A TV SOUND TUNER

Practical Television

1'3

APRIL: 1959

AND TELEVISION TIMES

EDITOR: F.J.CAMM

Contents

● ADVISORY SERVICE

We offer a complete before and after sales service. Our advice is ALWAYS available and freely given, BUYING or NOT!
Whether expert or novice, let our extensive experience ensure your success.

● AERIALS

An even wider range. We select the ever popular I.T.V add-ons to illustrate our bargains.
5 ELEMENT. Complete with universal clamp and stand-off arm. Still unbeatable, **39/6**. Also at **45/-**.
8 ELEMENT. As above. **51/6.** Also at **62/6.**
Easifix. All aerials pre-assembled and collapsed for transit.
Easimod. All single aerials can be modified to "double" arrays if desired
Takiteasi ! DO be careful on the roof. *DON'T* wear crêpe soles in wet weather. (Better still, wait for good weather.)
NOTE.—Efficiency and gain of aerials depends on number of elements, spacing, siting, etc., and hardly varies with PRICE which concerns finish, long-term durability and patent assembly methods. DO write us for aerial advice if in doubt.

● CABLE & ACCESSORIES

CO-AXIAL. Hi-grade, low loss, suitable all normal purposes. Expanded polythene type. **8d.** per yd. any length.
SEMI-AIRSPACED. A "must" for long runs in fringe areas. ("Don't spoil the ship," etc.) **1/6** per yd. any length.
DIPLEXERS (Junction boxes). Indoor type, **10/3.** Outdoor type, **13/-.**
IF-IN-DOUBT. Use a *separate* download for I.T.V. with a skirting board "diplexer" if necessary.

● TURRET TUNERS

Still available. The famous "Brayhead" at **£6.19.6.**
Easifix. Over 600 models convertible to I.T.V. by simple "plug-in" technique, using plug-in adapter at 2/6 extra.
SUCCESSFUL ! We have received very many appreciative letters. Our *supplementary advice* ensures success.

● CONVERTERS (external)

£6.19.6. Accessories, **7/6.**
Our *external* converter gives the very simplest conversion to I.T.V.
Handsome appearance.
Easifix (in fact, dead easifix !) Place on top of T.V. and connect up as per our instructions.
Efficient. 2 valve circuit. Best on the market at the price. Definitely superior to the cheap 1 valve efforts.

● AMPLIFIER KITS

Our DO-IT-YOURSELF amplifier. After exhaustive tests we have selected the famous Cossor 562KX.
Definitely the job for novice or expert. Not a "lash-up" but the real thing. *OUR SUPPLEMENTARY ADVICE* ensures success.
Printed circuit technique giving HI-FI 3 watts output
Twin Loudspeakers. Suitable *all* inputs.
Illustrated step-by-step advice. *Everything* except the cabinet !
£9.15.0 tax paid.

● RADIO KITS (F.M./V.H.F.)

Our DO-IT-YOURSELF radio. Again, after many tests, we have selected the famous Cossor 701K,
Everything except the cabinet for a 6 valve V.H.F./F.M. radio.
Pre-aligned R.F. and I.F. stages. (Expensive test gear *not* required).
10in. Elliptical loudspeaker.
Illustrated construction manual *plus* our *Supplementary Advice.*
£15.15.0 tax paid.

● VALVE KITS FOR YOUR TV

Save hours of faultfinding. Clear 90% faults.
One off, each type. Guaranteed valves (all set-tested).
Complete with TV Fault-finding Guide and advice on *your* TV.
Standard Kits : **£5.0.0** post free. (If non-standard, favourable quote by return.) Why pay repair bills ? (State make and model number.)

● TERMS OF BUSINESS

Cash with order or C.O.D. (2/6 extra).
Extended credit on more expensive items. Write to us in confidence.
Packing and carriage 1/6. Above £5 free, except aerials (5el., 2/6 ; 8el., 3/6 ; Others, 5/-.)
If in doubt or if needing advice WRITE US FIRST.

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48, CATHAY, BRISTOL, I.
TEL. 57819 or 26242.

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ILLUSTRATED

$\frac{3}{16}$" Detachable bit type (List No. 64)

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British and Foreign Pats.

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12" - - - - -	**£6. 0.0**
14" - - - - -	**£7. 0.0**
17" - - - - -	**£8.10.0**

Carriage and insurance 12/6 extra. Customers are requested to send their old tubes for rebuilding. We offer 48 hr. service. All tubes are guaranteed for twelve months.

