not always available when required, and it is hopeless trying to make a delicate adjustment when the meter needle is flicking to-and-fro in rhythm with any other modulation.

Secondly, it was noticed that even if the aerial was adjusted for maximum sound, this may not represent the optimum position for maximum vision. This effect, however, may have been aggravated since the aerial which was used appeared to have a wider pick-up angle at the sound frequency than at the vision frequency—though this was not proved conclusively.

Thirdly the effect of the sound AVC was most noticeable unless the input signal to the receiver was sufficiently attenuated. It may have been the AVC action, of course, which was tending to emphasise effect number two. Unfortunately, the AVC system on most commercial TV receivers cannot quickly be disconnected and reconnected.

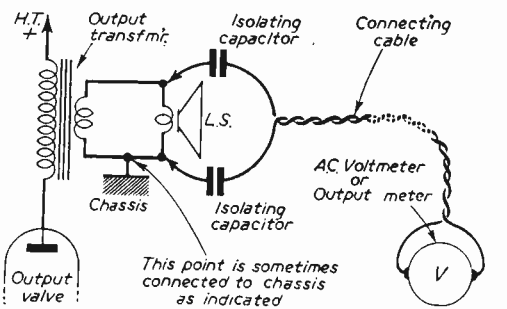


Fig. 1.—Using the sound signal.

Isolation

If any reader wishes to try out this method for himself, care should be taken to ensure that the chassis of the receiver used is adequately isolated from the cable. Remembering that a TV aerial is usually well earthed, and that if the cable connected to the output meter is live and happens to be touched by the rigger at the same time as the aerial, the effect may be dangerous, particularly if the rigger is perched precariously on the apex of a roof.

Two good A.C. isolated capacitors should be used between the loudspeaker terminals and the cable as shown in Fig. 1, and to be on the safe side it is as well to make sure that the receiver is connected to the mains in such a way that the chassis is in contact with the neutral side, where the receiver is of the A.C./D.C. variety, bearing in mind that the loudspeaker is connected direct to chassis on a large number of commercial sets.

Using the Vision Signal

Next, it was decided to experiment by using the vision signal as a general reference. The problem, however, was that of obtaining a meter indication at a point well removed from the receiver without unduly disturbing the function of the video stages. This was eventually solved by building a rectifying circuit into a small box which could readily be connected between the cathode connection at the picture-tube and receiver chassis.

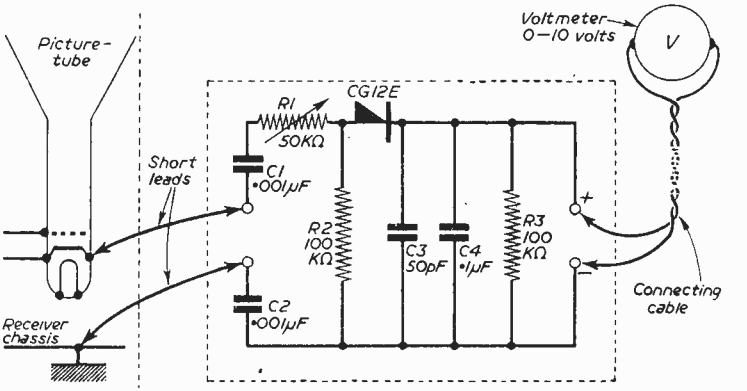


Fig. 2.—Using the vision signal.

Provided such an arrangement is connected to the set through short leads, it has very little adverse effect on the general function of the receiver, but is capable of supplying a D.C. voltage sufficient to give a usable indication on a standard moving-coil meter.

The circuit which was finally adopted is shown in Fig. 2. From this it will be realised that the voltage developed across the load resistor R3 corresponds to an average voltage representative of the composite picture-signal and synchronising pulses. This, the greater the white content of the picture, the greater will be the voltage across R3.

Modulation

For this reason, therefore, it is necessary to use the indicator for aerial siting purposes only during the transmission of a still picture, such as the test card. Nevertheless, the test card is radiated more frequently than the test-tone on sound, and at more convenient times—it is understood that the same will apply on Band III.

The rectifier unit makes use of a small crystal diode, and two isolating capacitors C1 and C2 are incorporated to eliminate the risk of shock. The variable resistor R1 acts as a form of sensitivity control which can be adjusted to provide the best indication on the voltmeter. A 4.7k resistor may, if desired, be connected in series with R1, so that the video circuits of the receiver will not be subjected to excessive damping by the diode circuit when R1 is set to minimum resistance. Capacitor C4 acts as a reservoir and also provides a certain degree of damping on the voltmeter. This is bypassed by a 50pF non-inductive capacitor C3 to keep R.F. out of the connecting cable.

Even when used with receivers embodying AGC in the vision channel a maximum can usually be obtained on the voltmeter when the aerial is accurately sited. In areas of very high signal strength, however, the vision AGC may tend to flatten the peak, though this effect can nearly always be countered by the use of a suitable attenuator in the aerial lead, or by reducing the sensitivity setting on the receiver. But, as was intimated earlier, a device of this kind is of most use in areas of low signal strength.

Experiments seem to indicate that siting the aerial for maximum vision signal is much better than siting for maximum sound.

AUSTRALIAN TV

by G. W. Oliphant

FOLLOWING the "boom" of 1958, the past twelve months have seen a phenomenal expansion of TV in Australia.

In 1958, when transmitters were operating only in Melbourne and Sydney, over 300,000 receiving licences were issued. Now, transmitters have been established in three other State capitals, Brisbane, Adelaide and Perth (Hobart is to follow suit in May), and the estimate is that new licences will total over 200,000.

Operation

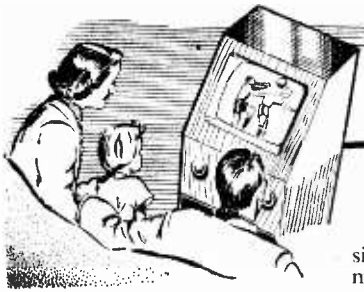
At present the transmitter grouping is that each locality has one ABC station, operating non-commercially, and closely following BBC lines, together with two commercial stations. The standard of 625 lines at 50 frames, together with positive modulation and the use of equalising pulses in the vertical sync block, makes receiver design relatively straightforward, and both definition and interlace are of high quality.

Among the receiver manufacturers there are several British representatives, including H.M.V., the Ferguson Radio Corporation (who use the trade name 'Atlas'), Pye and Ekco, and there is strong competition both from American firms—Healing, Admiral and Stromberg-Carlson amongst others—and from the huge Amalgamated Wireless Australasia. The 21in. set is firmly established as the popular size receiver; the average cost of a table model now is about £120 sterling, compared with £160 a year ago.

Fringe Area Models

Already, with an eye to the future, designers are concentrating on models for use in areas of poor signal strength. Extra I.F. stages are making their appearance, and the phase discriminator, with its better horizontal hold, is tending to replace normal synchroguide in the horizontal sync circuit.

In the country areas, some distance from the capital cities, it is now a common sight to see "toast-rack" aerial arrays on masts forty or fifty feet high.



UNDERNEATH THE DIPOLE

A MONTHLY COMMENTARY

By Iconos

THE explosive effect of the American TV "payola" scandals continue to reverberate around the world. In the U.S.A. the elaborate quiz competition programmes have been much reduced and subjected to such close control and scrutiny that some viewers think that the life—and certainly the liveliness—has been squeezed out of them. But even in a form which is said to be "stodgy," they are still regarded with suspicion by some of the viewers. Any kind of deception, legitimate or otherwise, that may be practised is likely to be queried. Even the simple illusion of passing off Ampexed programmes as real live transmissions is regarded with disfavour. An announcement or a sub-title stating that a programme is recorded is often put on before Ampexed transmissions take place; otherwise there might be an accusation of trickery!

Trickery?

American newspapers made such a fuss—and rightly so—about the contrived and rigged quizzes, that they started a chain-reaction which has caused annoyance and consternation all over the world. Even the new Ulster ITA station has felt the icy blast of criticism. This station sponsored an ITN item which featured a story about Belfast prison and its parole system at Christmas for "good behaviour" prisoners. For certain shots warders played the part of prisoners walking down corridors, mainly with their backs to the camera. There arose a local outcry against "faking"! I would have thought that it was to the advantage of prisoners and all concerned that they should not be recognised, and that a simple stratagem of this kind was perfectly legitimate. A few days later the UTV "Roundabout" programme featured a local blues singer, Ottilie Patterson, who mimed her songs to a sound playback. A further howl of indignation arose, condemning the "fake" as being phoney and misleading to the public. Really! How very startling!

Playback

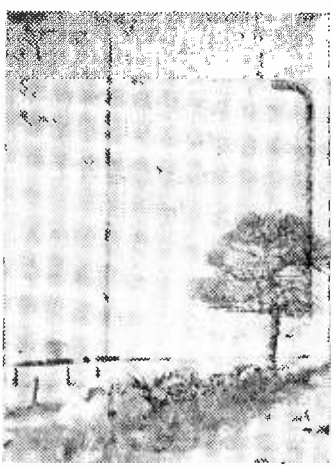
Playback has been used in film studios for many years, and vocal numbers are now rarely recorded direct. The sound is first recorded, with or without orchestra, and this is reproduced from film or tape for the actor to mime to when he is in front of the camera, moving about without the restrictions of a microphone hovering over his head. If the original recording is made without orchestral backing, a "quiet piano" system is used as an accompaniment. This quiet piano is barely audible on the sound track but is necessary for keeping the artiste in time and in tune! A full orchestral treatment is dubbed on the track when the picture is finally edited; otherwise an expensive and large orchestra would have to hang about the studios while complicated shots were made, with the usual lengthy breaks while the cameraman adjusts lighting. The same advantages apply to the use of musical playback for live television. The real point of criticism arises when the playback system is not carried out correctly.

Photographic Trickery

Now the advertisers are coming under the microscope of the witch-hunters of TV trickery. Someone has found out that products that polish floors or paint walls are not always used when the advertisement filmlets are photographed in a studio for television. The fact is, that unless the camera is aided a little, many subtle effects just do not register. The trivial deceits of putting make-up on actors' faces, introducing perspective distortion in scenery, using fruit salts (mild, I hope!) for champagne bubbles, have been used for stage and screen for many years. I am quite sure that the actors themselves would prefer drinking real whisky instead of cold tea or ginger ale! But these substitutions are all born of necessity, in the interests of the audience.

BBC News

THE British Kinematograph Society continues to sponsor many lectures of great interest to television technicians and viewers. Mr. S. W. Smithers, Manager of BBC Television News, recently gave a comprehensive and practical lecture on the complex organisation involved in world coverage for television news, not omitting valuable references to technical matters. The preferred medium for film interpolation is 16mm film with magnetic sound. It was a pleasure to listen to a programme executive who had such a sympathetic appreciation of the technical problems involved—including a realisation of the possibilities and limitations of new techniques such as Ampex.



This view of the ITA station at Burnhope, near Durham, was taken after a snowfall and shows the 750ft. mast and buildings.

reversal film stock, the different types of cameras and so forth. Future lectures include "Modern Television Studios" by W. H. Cheevers of Associated Rediffusion, who will presumably deal with the new super studios at Wembley, "Film Editing Techniques for Television," a symposium, and "Planning of Regional Television Studios" by Walter Kemp, who was mainly responsible for TWW's Cardiff and Bristol Studios.