MARSHALLS *for* TELEVISION
131 St. Ann's Road, Tottenham, London, N.15.
Telephone: STAmford Hill 3267

RECORD PLAYER CABINETS

Elegant cabinet, cloth covered in grey or red with sunken control panel and speaker fret. Size 13 x 17 x 8in. deep. Takes a B.S.R. Monarch 4-speed Autochanger; 7 x 4in. elliptical speaker and most of the modern portable amplifiers. Carr. & Ins. 4/6.

R.P.6. **49/6**

R.P.2. **69/6**

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

R.P.4. **79/6**

Stylish cabinet by famous manufacturer. Cloth covered in contrasting colours (red and grey). Grilled front controls panel. Size 15 x 19 x 8¾in. deep. Beautifully made—a cabinet of which you can be really proud. Takes 4-speed B.S.R. Autochanger, 6½in. round or elliptical speaker. Room for any amplifier of your own choice. Carr. & Ins. 4/6.

SINGLE PLAYER CABINET 35/6

Smart cabinet. Size 14½ x 6¼ x 12½in. Various 2-tone colour schemes with white handle and piping. Takes T.U.9 single player unit; 4 x 7in. elliptical speaker and amplifier Mark D.1 or D.2. Carr. & Ins. 4/6.

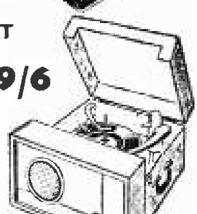
R.P.7

RECORD PLAYER CABINET

A delightful-looking cabinet 14¾ x 17⅞ x 8⅞in. in 2-tone leatherette. Will take a B.S.R. Monarch 4-speed Autochanger and 6½in. round speaker. Carr. & Ins. 4/6.

79/6

R.P.3,



EXTENSION SPEAKERS 19/9

Polished oak cabinet of attractive appearance. Fitted with 8in. 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. 3/6.

★ *IDEAL FOR STEREOPHONIC SOUND*

8in. P.M. SPEAKERS, 8/9 With O.P. Transformer fitted, 10/-.

6½in. P.M. SPEAKERS, 12/6. 4 x 7in. elliptical speaker.

FOCUS MAGNET 9/9

Brand new. 38 mm. Incorporating picture shift control. P. & P. 1/3.

B.S.R. MONARCH 4-SPEED AUTOCHANGER £6.19.6

Incorporating auto and manual control complete with turnover crystal p.u. and sapphire stylus. P/P & Ins. 5/6.

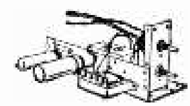
U.A.12. LATEST B.S.R. MONARCH 4-SPEED MIXER £8.9.6. P. & P. 5/6.

T.U.9. B.S.R. 4-SPEED SINGLE PLAYER £4.9.6. P. & P. 5/6.

COLLARO 4-SPEED AUTOCHANGER, £7.19.6. Incorporating auto and manual control complete with studio crystal p.u. and sapphire stylus. P/P & Ins. 5/6.

★ AMPLIFIERS ★

12 Months' Guarantee



PORTABLE AMPLIFIER MARK D.1. **59/6**

Brand new. Latest design with printed circuit. Dimensions 7 x 2¼ x 5in. 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.

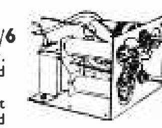
PORTABLE AMPLIFIER MARK D.2 **79/6**

Printed circuit. Latest design. Dimensions 7 x 2¼ x 5in. 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.

PORTABLE AMPLIFIER MARK D.3 **89/6**

De luxe model. Printed circuit. Latest design. Dimensions 7 x 2¼ x 5in. 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.

PORTABLE AMPLIFIER MARK D.4 **69/6**

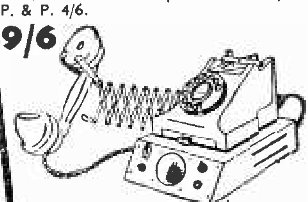


Brand new. By famous manufacturer. Especially built for portable record players. Dimensions 4½ x 3¼ x 4in. A.C only. 2 valves: EL84 as high-gain output valve; EZ80 as rectifier. Volume and tone controls. Knobs 2/6 extra. P. & P. 3/6.

★ *STEREOPHONIC AMPLIFIERS* **£7.19.6.**

Beautifully made for portable stereophonic record players. Latest design with printed circuit. Dimensions 3 x 5¼ x 9¾in. A.C. only. Mains isolated. Twin amplifiers each side giving 3-4 watts output. Incorporating ECL82 triode-pentode valve. Full tone, volume and balance controls. Complete and ready to fit. Knobs 3/6 extra. P. & P. 4/6.