Site Values

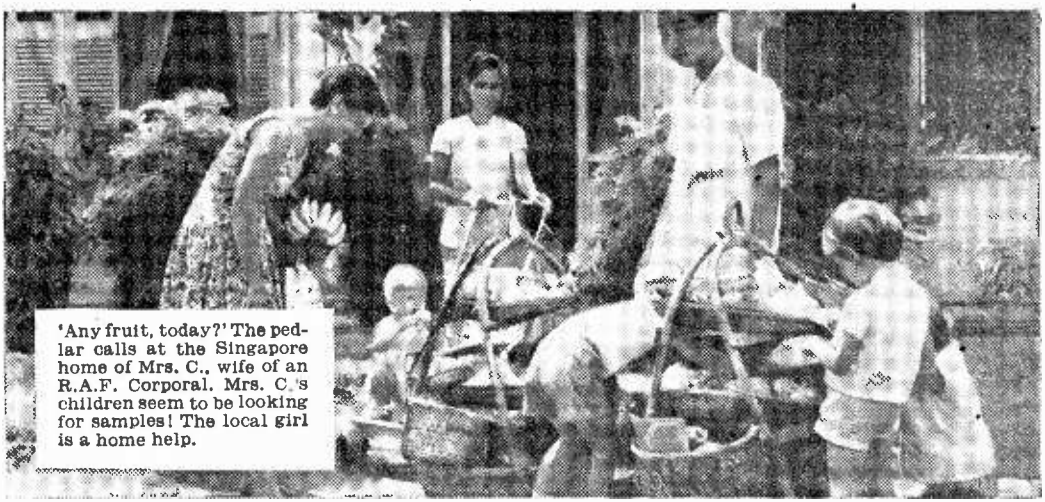
THE planning of a new television studio starts with the selection of a site. The BBC and ITA contractors have all been faced at various times with the choice of a site in the centre of a town—which is probably expensive and requires the adaptation of existing premises—or the alternative of a bare piece of ground in a suburb, ripe for building entirely new premises especially designed for television purposes. The first organisation to achieve this was, of course, the BBC, which acquired a large plot of ground at Shepherd's Bush and has been building its huge television centre for the last three years or so. Of the I.T.A. contractors, Granada were the first to build premises from zero, taking a fine piece of bombed-out ground within a stone's throw of Deansgate, Manchester. Scottish Television bought the Theatre Royal, Glasgow, and adapted it. Tyne-Tees converted a warehouse at Newcastle, Southern converted a cinema in a suburb of Southampton and Anglia acquired the old Agricultural Hall in the very centre of Norwich. And now the latest television contractor, Westward Television, has announced that its studios will be built brand new, on a bare piece of ground in the "Theatre precinct" of Plymouth. This site adjoins the Drake Cinema, also the Athenaeum (now being built), and is very close to the Civic Centre. Thus Westward will be able to cover a large number of outside broadcasts without even taking their O.B. truck on the road! This is a really good move in the interests of locally originated programmes at Plymouth, and sounds to me like first-class regional planning. In any case, I would think that a good looking frontage in an important part of a town was most important from the public relations point of view.

Entertainment Standards

CRITICISM of TV programmes is loudly voiced in the morning train, in pubs and in clubs about individual programmes and items seen the previous evening, but the entertainment standards of both BBC and ITV are extremely high—thus throwing into the shadow the odd features which have limited appeal or are just a little below par. When the ordinary man-in-the-street goes on a seaside holiday and sees a local summer show or concert party, his comment, heard loudly in the local hostelry afterwards, probably goes like this: "Ah! It were a good show, and funny, too! But it wasn't as good as Benny Hill last night on the telly. Why can't they get Benny Hill down here in this show?" The fact that Benny Hill is a first-class comic requiring a first-class salary, that the authors and producers worked for days on writing and rehearsing his TV show, that the musicians and all the other contributors probably received in aggregate at least £3,000 for a 30 minute TV feature, is not taken into account. "Why don't they have an orchestra at the Picture Pavilion?" and "What they ought to do is to give quiz puzzles—refrigerators and washing machines" were other fatuous comments that I have heard, spoken by presumably intelligent people. The television companies are rich and prosperous. It is only right that they should divert some of their wealth to support the remnants of local show business, especially the live theatre, the music hall, the summer shows and the orchestral concerts.

Film Transmission

IN my article last month, I mentioned that 70mm films pose problems for transmission on TV. The equipment cannot handle film 70mm wide. One method of sending excerpts from these films out on telecine is to have a special optical reduction print made on 35mm film of a section of the very wide picture, panning this particular part about on the main action during the optical reduction process, but the television reproduction of just a small section of the film frame will give a comparatively poor impression of "Ben Hur" or any similar epic made on this broad gauge film. The increase in definition, the improved colour values and the "solidness" of the sound, together with the tremendous size of the screen are all factors which the film people hope will draw audiences back into the cinemas. Over 400 cinemas in the USA have been equipped with suitable 70mm film projection equipment and there are already 38 installed in British cinemas. An important innovation of this kind cannot be ignored by the television film commentators. They will probably only be able to illustrate their remarks with still transparencies or reductions to narrow gauge film for the present telecine equipment.



'Any fruit, today?' The pedlar calls at the Singapore home of Mrs. C., wife of an R.A.F. Corporal. Mrs. C.'s children seem to be looking for samples! The local girl is a home help.

The private life of Corporal C., *R.A.F.*

When you see a man in R.A.F. uniform, do you ever think about his life? Not just the essential job he does, but his home and his family? These family album pictures are from the life of Corporal C. He's an R.A.F. cook out in Singapore. He earns over £20 a week with overseas allowances, and pays 30/- for his house. This is his life, and it could be your life, too. Even if you're not yet trained for a trade, because the R.A.F. are ready to train you. Send the coupon below for all the details.

Corporal C. is in the airmen's mess. In the R.A.F. every man has a trade, and every trade has a place. See the list on the coupon for training opportunities.

Going swimming? Or just taking it easy? There's always plenty going on in the R.A.F. Like so many R.A.F. people overseas, they have their own car.

Their children go to this excellent Forces primary school. Like most Service children they love the life—and how many children fly halfway round the world?

POST TODAY. There are vacancies now for training in these R.A.F. trades. Tick your particular interest, and send for full details of R.A.F. careers.

Post to R.A.F. Central Recruiting Office (PTN45), Victory House, Kingsway, London, WC2

Wireless Operator	☐	Teleprinter Op.	☐
Radar Mechanic	☐	Typist	☐
Tape Relay Op.	☐	Nursing Attendant	☐
Progress Clerk	☐	Electrical Mechanic	☐
Fireman	☐	Air Defence Op.	☐
Wireless Mechanic	☐	Operations Clerk	☐
Instrument Mech.	☐	R.A.F. Police	☐

NAME .....

ADDRESS .....

.....

..... DATE OF BIRTH .....

You'll get more out of life in the Royal Air Force

Letters to the Editor

The Editor does not necessarily agree with the opinions expressed by his correspondents.

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.

HUM BARS

SIR,—During some time base experiments I was continually coming across a fault which showed itself in the form of a series of solid horizontal bars travelling upwards slowly. At first I thought this was some fault in the circuit, but after modifying various components I found that the bars were present even when I had the tube and timebases disconnected from the sync separator. Is there any proof that such a defect could be caused by hum from the timebase H.T. line? I have previously experienced 50c/s and also 100c/s hum bars, but they have always remained locked by the 50c/s frame timebase, whereas my picture remained stationary, but the bars travelled quite slowly from top to bottom.—R. E. BADDELY (Worthing).

TUNER ALIGNMENT

SIR,—I recently fitted a turret tuner to my set and whilst I can receive both Channel 1 and Channel 9 satisfactorily, I find that on Channel 9 there is a noisy background when the picture is properly tuned. Thinking this might be due to wrong alignment of the oscillator circuits in the tuner, I retrimmed them slightly, but now find that on the BBC, for instance, when a very light scene is projected there is quite a noisy background. On dark scenes, everything is perfect. The video and sound channels have been aligned with a signal generator. Is there any possibility that some form of modulation is taking place between the set and the timebases, or is it just mis-alignment of the tuner? Perhaps some reader has experienced a similar trouble and would be willing to pass on hints as to the cure.—G. TRIMBLE (Gt. Yarmouth).

A USEFUL HINT

SIR,—I have experimented for a long time with TV circuits and layouts and have found it extremely difficult to remove and replace components on the standard metal chassis. I have therefore made up a 'plug-in' chassis, using for the sides standard sheet aluminium, with a half-inch turnover at the upper edge, to which I bolt ordinary perforated zinc sheet. I find that I can attach leads to certain components, slip over a piece of insulated sleeving and then pass the lead through a hole, and when the lead is bent to go to the next item it automatically holds the component in position. Where a component which has fixing holes is used, the bolts are passed through the perforated sheet. This makes for speedy assembly and very rapid dismantling and I am sure will save constructors and experimenters many hours of 'wasteful' work. The sheet can be used over and over again.—A. LINSTROM (N.W.5).

TV AND THE EYES

SIR,—In your November issue you published a letter from a reader commenting on the harmful effect of TV on the eyes. I was very interested to see in the daily Press very recently a comment by some doctors on the TV position and it was there stated that there are many other ill effects caused as a result of prolonged viewing. One of these was a reliable report that a fit had been induced in one patient as a result of the flicker present in every receiver. Is it not possible that other effects may be experienced by a viewer, not necessarily at the time but over a long period? I have heard that one doctor has blamed TV for acute indigestion and resultant sleeplessness.—N. MANSELL (Westminster).

COLOUR TV

SIR,—We do not seem to be progressing much in the way of commercial colour TV. Some time ago there were some coloured sheets on the market which one placed in front of the tube to give the effect of sky, sea, etc., but these were not popular. I would think there is a market for a similar type of colour device consisting of numerous coloured miniature bulbs surrounding the picture tube (hidden in a semi-transparent mask for instance) which could be operated by the viewer or mechanically. By a blue flood at the top of the screen, for instance, one could certainly give added effect to an outdoor view, whilst an overall green effect would be wonderful for the under-sea shots produced by Hans and Lotte Haas. Do readers think the idea is worth proceeding with and would there be a market for such a device?—G. HUMBERSTONE (N.W.).

[*We feel that such a device would be popular only with experimenters; most viewers have enough controls to adjust already!—Ed*]

110 DEG. SCANNING

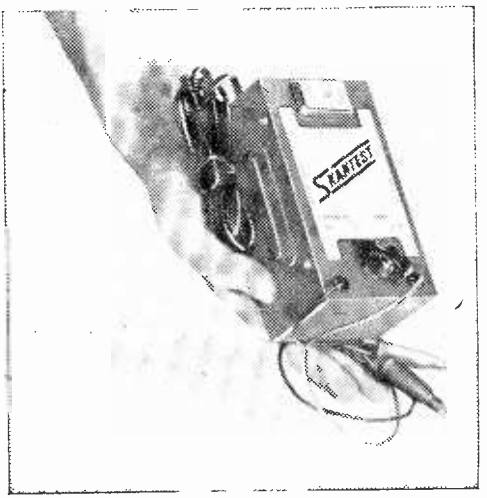
SIR,—I am very interested in the latest 110 deg. tubes and I wonder whether any readers have successfully modified an existing scanning coil unit so that it may be used with these wide angle tubes. It does not appear that such a modification would be impossible, but I do not want to start modifying my spare coil until I am certain as to just what is needed. Perhaps someone can help me? —F. LUCAS (Birmingham).

Trade News

NEW PRODUCTS AND DEVELOPMENTS

The "Skantest"

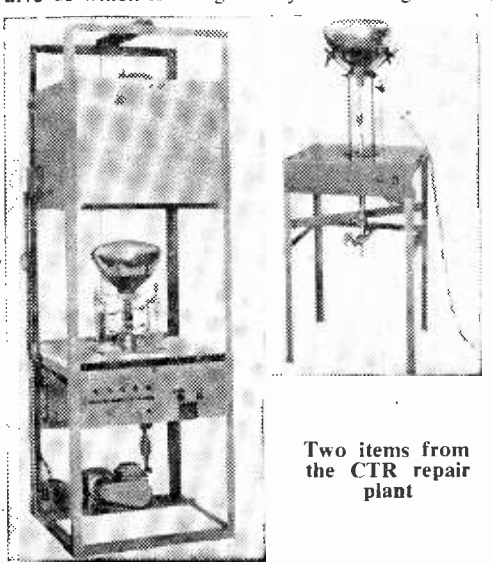
IT is well known that, with the exception of intermittent faults, one of the most time wasting and difficult faults to diagnose with certainty is that of a single shorting turn in a time-base winding. "Skantest" is a new device for



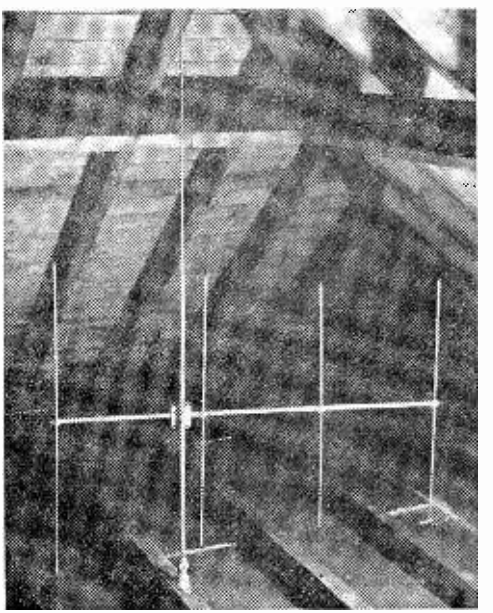
The Skantest

detecting shorted turns and is very similar in principle to most other instruments of this type, in so far as it employs an oscillating circuit, the valve of which is being fed by alternating current, so that the oscillations are, in fact, pulsed and a very peaky output is obtained. Across this oscillatory circuit is placed the inductance under test. In the case of the winding under test having one or more short circuited turns, there is a heavy damping effect, and the very low current neon indicating device ceases to glow.

The "Skantest" is available from *Direct TV Replacements, 158 Lewisham Way, London, S.E.*14.



Two items from the CTR repair plant



The Loft Ranger

CRT Repair Plant

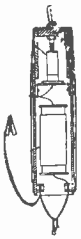
A complete set of equipment required for CRT repairs is now available for less than £600 and should be of interest to the smaller dealer. The N.E.V. 400 Range Plant includes all the necessary equipment for repairing cathode ray tubes. The basic plant will produce 25 tubes per week, but is an economical proposition if only one half of this quantity is required.

The plant is manufactured by *The Notting-Electronic Valve Co. Ltd., Kenrick Street, Netherfield, Nottingham.*

The "Loft Ranger"

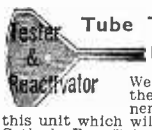
THE Loft Ranger is a combined Band I/III high gain loft aerial, with a rigid locking multiplane ball joint of new design. All elements have a turn and lock assembly. High efficiency is claimed on Band III and it only requires a single feeder. It is extremely light in weight and easy to install. The Loft Ranger is priced at 30s. 0d., and is marketed by *Wolsey Electronics Ltd., Cray Avenue, St. Mary Cray, Orpington, Kent.*

Radio Stethoscope



This can be slipped into the pocket rather like a fountain pen. With it in most districts a receiver can be checked from the grid of the first valve right through to the output without a signal generator. The stethoscope is a complete fault-finder.
All the necessary parts to make this tracer 6/6, post 1/-.

Tube Tester and Reactivator

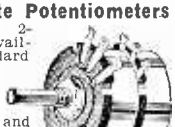


We can supply all the main components for making this unit which will not only test Cathode Ray Tubes but also will reactivate them. supplied complete with full instructions. Price £3, plus 2/6 post and ins.

TV Service Sheets

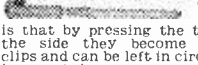
200 sheets covering most popular post-war televisors by leading makers—Cossor, Ekco, Ferguson, Pye, etc., £2, post free. PREVIOUS PURCHASERS OF THESE SHEETS PLEASE NOTE: WE CAN SUPPLY SHEETS Nos. 100-200, £1, or 150-200, 10/-.

Morganite Potentiometers



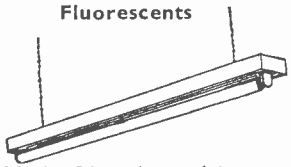
Single and 2-gang types available, standard size with good length spindle, all new and boxed. Single types, 1/- each valves available: 5K, 10K,-25K 50K1, 100K, 250K, 1 meg., 2 meg. Gang type 3/- each—valves available: 5K+5K, 100K+100K, ½ meg.+½ meg., 2 meg.+2 meg.

Avo Prodclips



The advantage of these testprods is that by pressing the trigger at the side they become crocodile clips and can be left in circuit. This is a great time saver when servicing. Price 15/- pair.

Fluorescents



All complete with polyester filled choke and interference suppressors, starters, and fluorescent tube—all ready, in fact, to switch on.

5ft 80 watt, 54/9 plus 5/6 carriage and insurance.
4ft 40 watt, 39/6 plus 5/6 carriage and insurance.
3ft 40 watt, 39/6 plus 4/6 carriage and insurance.
2ft 20 watt, 39/6 plus 4/6 carriage and insurance.
Circular 40 watt, 87/- plus 5/6 carriage and insurance.
Circular 80 watt, 104/6 plus 5/6 carriage and insurance.
These fittings are suitable for hanging or direct fixing—carriage and insurance applies for distances up to 250 miles, over and above this carriage will be extra.

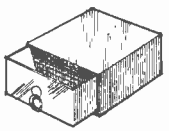
This Month's Snip

Super Transistor Kit

Makes ideal bedroom radio, uses one transistor and one crystal diode.

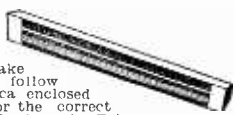
Complete with case 19/6
Post 2/6

Component Storage Drawers



Stout board construction these drawers are ideal for small parts. Supplied complete with simple erection instructions—1/6 each or 12 drawers each 6 x 2½ x 6½in., 13/6, post 2/-.

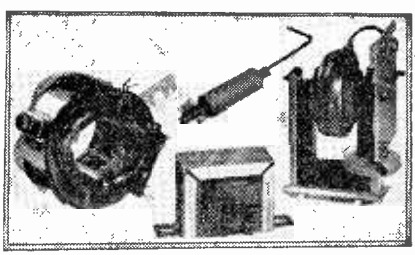
INFRA RED HEATERS



These latest type heaters are ideal for bathroom, kitchen, bedroom etc. They are simple to make from our easy to follow instructions—uses silica enclosed elements designed for the correct infra-red wavelength (3 microns). Price for 750 watt element and instructions, 15/6, plus 2/6 post and insurance. Or made up heater 52/6 plus 5/6 post and insurance—fully tested and guaranteed.

Our 68-page Hi-Fi Catalogue is now being sent out to customers—Gives details of the latest and best Hi-Fi equipment with over 400 illustrations., Price 2/6 per copy which is refundable from purchases.

FOUR ITEMS FOR PRICE OF ONE

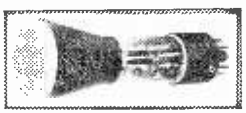


Set of modern T.V. parts, suitable for modernising old televisor or for a new one. For wide angle 14in. or 17in. tubes comprises: (1) Line output E.H.T. transformer. (2) 700 scanning coils on ferrite yokes. (3) Width control with ferrite core. (4) Frame output transformer. (5) Circuit diagram of a modern televisor. Offered at the price of the Line output transformer only, namely, 57/6, plus 2/6 post and insurance.

Band III Converters

Suitable Wales, London, Midlands North, Scotland, etc. All the parts including two EF80 valves, coils, fine tuner, contrast control, condensers and resistors. (Metal case available as an extra.) Price only 19/6, plus 2/6 post and insurance. Data free with parts or available separately, 1/6.
Please send two more kits, the one you sent last week is performing magnificently. We receive this sort of letter every day of the week, so if you have hesitated because you thought our kits too cheap you need hesitate no longer.

Building A Scope?



3in. oscilloscope tube. American-made type No. 3FP7, octal base 6.3 v. .6 amp. heater, electrostatic deflection, brand new and guaranteed, with circuit diagram of scope. 15/- each, plus 1/6 post and ins.

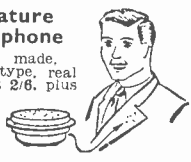
A.C./D.C. Multimeter Kit

Ranges: D.C. volts, 0-5, 0-50, 0-100, 0-500, 0-1,000. A.C. volts 0-5, 0-50, 0-100, 0-500, 0-1,000. D.C. milliamps 0-5 0-100, 0-500. Ohms 0-50,000, with internal batteries. 0-500,000 with external batteries. Measures A.C./D.C. volts, D.C. current and ohms. All the essential parts including metal case, 2in. moving coil metre, selected resistors, wire for shunts, range selector, switches, calibrated scale and full instructions, price 19/6, plus 2/6 post and insurance.

Yaxley Switches

1 Pole 3 way	1/6
1 Pole 5 way	2/-
1 Pole 11 way	2/6
2 Pole 2 way ceramic	2/6
2 Pole 4 way	2/-
2 Pole 6 way	2/6
2 Pole 8 way	3/6
2 Pole 11 way	3/6
2 Pole 12 way	4/6
3 Pole 3 way	1/6
3 Pole 6 way	3/6
4 Pole 4 way	3/-
6 Position shorting	2/-
6 Pole 3 way	2/6
6 Pole 3 way ceramic	3/6
8 Pole 2 way	2/-
9 Pole 3 way	2/6
12 Pole 2 way	2/-

Miniature Microphone



American made. Dynamic type, real bargain at 2/6, plus 6d. post.

ELECTRONIC PRECISION EQUIPMENT LTD.