TELEVOX TELEPHONE AMPLIFIER 89/6



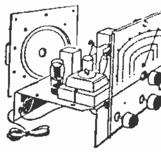
Invaluable in a noisy office or workshop. 3 valves: UY41, UF41, UL41. 3in. speaker and a suction type vibration microphone. A.C./D.C. Size of amplifier 7 x 11 x 3in. Fits any type of G.P.O. telephone. P/P & Ins. 4/6.

RELIABILTY PLUS QUALITY AT THE RIGHT PRICE

DUKE & CO.

SUPER CHASSIS 99/6

5-valve superhet chassis including 8in. 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. Ins. carr. 5/6.



REGETTERED IMPROVED VACUUM T.V. TUBES

17in. rect. ... **£7.10.0**

14in. rect. ... **£5.10.0**

12 MONTHS' GUARANTEE

Our 12 months' guarantee (6 months full replacement, 6 months progressive) illustrates our whole-hearted confidence in the Tubes we offer. We sell many hundreds a week throughout the country and have done so for the past 7 years. Many of them go to the Trade, i.e., to Insurance Companies, Renters and Retailers who are thoroughly satisfied with our supplies. Remember, they also hold a 10 days' money back guarantee.

9in., 10in., 14in., 15in. & 16in. ROUND TUBES

Our special offer of these sizes, £5. 12in. T.V. Tubes, £6. Three months' guarantee on round tubes. Carr. 15/6.

★ EXPRESS DESPATCH SERVICE ★

Please 'phone to confirm Tube in stock. Send Telegraph Money Order. Tube despatched Passenger Train same day. This service only available with remittance by a Telegraph Money Order.

SOUND/VISION & I.F. STRIP 25/6

Plessey. Tested. I.F's 10.5 Mc/s sound. 14 Mc/s vision. 8 valve holders. less valves. Size 8½ x 5 x 4½in. Circuit incl. The tuner unit plugs directly into this chassis. P. & P. 2/6.

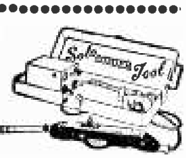
SOUND/VISION & I.F. STRIP 5/9

Salvaged. Complete sound & vision strip. 8 valve holders. Less valves. I.F's 16-19.5 Mc's. Size 8½ x 4½ x 4½in. Drawings free with order. P. & P. 2/6.

TIMEBASE 4/9

Containing scanning coils, focus unit, line transformer, etc., less valves. Drawings free with order. P. & P. 2/6.

SOLO SOLDERING TOOL 12/6



110 v., 6 v. or 12 v. (special adaptor for 200/240 v. 10/- extra). Automatic solder feed including a 20ft. reel of Ersin 60/40 solder and spare parts. It is a tool for electronic soldering or car wiring. Revolutionary in design. Instantly ready for use and cannot burn. In light metal case with full instructions for use. Post 2/9.

★ T.V. AERIALS ★

For all I.T.A. channels. Outdoor or loft. 3 elements. P. & P. 2/6. **25/6**

B.B.C. indoor type. Folded dipole with 12ft. Co-ax cable fitted. Post 1/9. **15/9**

TERMS AVAILABLE

DUKE & CO.

(Dept. E4), 621/3, Romford Road, Manor Park, E.12

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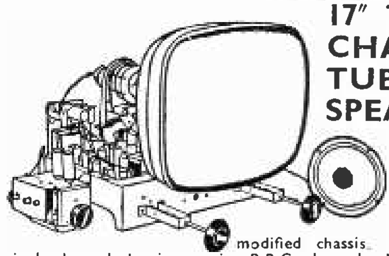
Open all day Sat. Closed Thurs. 1 p.m.

Tel.: ILF. 6001/3.

TV TUBES, CHASSIS and SPEAKERS

17" TUBE CHASSIS TUBE & SPEAKER 16 GNS.



17in. Rectangular Tube on modified chassis. Supplied as single-channel chassis covering B.B.C. channels 1-5 or, incorporating Turret Tuner which can be added as an extra, at our special price to chassis purchasers of 50/-, giving choice of any 2 channels (B.B.C. and I.T.A.). Extra channels can be supplied at 7/6 each. Chassis size 12 x 14½ x 11in. Less valves. Similar chassis are used by well-known companies because of their stability and reliability. With Tube and Speaker (less valves), **16 guineas**. Complete and working with valves and Turret Tuner, **24 guineas**. 12 months' guarantee on the Tubes; 3 month's guarantee on the valves and chassis. Ins. carr. (incl. Tube), 25/-.