66, GROVE ROAD, EASTBOURNE, SUSSEX

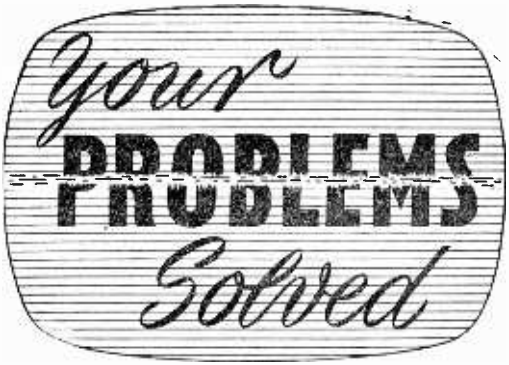
This is the correct address for post orders and for prompt attention please mark your envelope Dept. 5, also enough for postage. Personal shoppers should use one of the companies below.

Electronics (Croydon) Ltd.
266, London Road, Croydon.
Phone: CRO 6558.
Half day Wednesday.

Electronics (Finsbury Park) Ltd.
29, Stroud Green Rd., Finsbury Park, N.4.
Phone: ARChway 1049.
Half day Thursday.

Electronics (Manor Park) Ltd.
520, High St. North, Manor Park, E.12.
Phone: ILFORD 1011.
Half day Thursday.

Electronics (Ruislip) Ltd.
42-46, Windmill Hill, Ruislip, Middx.
Phone: RUISLIP 5780.
Half day Wednesday.



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

FERGUSON 988T

My television set has developed the following fault. Superimposed on the left hand side of the picture there appear three dark grey vertical lines each about ½in. wide and the same distance apart. This does not alter by any adjustment of the contrast control. The tube is a rebuilt one, giving a very good picture in every other respect.—J. Taylor (Letchworth, Herts).

We suggest that you check the 0.001μF capacitor wired from pin 2 of the CRT base socket. This is probably open circuited.

ENGLISH ELECTRIC T30365

The set is giving good sound and picture but when it has been on for a short while, the picture will fade out and sometimes comes back of its own accord. However, if it takes quite some time coming back, I turn the brightness control on the front of the set and the picture is all right for half an hour or more but then fades away again. Also, when the picture is OK, there are wide shadow lines moving up and down at the back of the picture. I have replaced the PL83 but this made no difference. The sound is perfect.—A. Harper (Pontypridd, Glam).

You should check tuner valves PCC84 and PCF80 and the base connections of the EF80 valves. Also check the tuner switch contacts. The tube could be at fault, but this is less likely. The shadow lines are due to the reception of interfering signals which the tuner is incapable of rejecting.

G.E.C. TV1746

The trouble is sound on vision on Band I and Band III. I have tried the oscillator trimmer, etc. Also the sound rejects on L22 but I cannot remove it. I have tried cutting down signal strength but no luck. There is no mid position between vision and sound: vision on sound in one position; sound on vision in the other.—T. Pearson (Salford 6).

You should first check the 16+32μF electrolytic capacitor which decouples the H.T. of the sound A.F. and output stages. If this is in order check by shunting a good condenser (say 16μF) across each tag to chassis in turn. Check the H.T. decoupling 0.001μF capacitor and the decoupling capacitors generally. We assume the beehive type rotary capacitors in the centre of the I.F. chassis have not been disturbed.

MARCONI V.C.152

I cannot stop the picture from rolling up or down and I lose about ⅛th of the picture at the bottom.—S. Stanway (Westcliffe-on-Sea).

Your letter indicates that the picture can be made to roll downward or upward with the hold control but cannot be locked. This indicates lack of sync pulses or at least weakened sync pulses. You should, therefore, suspect the interlace diode (small metal rectifiers associated with the LN152 (ECL80) from timebase valve), also the shunt 2.2M resistor. The LN152 should also be replaced as this may be causing the cramping at the bottom.

AMBASSADOR TV5

I have been trying to repair the above set. There was no audible line whistle and no EHT. The owner informed me that before the screen went blank there were multiple horizontal pictures on it. I checked V14, 20P1 by substitution with a known good valve and renewed R79 and C56, checked R76, 77, 78, 74 and R83, C53, C54 and C55, had V15 (U281) tested. I finally renewed the line output transformer without much improvement. I have checked for line sync pulse at V11 anode with signal tracer and can hear it quite clearly. I checked C51 by substitution. The heater in the EY51 does glow faintly. I can draw a small spark from cathode and one about ¼in. long from anode. There is still no line whistle. EY51 heater glows the most with R79 set at minimum resistance. All there is on the screen is a round patch of light on the bottom half, extending just above half-way. The H.T. output from the metal rectifier is 250V.—G. V. Walker (Bilston, Staffs).

We are inclined to think that the installation of the U281 heater winding on the mains transformer has partially broken down. Is it possible for you to check this with a megger?. R76 is 270ohms (not 270k or 27k). Try the effect of putting a 270ohm across the existing R76.

BUSH TV62

I am trying to locate a fault in the above set. The symptoms are: No raster—no H.T. boost. Sound normal. The line whistle can be heard. A ¼in. arc can be drawn from EHT but is not very "fat". The tube is an AW36-21 and valves P181, ECC82, PY81, EY86, PY82 (2) have all been tested and found to be in order except that the rectifiers are down a little.—G. Kaye (Edgbaston, B'ham).

You do not say whether the EY86 lights up normally or not or whether the EHT was tested at the EY86 anode or the CRT cap. Also we are not sure what is meant by H.T. boost. In view of this we would advise you first to ensure the ion trap magnet is correctly aligned, that the EY86 does light up (if it does the boosted H.T. line must be in order). If it does not, remove the EHT clip from the CRT and note the effect. If the EY86 does not light up at all, check the 140pF width capacitor, the 3.3k resistor to pin 8 of the PL81 and the 1μF boost capacitor. Also check H.T. electrolytics.

ARGOSY 21K40

My set, which is 18 months old, has developed a fault. It is needing constant adjustment of the line hold control. This is very erratic sometimes needing constant adjustment of the line hold a dozen or more times during an evening and then it will hold good for several evenings with no bother. The picture is good otherwise. When it starts to slip, it only affects the top third of the picture at first and then after some seconds the whole picture. I have tried substituting valves, sync sep., interlace diode, removing EHT connection but with no better result. I wonder whether it may be some of smaller components associated with the valve V7B. —W. Barthwick (Liverpool 6).

The 21K40 differs in many respects from the 17K40. The line oscillator for example is an ECC82 and it is this valve which should be replaced. The associated components should be checked.

PHILIPS MODEL 1236U-15

There is no EHT on this set. The sound is good. I have had all the valves tested and they are all right. I have had the EHT transformer out and it appears OK for continuity in the windings. The EY51 does not light up, the filament has been tested and is intact.—S. Pilling (Derby).

You should not suspect the transformer at this stage. If the PY80 and PL81 valves are in order, check H.T. to pin 8 of the PL81 (assuming there is no line whistle at all). If there is no H.T. present check 6.8k resistor from H.T. to line blocking oscillator transformer and continuity of this winding. If there is a line whistle suspect EY51, EHT smoothing capacitor (on the side of transformer—disconnect top end) or tube (remove anode clip from tube).

MURPHY V150/8

I recently acquired the above set on the understanding that sound was working but no picture. When I first switched on there was good sound and a raster, but no picture. After about half an hour smoke came out of the back and the set completely cut out. I tried the set again the following morning—there was no smoke this time but sound and raster are still in order. — A. Anderson (Coventry).

Without some further details we cannot give a specific reply, but suggest you check for charred components around the base of the valves in the sound I.F. stage. Replace any resistors burned out and their decoupling condensers. and also check the valve concerned for inter-electrode shorts.

STELLA ST6417V

The above set, a 17in. model, has run almost trouble free for nearly five years, but as the tube was becoming "low" I decided to renew same. My dealer supplied the New Mullard Tube—MW/4369 instead of MW/43/64 as he said it is a later tube and a direct equivalent. Since fitting the tube the set suffers badly from a fault which it did not have before: defocusing on peak white. When the contrast control is only slightly on, it is a fair but watery picture. The slightest advance of the control makes peak white lettering, etc., blurred. As I assumed this was the tube, I notified the dealer and he was good enough to let me try a further new tube, but with identical results. I have an average knowledge of TV and have delved into all the accepted cures for this annoying fault but have had no success. Valves replaced include EY51, PL81, PY81, EF80.—A. H. Violet (Kidderminster, Worcs).

We are inclined to suspect the video amplifier anode circuit decoupling capacitor which may well be open circuited. The focus magnet may be defective but this is less likely.

CLEVELAND CONVERTER (A.C.29)

I am using a Band III converter tuned to Channel 9 London ITV. In December the new Dover transmitter opened up on Channel 10. Will this converter tune to this new channel? Low power transmissions were radiated for tests but I have been unable to pick up anything, not even sound. I know of a few people who picked them up. It appears also that reception is obtained with the aerial still in the direction of the London transmitter. Will I have to alter the coils for reception? —F. W. Angus (Canterbury).

You will have to unscrew the dust-iron cores slightly to receive Channel 10. However, the I.F. output coil which remains tuned to the existing Band I channel. There are therefore three adjustments to make, the aerial, R.F. and oscillator coil cover, the latter of course being the most important and most critical.

DEFIANT TR1453:T

I wish to fit a turret tuner in my set. Could you please advise a suitable tuner, also the I.F. of this set.—F. Hughes (Co. Durham).

The I.F.'s are: sound, 37.5Mc/s and vision, 34Mc/s. You would be well advised to contact your supplier regarding the best type of tuner for this model, as this model varies somewhat in different areas.

PYE B18T

About 20 seconds after switching on, I get a rasping sound from the speaker. This lasts for a couple of seconds and then the sound comes on; about ten seconds after this the picture comes on and is perfect. Sometimes I get a little cramping at the top right-hand corner, but this clears within a minute.—D. F. Jones (Sutton, Surrey).

The initial disturbance may be caused by instability resulting from an impaired valve, which tends to correct itself as it warms up. The cramping at the corner of the screen is caused by the formation of electro-static charges on the tube face, and is often the mark of a failing tube.

SOBELL T121

Recently I could only obtain a picture occupying about three-quarters of the screen, eventually no picture at all, with a white bar about ⅜in. wide, extending vertically down the centre of the screen. Would you let me know if the tube is finished, or would it be possible to use a boosting transformer? —R. J. Spencer (Belfast).

The fact that your picture has developed into a vertical line does not indicate that your CRT is at fault, it is more likely to be due to a faulty

(*Continued on page* 327)

PL81 valve or the 600pF condenser which comes from the cathode of EY51 to the anode of the PY80.

C.R. TUBE BOOSTING

I wish to boost my C.T.R. The set is a Cossor 932 and the tube a Mullard MW31/74. — W. Smeson (Donnington, Salop).

We would make one point clear before dealing with your query, it is that the MW31/74 should not have excessive boost applied to its heater as this will almost certainly result in complete loss of emission. To moderately boost the heater, wire a 5k 10W resistor from the live fuse to pin 1 or 12 of the tube base socket, whichever causes the heater to glow more intensely.

KOLSTER-BRANDES FV40

There is no picture, though the sound is in order. Valve EY51 will only light up when the width plug is left out. Then I get only a line from top to bottom of the screen and this line is broken in two places. I can then draw about a ½in. spark from the anode of EY51 with a screwdriver. I have a service sheet for this receiver. — H. Gass (Nottingham).