14" T.V. CHASSIS, TUBE & SPEAKER 11 Gns.

As above, with 14in. Rectangular Tube. 12 months' guarantee on Tube. 3 months' guarantee on chassis and valves. Chassis with Tube & Speaker (less valves), **11 guineas**. Complete and working with valves and Turret Tuner, **19 guineas**. Ins. carr. (incl. Tube) 25/-.

POPULAR PLESSEY 12" T.V. CHASSIS 39/6

This is a real bargain for anyone wanting to make up their own T.V. at a very low cost. I.F's 10.5-14 Mc/s. Simply adapted for a 12-Channel Turret Tuner and can be modified to take a larger tube. A chassis in one unit. Untested. Less valves, tube, speaker and scanning coils. (All can be supplied as extras.) Circuit diagram available at 3/6 or FREE with order. Carr. & Ins. 10/6.

MIDGET 5 VALVE SUPERHET 49/6

5 valve superhet. Can be used on 110 volt-250 volt mains. A.C. or Universal. Compact little set using 12K8, 12K7, 12Q7, 35L6 and 35Z4 G.T. Valves. 5in. speaker. Cabinet size 17 x 8 x 6in. Carr. & Ins. 3/6.

★ MAINS TRANSFORMERS ★

DROP THROUGH TYPE 12/9

350-0-350 volts at 250 mA, 6.3 volt at 4 amp., 6.3 volt at 4 amp., 4 volt at 3 amp., 22 volt at .3 amp., 4 volt centre tapped at 1.5 amp. Primary 200-250 volt. 50 cycles. P. & P. 3/9.

DROP THROUGH TYPE 12/9

350-0-350 volts at 250 mA, 6.3 volt at 5 amp., 4 volt at 4 amp., 4 volt at 7 amp. 4 volt centre tapped at 1 amp. Primary 200-250 volt. 50 cycles. P. & P. 3/9.

MAINS AUTO 12/6

0-205-225-245 volts at 300 mA. Isolated windings of 6.3 volt at 2-6 amp. 6.3 volt at 3-6 amp.. 2 volt at 1-4 amp. P. & P. 3/9.

O.P. TRANS. 1/3

Standard size 2-5 ohms. Post 1/-. 20 for £1. P. & P. 5/6.

INSULATING TAPE 1/6

Finest quality. 75ft. x ½in. in sealed metal container. Post on 1 tin 9d. Post on 6 tins 2/-.

SOLDER REELS 1/6

On plastic spools. 60-40 3-core Ersin. 20ft. for 1/6. Will fit the Solo Tool. Post 4d.

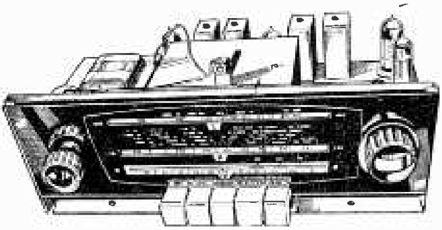
POWER PACK & AMPLIFIER 19/6

R.F. E.H.T. Not tested. Amplifier stage 6V6 with O.P. trans. 3 ohms matching. Smoothed H.T. 350 volt at 250 mA. 6.3 v. at 5 amp. 22 v. at 3 amp. 6.3 v. at 4 amp. and 4 v. centre tapped. Less valves. Drawings free. Size 14½ x 8 x 7in. Ins. carr. 5/6.

POWER PACK & AMPLIFIER 9/9

Output stage PEN45. O.P. trans. choke. Smoothed H.T. 325 volt at 250 mA. 4 v. at 5 amp. 6.3 v. at 5 amp. 4 v. at 5 amp. centre tapped. Valve base for rectifier. Octal or 4 pin. Output is taken from standard plugs. Less valves. Ins. carr. 5/6.

WONDERFUL OFFER OF A.M.-F.M. CHASSIS AT £14 (P. & P. 10/-)

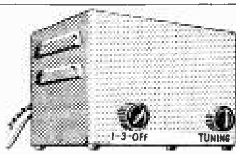


Why buy a F.M. Tuner at the same price? Tapped input 200-225 v. and 226-250 v. A.C. ONLY. Chassis size 15″ x $6\frac{3}{4}$″ x $5\frac{1}{4}$″ high. New manufacture. Dial $14\frac{1}{2}$″ x 4″ in gold, red and deep brown. Pick-up. Extension speaker, Ae., E. and Dipole sockets. Five "piano" push buttons—OFF, L.W., M.W., F.M. and Gram. Aligned and tested. With all valves. 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, polished with back, 70/-. 8″ x 5″ ELLIPTICAL SPEAKER 20/-.