First check the 0.25μF capacitor wired from the boosted H.T. line to the 5V4 anodes. If this is in order, a short could be present in the line scanning coils or the line output transformer could have shorted turns.

BUSH TV24

The picture keeps on rolling downwards. When I do get it to lock the vertical hold control is fully anti-clockwise. I replaced the first ECL80 and the PZ30. It stayed all right for a week and then started rolling again and sometimes it is hours before I can get it to relock.—S. Brett (London E.17).

There are a number of resistors connected with the frame hold control. Check the 680k (blue-grey-yellow) feed resistor which has probably 'gone high'. If this restores the optimum position to approximately the centre but the sync is weak (no positive lock) check the WX6 interlace rectifier (small red and black rectifier).

SOBELL T347

My trouble is lack of brightness with the control fully turned up. On looking at the back of receiver I find voltage selector flange wrongly set at 230V, the voltage in this district being 240. This was set by the supplier 18 months ago. I would welcome instructions regarding removal of the chassis from the cabinet, together with methods of making condensers safe to handle. Could you tell me whether it is possible to replace the EY51 without removing chassis.—W. Hunter (Lydiate).

Lack of brilliance can be due to low EHT, in which case the EY51 could well be responsible. We also suggest you check the voltage on the grid of the CRT. It should read 0-110V, dependent upon the setting of the brilliance control. If, however, with control at maximum, the voltage is not about 75 volts, this could then suggest that your CRT is suffering from low emission. The fact that your mains voltage is 240V and the tapping is for 230V should not be detrimental in any way. To remove the chassis, remove mains plug—back and front control knobs, side escutcheon, inspection panel and speaker leads. Finally, remove the 4 chassis bolts and the chassis can then be withdrawn. Normally on switching off a receiver, the electrolytic condensers discharge through the circuit. Before touching EHT components they short circuit them to earth. It is possible to replace the EY51 without removing set from the cabinet. Remove screening can and lay the set on its side; the tags can then be soldered making good rounded joints.

REGENTONE "Big 12"

I cannot obtain sharp focus on this set. There seems to be no medium between white and black and at its best the focus is poor (for example, one cannot read small print on the screen). Also, after operating for about 30 minutes the picture suddenly becomes very bright although this can be adjusted by the brightness control. I have just renewed the EL38 and the EY51 and also the resistor R68. The metal rectifier which was 14A100 has been replaced by 14A86. Do you think this will be suitable for any length of time?—S. Berry (Chorley).

The voltage applied to a 14A86 should not exceed 250, and as a higher voltage is applied to the "Big 12" the life of the 14A86 may be curtailed. We advise you to check the video amplifier stage components, resistors, etc., adjust the focus magnet gantry for optimum focus and then suspect the tube itself.

FERGUSON 306T

At times, after the set has been switched on, sound goes dead and when the set is turned off for a few minutes and then turned on sound is restored, only to go dead after a period. If the set is not turned off, but volume fully advanced, sometimes sound is heard very faintly and occasionally I am taken unawares when the sound rectifies itself and comes out full volume only to break down again.—A. McLean (Co. Down).

This is, indeed, a difficult fault to solve without the abundant use of instruments. We would not consider valve trouble initially, check for instance, the A.F. coupling capacitor, the loudspeaker connections, the sound detector and circuit, and wires to the volume control. There is every likelihood that the A.F. section is to blame. A few simple checks should prove this for you.

QUERIES COUPON

This coupon is available until MARCH 22nd, 1960, and must accompany all Queries sent in accord with the notice on page 323.

PRACTICAL TELEVISION, MARCH 1960.

Published on the 22nd of each month by GEORGE NEWNES, LIMITED, Tower House, Southampton Street, Strand, London, W.C.2, and printed in England by WATMOUGHS LIMITED, Idle, Bradford; and London. Sole Agents for Australia and New Zealand: GORDON & GOTCH (A/sia), Ltd. South Africa and Rhodesia: CENTRAL NEWS AGENCY, LTD. Subscription rate including postage for one year: Inland £1.2.0, Abroad £1.0.6 (Canada 19s.). Registered at the General Post Office for the Canadian Magazine Post.

SETS & COMPONENTS

H.M.V. 15IN., English Electric 15in., Ultra. etc., Televisions not working, originally £175 each, **£5/10/-**. TOMLINS, 127, Brockley Rise, Forest Hill, S.E.23.

SALVAGED VALVES

All at 2/6 each

EF91	U31	10F1
DH77	6F1	B36
Z77	6F13	KT33C
EB91	6P25	EF50
	6P28	& Many Others

Minimum Order £1. S.A.E. for List. All Valves Tested on Mullard High Speed Valve Tester. C.W.O. to—

ARION TELEVISION, 4 Maxted Rd., S.E.15

TURRET TUNERS, brand new, famous make. 12-channel, coils 1 to 5 and 8/9 fitted, 34/38 mc/s, complete with P.C.F. 80 and P.C.C. 84, circuit diagram included, **£1/17/6**, p. and p., 3/6; discounts for quantities; cash with order. SOUTH SUPPLIES (ELECTRICAL) LTD., 95, Old Kent Rd., London, S.E.1.

INDICATORS, Type 277, with 1in. C.R.T., 4/VR91, 2/VR92. **37/6** (p.p. 3/6). Type 101, with VCR530 (4½in. blue. magnetic, octal base), and 2/EB91, 2/EF91. 2/R10; new cond., **30/-** (post 3/6). Type 1, with VCRX263. 2/EF52, 5/6J6. 1/6V6. 1/EY51, 2/EB91, 3/EF91, with R.F. E.H.T. generator and 28 kc/s. xtal, **48/-** (rail 7/6). Type 97 with VCR517, 10 valves, **30/-**. Potentiometers, miniature wirewound, 6 ohms, 100 ohms, 600 ohms, 1k or 2k; each 1/-. Chokes, L.F. 10H 200mA., 8/6; Potted 10H 100mA., 7/6; "C" 5H 400mA., 10/6. Monitor, Type 56 (2 units Oscilloscope and power unit), **£8/10/-** (rail 20/-). List and enquiries: s.a.e. please. Terms. c.w.o. Postage extra. Immediate despatch. W. A. BENSON (PT), 136, Rathbone Rd., Liverpool, 15.

FIX IT YOURSELF AERIALS! Preassembled ready for instant fitting. New season models. Loft 5EL, 30/-. Clip on 5EL, 30/-. 8EL, 42/6. Diapole + 5EL + Chimney Kit, 75/-. **FRINGE AREA MODELS** for high gain. Band 1, 3EL array, 80/-. Band 3, Double 5 Array, 72/6. Double 8 Array, 100/-. Fringe area super low loss Coaxial, 1/3 yd. Standard low loss, 7½d. yd. All items carriage paid. C.W.O. S.A.E. for aerial list, etc.

HASE SUPPLIES, 34 PRINCE STREET BRISTOL (Dept. P.T.I).

TV TUBES. Factory rebuilt. Top quality with-brand new gun assembly. 12 months guarantee. 12 inch. **£5/17/6**; 14, 15, 16, 17 inch. **£6/10/0**, carriage 12/6. R. HAINSWORTH (Dept. C2), 31 Airedale College Mount, Undercliffe, Bradford 3, Yorks.

LONDON TELEVISION

OFFER THE FOLLOWING BARGAINS. RIGIDLY TESTED EX-EQUIPMENT TELEVISION VALVES.

Individually Boxed, 3/- to 7/6 each.

WIDE ANGLE SCANNING TELEVISION CHASSIS. Complete less valves. **30/-** each. Most makes in stock.

TELEVISION COMPONENTS at Bargain prices. Please write for your individual requirements. Carriage extra.

The undermentioned Televisions for Personal Callers Only.

14in. TELEVISIONS. Working. **£4.0.0** to **£8.0.0.** **17in. TELEVISIONS.** **£9.0.0** to **£14.0.0.** Trade enquiries invited.

4, HENDERSON RD., EASTNEY, PORTSMOUTH.

RATES: 4/- per line or part thereof, average five words to line, minimum 2 lines. Box No. 1/- extra. Advertisements must be prepaid and addressed to Advertisement Manager, "Practical Television," Tower House, Southampton St., Strand, London, W.C.2.

SETS & COMPONENTS (*continued*)

NEW TUBES

	2 Years' Guarantee	1 Year Guarantee
14 in. Type M.W. ...	**£10.10.0**	**£8. 0.0**
17 in. Type M.W. ...	**£12. 0.0**	**£9. 0.0**
17 in. Type C.R.M....	**£13.10.0**	**£10.0.0**

and Equivs. Carriage 5s.

12 in. NEW 1 year Guarantee tubes ONLY £5.19.6

LINE OUTPUT TRANSFORMERS

Direct Replacements for **500** sets. Compare these prices (add 2s. 6d. post):

Pye. LV30, 16T, CS17, etc. ...	**50/-**
18T, V4, etc., LV21, Luxury 17 ...	**60/-**
Cossor. 930, 931, 933, 934, etc. ...	**60/-**
Baird. T29, T163	**53/-**
T164, T167, T172, 2014, 1712 ...	**60/-**
Ferguson. 990T to 997T ; 103T to 145T, 203T to 246T	**66/6**
Ekco. TS46 ; TS113-114 ; T161, 164; T222, 231 ; TSC311, etc., etc. ...	**55/-**
Invicta. T108 to T110	**52/-**
T101 to T104 ; T114 to T126 ; T133 to T142	**60/-**
Bush. TV 11A, B; 12A, B; TVF 12A, TUG 12A, B ; TRG12A, B ...	**45/-**
TV12AM ; TV22, 24 ; TRG24, TUG24	**60/-**

WESTWAY RADIO

5 Westward Way, Harrow, Middlesex.

RECLAIMED VALVES, tested and perfect. Huge stocks. Any type, price 5/-, plus 6d. postage each; delivery by return. LEWIS. 57, Chalford Walk, Woodford Green, Essex.

TELEVISION TUBES

NEW TV TUBES. TWELVE Months' Guarantee

	£.s.d.
12" MW 31-74	6. 0.0
14" MW 36-24	7. 0.0
17" MW 43-64	8. 0.0
17" MW 43-69	8. 0.0
Carriage	10/-

FULLY Rebuilt TV Tubes TWELVE Months' Guarantee

	£.s.d.
12" MW 31-74 CRM 123	5. 0.0
14" MW 36-24 CRM 141	5.10.0
14" AW 36-21 CRM 142	5.15.0
17" MW 43-64 CRM 171	6.10.0
17" MW 43-69 CRM 172	6.15.0
17" MW 43-80 CRM 173	6.15.0
21" MW 53-20 CRM 211	8.15.0
21" MW 53-80 CRM 212	8.15.0
15" CRM 152 CRM 153	6.10.0

Carriage paid

CATHODE RAY TUBE SERVICE

35 Broomwood Road, St. Paul's Cray, Orpington 21285 Battersea 6859

SETS & COMPONENTS (*continued*)

TELEVISIONS. 12in., 14in., 17in. and Projections. Require attention, from **£3.** In working order—12in. BBC from **£7.** 14in. BBC/ITA with regunned CRT from **£18.** 17in. from **£25.**

Send for Lists. Carriage Paid.

CADMAN'S

Service Department, Bryan St., Hanley, Stoke-on-Trent.

CALLING 9in. Television owners. Brand new. factory fresh. 9in. Ferranti Tubes. originally **£14/10/-**, will replace Mazda, Brimar, G.E.C., etc. **£4/10/-** each, 6 months' guarantee. TOMLINS, 127, Brockley Rise, Forest Hill, S.E.23.

VALVES from 1/6. All guaranteed. Radio, T/V Components. Lists 3d. HAMILTON RADIO (T), 237, Sedlescombe Rd. N., Hastings.

T/V SPARES

LARGEST RANGE OF NEW AND USED SPARES

Line Outputs our Speciality. Used from **£1.** New from 45/-. Also breaking hundreds of T/Vs for Spares. All Coils, Transformers, Chassis, Valves, etc. No Lists. Send S.A.E. and State Requirements for Immediate Quote.

VALVE KITS. A complete Kit for YOUR set (one of each type) from **50/-**. Quote Model Number for exact price.

T/V BARGAINS. Reconditioned All-channel Models at New Low Prices. 14inch from **22 gns.**, 17inch from **29 gns.** Fully guaranteed. Terms available.

T.C.S. LTD., **28, Brockley Cross, S.E.4** *TIDeway* 5394.

TV TUBES. ..Genuine re-gunned tubes with 6 months' guarantee; 14in. rectangular and 17in., **£6** each, carriage extra. TV ELECTRIC & CYCLE CO., 1 High St., Chalvey, Slough (Tel.: 21860).

AERIAL "GEN" in the January issue. We have the "pukka" materials. Band III folded dipole, fitted insulator. **8/-**; elements **1/8** each, post 1/6. Stacked array element kits, July issue, still available, **30/-**. S.A.E. price list. AERIAL SUPPLY, 165 Beoley Road, Redditch, Worcs.

BAR PATTERN GENERATOR; Bands I and III: **£5** incl. p. and p. Box 21.

RENFREW ELECTRONICS

ANDERSON DR., RENFREW

REN 2642

YOUR GUARANTEE TO CHEAPER VIEWING

17" **Mazda Tube** with new American Gun-mount	**£7.15.0**
14" **Mazda Tube** with new American Gun-mount	**£6.10.0**
17" **Mullard Tube** with new American Gun-mount	**£7.15.0**
14" **Mullard Tube** with new American Gun-mount	**£6.10.0**

One Year's Guarantee. Cash with Order. 7s. 6d. allowed on old tube returned in carton supplied.

Dealers' Inquiries Invited.

Less than 1 per cent. returns.

SETS & COMPONENTS (continued)

C. EDWARDS
1070 HARROW ROAD,
LONDON, N.W.10.
LADBROKE 1734

Offers
S/H TV in
First-class
Condition.
12in. £5. 0.0.
14in. £7.10.0.
17in. £15. 0.0.
(all 5 channel)
+ 15/- carriage.
Guaranteed
tubes, all sizes.
12" 30/-, 14" £3,
17" £4.

in stock : **PYE, FERGUSON, EKCO**
CASH ONLY. 15/- Carriage.
Trade Enquiries Welcome.

BRAND NEW TESTED VALVES in Makers' printed cartons. EY86, ECL80, 8/-; N339, PL81, 9/6; PY32, R19, 10/6; PL36, 20PI, 12/6. STEVENSON, 653 Maryhill Road, Glasgow.

AERIALS AT TRADE PRICES
For Example DOUBLE FIVE ARRAY COSTS ONLY 60/-.
Band III Self-contained Pre-Amplifiers Only £3.15.0. Band III Converters, 100/-. Turret Tuners, 94/-. Complete Rebuilt T.V. Tubes from £5. Revacuumed ones, All Sizes, £2.10.0. All Tubes are Guaranteed. Super Low-loss Coaxial Cable, 1/1 yd. Standard, 6d. yd. Diplexers, 8/8 each. S.A.E. FOR FULL LISTS.
G. A. STRANGE, Broadfield, North Wraxall, Nr. Chippenham, Wilts. Tel. : Marshfield 238.

SELLING UP. Must clear. 17 inch TVs. Test Gear and S. Sheets. Chassis, Cabinets, Components, Valves. Tuners, etc. Your Price Bargains. A. PHILLIPS, 8 Fettes House, N.W.8. PRI 7085. Evenings, Sundays.

REBUILT TV TUBES
FULLY GUARANTEED 12 MONTHS
ALL MAKES — 12" to 21"
BLANE & MARTIN ELECTRONICS
SANDOWN LANE
LIVERPOOL
Details on request. Tel. SEF. 3428

SAVE ON REPAIRS.—100,000 salvaged Radio and TV Spares. Valves. Tubes for practically any set made since 1936. Prices from: LOT, 17/6; FOT, 7/6; osc. tr., 6/-; Sound, 2/6; Mains, 10/-; EHT Mains, 50/-; Def. Coils, 12/6; Speakers, 5/-. Tubes, Mullard, Mazda, etc., 9-10in., 30/-; 12-14in., £2/19/6; 17in., £3/19/6. All picture tested, fitted free or sent subject to 14 days' money-back guarantee; Mullard 6 months' guarantee. Valves, 1,000 types from 1/6; EF91, EB91, 6J5, 2/6; EF80, UF42, 10F1, 6F1, 6SN7, 3/6. We can save you pounds! Send s.a.e. with enquiries or for complete list. "ST. JOHN'S RADIO," 156, St. John's Hill, S.W.11. (BAT 9838.)

BRAND NEW TELEVISION TUBES
12 Months' Guarantee
12in., £5.12.6 ; 14in., £8.0.0 ; 17in., £9.0.0
CRM type 17in., £10.0.0. Carr. & Ins. 5/-.
FIDELITY RECORD PLAYER
Four speeds. Takes 7in., 10in. or 12in. records. Amazing reproduction. Colours : Fawn, Tweed/Tan or Grey Cord/Maroon. A.C. only 200-250 volts. Only 9½ gns. Carr. 5/-. S.A.E. with all enquiries.
RELIANCE ELECTRICAL SERVICES
Mail Order Dept., 73, Vista Way, Kenton, Harrow, Middx. *WOR.* 4512

SETS & COMPONENTS (continued)

T.V. TUBES, factory rebuilt (regunned), fully guaranteed, 14in. £4, 17in. £5, p. and p. 10/-. 24, Bristol Rd., Brighton.

FOR SALE

ASTOUNDING VALUE.—9in. Televisions, 45/-; 12in. Televisions, 70/-; 14in., £9/10/-; 15in., £5/10/-; 17in., £14. Complete but not guaranteed working; as received in part exchange. TOMLINS, 127, Brockley Rise, Forest Hill, London, S.E.23. All famous makes available; carriage 7/6.

SERVICE SHEETS; also Current and Obsolete Valves for sale. JOHN GILBERT RADIO, 20, Extension, Shepherds Bush Market, London, W.12. (Phone: SHE 3052.)

VALVE CARTONS at keen prices. Send 1/- for sample and list. J. & A. BOXMAKERS, 75a, Godwin St., Bradford, 1.

SATISFACTION ASSURED. — 12in. Televisions, £9/10/-; 14in., £16; 17in., £19/10/-. Write for quotation, stating requirements. We guarantee satisfaction. TOMLINS, 127, Brockley Rise, Forest Hill, S.E.23.

MAKING YOUR OWN TELESCOPES. Enlargers, Projectors, Viewers, Microscopes, Episcopes, etc., then our booklets "How to Use Ex-Gov. Lenses and Prisms." Nos. 1 and 2, 2/6 ea., will show you easily and quickly how to achieve the finest possible results at lowest possible cost. The most comprehensive lists of optical and scientific equipment in the British Isles is free for s.a.e. H. W. ENGLISH, Rayleigh Rd., Hutton, Brentwood, Essex.

1,000 TELEVISIONS, all makes, from £3 working, 10/- not. Callers only. 9 till 6, including Sats. 39, Whitehorse Lane, Stepney, London.

---

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

WANTED

WANTED, Service Sheets and Manuals. No quantity too large or too small; highest prices paid. SULTAN RADIO, 2 Stanley Road, Tunbridge Wells, Kent.

NEW TV VALVES WANTED. Send valves, cash by return to: P. J. F. ANDREWS, 61-63, Rosemary Rd., London, S.E.15.

A PROMPT CASH OFFER for your surplus Brand New Valves, Speakers, Components, Test Instruments, etc. R.H.S., 155, Swan Arcade, Bradford, 1.

NEW VALVES WANTED. — EY51, ECL80, PCC84, PCF80, PCL83, PL81, PCL82, PY81, R19, U801, 30P4, etc. Best cash prices by return. DURHAM SUPPLIES, 175, Durham Rd., Bradford 8, Yorkshire.

WANTED—VALVES. Modern TV and radio types. Large or small quantities. Box No. 22.

AERIALS

MAKE YOUR OWN AERIALS
SAVE £££s
TV aerial manufacturer offers "do-it yourself" kits. 50 components include castings, pressings, mouldings, tubes, brackets, can be utilized to make 100 different models, TV, V.H.F., amateur. Brochure gives full illustrations, element dimensions and prices. Discounts for quantities.
THE RICHARD MAURICE EQUIPMENT CO.,
Portsmouth Road, Cobham, Surrey.
COBHAM 3239.

MISCELLANEOUS

LOUDSPEAKERS. Electric Clocks and Shavers repaired promptly. MODEL LOUDSPEAKER SERVICE, Shipton on Cherwell, Oxford.

PROTECT YOUR CAR AT NIGHT
"LITON"
PHOTOELECTRIC PARKING LIGHT SWITCH
will switch your lights on at dusk—off at dawn, automatically, while you are at work, in bed, or away from home. Controlled by light. Transistorised. Avoid accidents, fines. Save your battery.
KIT OF PARTS, 52/6
BUILT AND TESTED, 57/6
Pat. Pending. Send 6d. stamp for pamphlet.
"St. John's Radio," 156, St. John's Hill, S.W.11. BATtersea 9838

SERVICE SHEETS

FAULTFINDER FILES (TV) showing common faults that each receiver is prone to and other useful servicing information, 2/- ea. List 9d. plus postage. S.P. DISTRIBUTORS, 11, Old Bond St., London, W.1.

SERVICE SHEETS, Radio, T.V., 5,000 models. Lists 1/-. S.A.E. enquiries. TELRAY, 11, Maudland Bk., Preston.

SERVICE SHEETS, Radio and TV, 4/- ea.; also hire. List 1/-. GLOBE SUPPLIES, 33, Fairfield Close, Sidcup, Kent.

SERVICE SHEETS for sale, T.V. 4/-; Radio 3/-; also hire; immediate delivery; s.a.e. please. SULTAN RADIO, 2 Stanley Road, Tunbridge Wells, Kent.

SERVICE SHEETS for sale, all types, from 1/-. Free Fault Finding Guide with all service sheets. 100 T/V Service Sheets covering 330 popular models, 18/6. Radio, T/V, Electronic, Books. S.A.E. lists / enquiries. HAMILTON RADIO (T), 237, Sedlescombe Rd. N., Hastings.

SERVICE SHEETS. — We have the largest stock of Radio and TV Service Sheets in the Country for sale at 4/- each and for hire. Why tolerate delay in obtaining Service Sheets when we will despatch by return? List 1/-; s.a.e. with enquiries. Mail Order Only. S.P. DISTRIBUTORS, 11 Old Bond Street, London, W.1.

SITUATIONS VACANT

LABORATORY TECHNICIAN AND WIREMEN for interesting work in the building and testing of Electronic Apparatus, for medical and industrial equipment. Permanent posts for suitable applicants, in pleasant, modern premises in central area, easily accessible by Tube and bus. Box 20.

TELEVISION ENGINEERS

required for

PRODUCTION FAULT-FINDING TESTING AND REPAIR

Work is varied and interesting with opportunities for employment on Experimental work.

All appointments are to the Permanent staff, with Pension Fund and Sports and Social Club.

Exceptional prospects in a large and rapidly expanding organisation.

Apply to :—

BRITISH RELAY WIRELESS LIMITED

(Staff Appointments),

1-7 CROFT STREET, SOUTH BERMONDSEY, S.E.8.

EDUCATIONAL

INCORPORATED Practical Radio Engineers home study courses of radio and TV engineering are recognised by the trade as outstanding and authoritative. Moderate fees to a limited number of students only. Syllabus of Instructional Text free. "The Practical Radio Engineer," journal, sample copy 2/-, 6,000 Alignment Peaks for Superhets, 5/9. Membership and Entry Conditions booklet 1/-, all post free from the SECRETARY, I.P.R.E., 20, Fairfield Road, London, N.8.

"HOW AND WHY" of Radio and Electronics made easy by a new, non-maths, practical way. Postal instructions based on hosts of experiments and equipment building carried out at home. New Courses bring enjoyment as well as knowledge of this fascinating subject. Free brochure from: Dept. 12 P.T., RADIOSTRUCTOR, 40, Russell St., Reading, Berks.

STUDY RADIO, TELEVISION AND ELECTRONICS with the world's largest home study organisation—I.C.S. Courses for the enthusiast and for those seeking examination qualification. Brit.I.R.E., City and Guilds, R.T.E.B., etc. Build your own equipment with Practical Radio Course. Write to-day for free book. INTERNATIONAL CORRESPONDENCE SCHOOLS, Intertext House, Parkgate Road (Dept. 516), London, S.W.11.

EDUCATIONAL *(continued)*

BUILD YOUR OWN HI-FI at home! At last, for reasonable cost—the chance to make your own quality Hi-Fi Audio Equipment and to gain the knowledge to service and maintain it. Free brochure from: Dept. 20 P.T., RADIOSTRUCTOR, 40, Russell St., Reading, Berks.

★ **LEARN** ★

RADIO & T/V SERVICING

for your OWN BUSINESS/HOBBY

● by a new exciting no-maths system, using practical equipment, recently introduced to this country.

FREE Brochure from :—

RADIOSTRUCTOR

DEPT. G78, 46, MARKET PLACE READING, BERKS. 1/60

FIRST-CLASS TELEVISION and RADIO COURSES . .

GET A CERTIFICATE!

After brief, intensely interesting study—undertaken at home in your spare time—**YOU** can secure your professional qualification or learn Servicing and Theory. Let us show you how!

FREE GUIDE

The New Free Guide contains 132 pages of information of the greatest importance to those seeking such success compelling qualifications as **A.M.Brit.I.R.E., City and Guilds Final Radio, P.M.G. Radio Amateurs' Exams., Gen. Cert. of Educ., London B.Sc. (Eng.), A.M.I.P.E., A.M.I.Mech.E., Draughtsmanship (all branches),** etc., together with particulars of our remarkable Guarantee of

SUCCESS OR NO FEE

Write now for your copy of this invaluable publication. It may well prove to be the turning-point in your career.

FOUNDED 1885—OVER 150,000 SUCCESSES

NATIONAL INSTITUTE OF ENGINEERING (Dept. 462), 148, HOLBORN, LONDON, E.C.1.

S. Africa : P.O. Box 8417, Jo'burg. Australia : P.O. Box 4570, Melbourne.

TRANSFORMERS

Suppliers to B.B.C., I.T.A. and leading radio manufacturers, single or long runs, prompt delivery, home and export.

Rewinds to all makes.

H.W. FORREST (Transformers) Ltd.

Shirley, Solihull, Warwickshire

Tel. : SHirley 2483

Fly with the R.A.F. as an Air Signaller

There are immediate vacancies for fit young men to train as Air Signallers. They will carry out a wide range of skilled duties in the latest types of aircraft.

Candidates must be between 17½ and 25 and have reached G.C.E. standard (or equivalent) with 'O' level passes in English and Maths; they must have studied elementary Science. Initial engagement is for 9 years but service may be extended to the age of 55. There are opportunities for Air Signallers to be considered for commissions as Pilots, Navigators or Air Electronics officers.

Pay whilst under training starts at £8 4s, 6d. On successful completion of training and promotion to sergeant, pay increases to £13 6s. 0d. Food and accommodation are provided free; marriage allowance and ration allowance are issued where appropriate; and other allowances are payable in special circumstances.

Write for full details stating age and educational qualifications to:—

The Under-Secretary of State

AIR MINISTRY (M.9) (PTN 565), ADASTRAL HOUSE

LONDON, WC1

C.R.T. ISOLATION TRANSFORMERS
TYPE A. OPTIONAL 25% and 50% BOOST. 2 V. *OR* 4 V. *OR* 6.3 V. *OR* 10.3 V. *OR* 13.3 V., 12/6. TAPPED MAINS INPUT.
TYPE A2. HIGH QUALITY, LOW CAPACITY, 10/15 pF. OPTIONAL BOOST 25%, 50%, 75%, 16/6. TAPPED MAINS INPUT.
TYPE B. MAINS INPUT, MULTI OUPTUT 2, 4, 6.3, 7.3, 10 AND 13 VOLTS. BOOST 25% AND 50%. LOW CAPACITY, 21/-.

TRIMMERS, Ceramic. 30, 50, 70 pf., 9d. ; 100 pf., 150 pf., 1/3 ; 250 pf., 1/6 ; 500 pf., 750 pf., 1/9.
RESISTORS, Preferred values. 10 ohms to 10 meg., ½ w., 4d. ; ¾ w., 4d. ; 1 w., 6d. ; 1½ w., 8d. ; 2 w., 1/-
HIGH STABILITY. ½ w., 1%, 2/- Preferred values 100 Ω to 10 meg. Ditto, 5%, 100 Ω to 5 meg.Ω., 9d

5 watt	WIRE-WOUND RESISTORS	1/3
10 watt	25 ohms—10,000 ohms	1/6
15 watt		2/-

15,000 ohms.—50,000 ohms., 5 w., 1/9 ; 10 w., 2/3.

PLASTIC RECORDING TAPE

Long Play 7in. reel, 1,700ft.	35/-
Long Play 5½in. reel, 1,200 ft.	28/-
Long Play 5in. reel, 850ft.	21/-
Long Play 3in. reel, 225ft	7/6
Standard 7in. reel, 1,200ft.	24/-
Standard 5in. reel, 600ft....	15/-

"Instant" Bulk Tape Eraser and Head Defluxer. 200/250 v. A.C., 27/6. Leaflet. S.A.E.

O.P TRANSFORMERS. Heavy Duty 50 mA.. 4/6. Multiratio push-pull, 7/6. Miniature, 3S4, etc., 4/6. **L.F. CHOKES** 15/10 H. 60/65 mA., 5/- ; 10 H. 85 mA., 10/6 ; 10 H., 150 mA., 14/-.

MAINS TRANSFORMERS 200/250 v. A.C.

STANDARD, 250-0-250, 80 mA., 6.3 v. 3.5 a. tapped 4 v. 4 a. Rectifier 6.3 v. 1 a. 5 v. 2 a. or 4 v. 2 a. ditto, 350-0-350	22/6
MINIATURE 200 v. 20 mA., 6.3 v. 1 a.	10/6
MIDGET, 220 v. 45 mA., 6.3 v 2 a. ...	15/6
SMALL, 250-0-250, 100 mA. 6.3. v. 3.5 a.	19/6
STD., 250-0-250, 65 mA., 6.3 v. 3.5 a.	17/6
HEATER TRANS. 6.3. v. 1½ amp. ...	7/6
Ditto, tapped sec. 2, 4, 6.3 v., 1½ amp.	8/6
Ditto, sec. 6.3 v. 3 amp.	10/6

ALADDIN FORMERS and core, ½in., 8d. ; ¾in., 10d. 0.3in. **FORMERS 5937/8 and Cans TV1/2.** ½in. sq. x 2½in. and ¾in. sq. x 1½in., 2/- ea., with cores.
TYANA.—Midget Soldering Iron, 230 v. 40 w., 16/9.
REMPLOY Instrument Iron, 230 v. 25 w., 17/6.
MAINS DROPPERS. 3in. x 1½in. Adj. Sliders, 0.3 amp., 1,000 ohms, 4/3. 0.2 amp., 1,000 ohms, 4/3.
LINE CORD. .3 amp., 60 ohms per foot. .2 amp., 100 ohms per foot, 2-way, 6d. per foot. 3-way, 7d. per ft.
LOUDSPEAKER P.M. 3 OHM. 5in. Rola, 17/6. 8in. Plessey, 19/6. 6in. x 4in. Rola, 18/-.
6½in. Rola, 18/6. 10 x 6in., 27/6. 10in. Rola, 30/-, 4in. Hi-Fi Tweeter, 25/-. 12in. R.A., 80/-. 12in. 15 ohm 10 w. Plessey 45/-.
STENTORIAN HF1012 10in. 4 to 15ohm 10 w., 95/-. 12in. Baker 15 Watt 3 ohms, or 15 ohms, 105/-.
CRYSTAL DIODE G.E.C.. 2/-. GEX34. 4/-.
HIGH RESISTANCE PHONES. 4,000 ohms, 16/6 pr.
MIKE TRANSF. 50 : 1. 3/9 ea. ; 100 : 1. Potted, 10/6.
SWITCH CLEANER. Fluid squirt spout. 4/3 tin.
TWIN GANG TUNING CONDENSERS. 365 pf. miniature 1in. x 1¼in., 1½in., 10/-. .0005 Standard with trimmers, 9/- ; less trimmers, 8/- : midget. 7/6.
SINGLE, 50 pF., 2/6 ; 75 pF., 100 pF., 160 pF., 7/-. Solid dielectric 100, 300, 500 pF.. 3/6.
SPEAKER FRET. GOLD CLOTH. 17in. x 25in. 5/-. 25in. x 35in., 10/-. Tygan 4ft. 6in. wide, 10/- ft.: 2ft 3in. wide, 5/- ft. Samples S.A.E.

New and Boxed VALVES 90-day Guarantee.

1R5	8/6	6K8G	8/6	EABC80	HABC80
1S5	8/6	6L6G	10/6	10/6	10/6
1T4	8/6	6N7M	7/6	EB91	6/6 HVR2A 7/6
2X2	3/6	6Q7G	10/6	EBC33	8/6 MU14 10/6
3S4	8/6	6SA7	7/6	EBC41	10/6 P61 6/6
3V4	8/6	6SJ7M	10/6	EBF80	10/6 PCC84 12/6
5U4	8/6	6SN7	8/6	ECC84	12/6 PCF80 11/6
5Y3	8/6	6V6G	7/6	ECF80	11/6 PCL82 11/6
5Z4	10/6	6X4	7/6	ECH42	10/6 PEN25 6/6
6AM6	8/6	6X5	7/6	ECL82	12/6 PL82 10/6
6B8	5/6	12AT7	9/6	EF39	7/6 PY80 8/6
6BE6	7/6	12AU7	9/6	EF41	10/6 PY81 10/6
6BH6	10/6	12AX7	9/6	EF50	5/6 PY82 8/6
6BW6	10/6	12BE6	10/6	EF80	10/6 SP61 5/6
6D6	7/6	12K7	8/6	EF91	8/6 UBC41 10/6
6F6G	7/6	12Q7	8/6	EF92	5/6 UCH42 10/6
6H6	3/6	35L6	9/6	EL32	5/6 UF41 10/6
6J5	6/6	35Z4	9/6	EL41	10/6 UL41 10/6
6J6	7/6	80	10/6	EL84	10/6 UY41 8/6
6J7G	8/6	807	6/6	EZ40	8/6 U22 10/6
6K6GT	6/6	954	1/6	EZ80	8/6 VR105 8/6
6K7G	5/6	EA50	1/6	E1148	1/6 VR150 8/6

TELEVISION REPLACEMENT LINE OUTPUT TRANSFORMERS

70/- ea. from stock.

For Makes and Models

Argosy : T2, CTV517. **Decca :** D17 & C. **Defiant :** TR1753. **RGD :** 6017T, 7017C, C54. **Regentone :** 17C, 17T, 17 Comb.

Argosy : T3. **Decca :** D14. **Defiant:** TR1453T. **Regentone:** 14T. **RGD :** 6014T.

Marconi : VT63DA.

Baird : 2014, 2017, 2114, 2117.

Cossor : 930 & T, 931, 933-4-5, 937, 938 & A. & F. 939 & A & F, 943T, 946.

H.M.V. 1824 & A, 1825 & A, 1826 & A, 1827 & A, 1829 & A, 1865, 1869.
Marconi : VT68DA, VT69DA.

Sobell : TS17, T.346.

Ferguson : 306T, 308T.
Other makes available (7 days). S.A.E. with enquiries.

LINE BLOCKING TRANSFORMERS, 10/- to 16/6.

FRAME BLOCKING TRANSFORMERS, 13/6 to 21/-

FRAME OUTPUT TRANSFORMERS, 27/6 to 39/-.

Most makes available (7 days). S.A.E. with all enquiries.

TV and RADIO SERVICE SHEETS 1,500 models. Send 2/6, your Model No. and S.A.E.

ALUMINIUM CHASSIS. 18 s.w.g. undrilled. With 4 sides, riveted corners and lattice fixing holes, 2½in. sides, 7 x 4in., 4/6 ; 9 x 7in., 5/9 ; 11 x 7in., 6/9 ; 13 x 9in., 8/6 ; 14 x 11in., 10/6 ; 15 x 14in., 12/6 ; 18 x 16 x 3in., 16/6.

TRANSISTORS, GENUINE EDISWAN. Audio, 10/-. R.F. 2 Mc/s, 15/- 4 Mc/s, 18/-. Complete data supplied. Continental OC71, 7/6

CRYSTAL MIKE INSERT by Acos, precision engineered. Size only ½in. × 3/16in. 6/6.

HI-GAIN BAND 3 I.T.A. PRE-AMP KIT Cascode circuit with valve ECC84. Price 29/6 With Power Pack, 49/6. Plans only 6d. Band I B.B.C. version same prices.

TELETRON "TRANSIDYNE" MIDGET SUPERHET PORTABLE 6" x 4" x 1½" 6 transistors, printed circuit, Ferrite aerial. All parts and cabinet. £11.19.6.
We include Ediswan Transistors for maximum performance. Details 9d.

BBC TRANSISTOR RADIO. Med. and Long Wave. Complete kit, 32/6, phones 7/6 extra. Deaf Aid Earpiece with Special Lead 15/-. Details 6d.

GARRARD TA MK 11 SINGLE PLAYER

AUDIO PERFECTION

Designed to play 16, 33, 45, 78 r.p.m. Records 7in., 10in., 12in. Lightweight Xtal pick-up. GC8 plug-in head, Auto stop. Stereo-wired.

OUR PRICE **£8.10.0** each. Post Free
(Stereo Heads £2 extra).

Model 4HF TRANSCRIPTION QUALITY. With Plug-in Norma Heads, £18.0.0. (Stereo Heads £2 extra).

Volume Controls
Long spindles. Guaranteed 1 year. Midget 5K ohms to 2 Meg. No Sw. D.P.Sw. 3/- 4/9
Linear or Log Tracks.

80 ohm CABLE **COAX**
Post 1d. per yard extra. Semi-air, spaced. ¼in. dia. Losses cut 50%. **6d.** yd
Fringe Quality. **1/-** yd.
Air Spaced.

COAX PLUGS ... 1/- **LEAD SOCKET** ... 2/-
PANEL SOCKETS 1/- **OUTLET BOXES** ... 4/6
BALANCED TWIN FEEDER yd. 6d. 80 or 300 ohms.
DITTO SCREENED per yd. 1/6. 80 ohms only.
WIRE-WOUND POTS, 3 WATT. Pre-set Min. T.V. Type. All value 25 ohms to 25 K., 3/- ea. 30 K. 50 K., 4/-. (Carbon 30 K., to 2 meg., 3/-.)
WIRE-WOUND 4 WATT. Pots Long Spindle Values, 100 ohms to 50 K., 6/6 ; 100K., 7/6.
CONDENSERS. New Stock. .001 mfd. 7 kV. T.C.C., 5/6 ; Ditto, 20 kV., 9/6 ; .1 mfd., 7 kV., 9/6 ; Tubular 500 v. .001 to .05 mfd., 9d., ; .1, 1/- ; .25, 1/6 ; .5/350 v., 1/9 ; .1/350 v., 9d. ; .01/2,000 v., .1/1,000 v., 1/9 ; .1 mfd., 2,000 volts. 3/6.
CERAMIC CONDS. 500 v., .3 pf. to .01 mfd., 9d.
SILVER MICA CONDENSERS. 10% 5 pf. to 500 pf., 1/- ; 600 pf. to 3,000 pf., 1/3. Close tolerance (±1 pF.) 1.5 pF. to 47 pF., 1/6. Ditto 1% 50 pF. to 815 pF., 1/9 ; 1,000 pF. to 5,000 pF., 2/-.

I.F. TRANSFORMERS 7/6 pair.
465 Kc/s Slug Tuning Miniature Can. 2½in. x 1in. x 1in. High Q and good bandwidth. By Pye Radio. Data sheet supplied.
Wearite M800 I.F. 465 Kc/s. 12/6 per pair.
Wearite 550 I.F. 465 Kc/s. 12/6 per pair.

NEW ELECTROLYTICS. FAMOUS MAKES

TUBULAR		TUBULAR		CAN TYPES	
1/350 v.	2/-	50/350v.	5/6	8/500v.	3/-
2/450 v.	2/3	100/25v.	2/-	16/500v.	4/-
4/450 v.	2/3	250/25v.	2/6	32/350v.	4/-
8/450 v.	2/3	500/12v.	3/-	100/270v.	5/6
8/500 v.	2/9	8+8/450v.	4/6	2,500/3v.	4/-
16/450v.	3/6	8+8/500v.	5/-	5,000/6v.	5/-
16/500v.	4/-	8+16/450v.	5/-	32+32/350v.	4/6
32/450v.	5/6	8+16/500v.	5/6	50+50/350v.	7/-
25/25v.	1/9	16+16/450v.	5/6	64+120/275v.	7/6
50/25v.	2/-	16+16/500v.	6/-	64+120/350v.	11/6
50/50v.	2/-	32+32/350v.	4/6	100+200/275v.	12/6

LATEST EMI. 4-SPEED SINGLE RECORD PLAYER. Acos 73 hi-fi stereo and normal crystal pick-up. Silent motor, heavy turntable. Special Offer. £6.19.6. Post 3/6.

MAINS TYPE SELENIUM 300 v. 85 mA., 7/6
CONTACT COOLED 250 v. 50 mA., 7/6 ; 60 mA., 8/6 ; 85 mA., 9/6 ; 200 mA., 21/- ; 300 mA., 27/6.
COILS Wearite "P" type, 3/- each. Osmor Midget "Q" type adj. dust core from 4/-. All ranges.
TELETRON, L. & Med. T.R.F., with reaction, 3/6
FERRITE ROD AERIALS. M.W., 8/6 ; M. & L., 12/6.
T.R.F. COILS A/HF, 7/- pair. H.F. CHOKES, 2/6.
FERRITE ROD. 7in. x 3/8in., dia., 2/6.

JASON F.M. TUNER COIL SET. 26/-. H.F. coil, aerial coil. Oscillator coil, two I.F. trans. 10.7 Mc/s. Ratio Detector and heater choke. Circuit book using four 6AM6, 2/6.
COMPLETE JASON F.M. KIT WITH VALVES. £6.15.0. Fringe area kit, 22/6 extra.

FULL WAVE BRIDGE SELENIUM RECTIFIERS : 2, 6 or 12 v. 1½ amp., 8/9 ; 2 a., 11/3 ; 4 a., 17/6.
CHARGER TRANSFORMERS. Tapped input 200/250 v. for charging at 2, 6 or 12 v., 1½ amps., 15/6. 2 amp., 17/6 ; 4 amps., 22/6. Circuit included.
VALVE and TV TUBE equivalent books, 5/-.
TOGGLE SWITCHES. S.P. 2/-. D.P. 3/6. D.P.D.T. 4/-
WAVECHANGE SWITCHES
5 p. 4-way 2 wafer long spindle 6/6
2 p. 2-way, or 3 p. 2-way short spindle ... 2/6
2 p. 6-way, 4 p. 2-way, 4 p. 3-way long spindle ... 3/6
3 p. 4-way, or 1 p. 12-way long spindle ... 3/6
VALVEHOLDERS. Pax Int. Oct., 4d. EF50, EA50, 6d. B12A, CRT, 1/3. Eng. and Amer. 4, 5, 6 and 7 pin, 1/-. **MOULDED MAZDA** and Int. Oct., 6d. B7G, B8A, B8G, B9A, 9d. B7G with can., 1/6. B9A with can., 1/9. CERAMIC EF50, B7G, B9A. Int. Oct., 1/-. S/CANS B7G, B9A, 1/- ea.

RADIO COMPONENT SPECIALISTS

OUR ONLY ADDRESS
337 WHITEHORSE RD., WEST CROYDON
THO 1665. Buses 133 or 68

Post and Packing 1/-. over £2 free. (Export post Extra.) C.O.D. 1/6. (Wed. 1 p.m.)