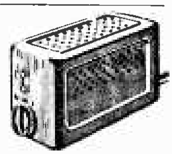
TERMS:—(Chassis) **£5** down + carr. and 5 Monthly Payments of **38/-** or with Cabinet and Speaker **£6** down + carr. and 6 Monthly Payments of **£2.**

We are specialists in I.T.A. Converters. All our converters give direct switching I.T.A. to B.B.C., have internal power pack, 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).

Price **£4.7.6** (3/- post), grey metal finish, 2 valves ECC81. Switch positions OFF—I.T.A.—B.B.C.

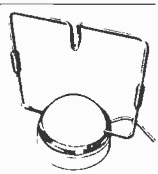


ANOTHER "READY TO USE" I.T.A. CONVERTER

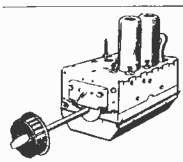


Separate gain controls. Valves PCF80 and PCC84. Switch positions I.T.A. (1) — I.T.A. (2) — B.B.C. Bakelite moulded cabinet $8\frac{1}{2}$″ x 4″ x 6″. **£5.5.0** P. & P. 3/-.

I.T.A. TABLE TOP AERIAL

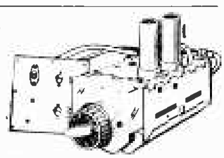


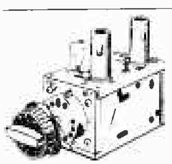
An I.T.A. table top aerial with amazing performance. The Wolsey Hi-Q at **19/6** (2/6 post). Gives good reception up to 20 miles, and has cross-over unit in base with socket for B.B.C. aerial.



CYLDON 16 Mc/s and 19 Mc/s TURRET TUNER with two sets coils (state B.B.C. & I.T.A. channels). Extra pair of coils, 5/- pr. With knobs. ONLY **77/6** (2/6 post). Valves PCC84 and PCF80 included, or valves UCC84 and UCF80.

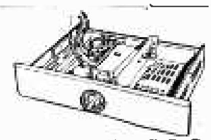
THE BRAYHEAD TURRET TUNER, £7.7.0, post free. Complete with booklet and fitting instructions. State set and model no. when ordering.





INCREMENTAL TURRET TUNER by famous manufacturer for 35 Mc/s only; with knobs. Valves PCC84 and PCF80. ONLY **77/6,** post free, or valves UCC84 and UCF80.

NOVEL "PLINTH" CONVERTER



Your set stands on this converter giving neat appearance. Size $16\frac{1}{2}$″ x $14\frac{1}{2}$″ x 3″. Valves PCF80 and PCC84. Switch positions I.T.A. (1)—I.T.A. (2)—B.B.C. Separate gain controls. PRICE only **£4.15.0** (3/- post), or without power pack **£3.3.0**, post free.

GRAMOPHONE AMPLIFIER with 5in. SPEAKER

WHY PAY MORE? ONLY 60/- (POST 3/-)

On Fabric-covered Baffle $12\frac{1}{2}$″ 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.

NEW SILVERED MICA CONDENSERS. 50 different values, **10/-**, post paid.

RESISTORS. 50 different values. $\frac{1}{4}$ watt to 1 watt. **5/-**, post paid.

I.T.A. AERIALS clipping to existing mast 1-2″ dia. 3-element, **27/-**; 5-el., **35/-**; 9-el., **55/-**; Loft mountg. 3-el., **20/-**; 5-el., **27/6**; Combined single B.B.C. and 5-el. I.T.A., **75/-** with chimney lashings; Co-axial cable semi-air-spaced, **8d.** yd. or 20 yds., **12/6**; aerial and cable prices carr. pd.

SEND 6d. FOR CATALOGUE.

BATTERY ELIMINATOR. Converts your Battery Set to Mains. For 4 Low Consumption Valves (DK96 range). 90 v. 15 mA. and 1.4 v. 125 mA., **42/6** (2/6 post). 200-250 v. A.C. Size $5\frac{3}{4}$″ x $3\frac{3}{4}$″ x 2″. Also for 250 mA. 1.4 v. and 90 v. 15 mA. at same price. Please specify which, or state valves.

ARMOUR PLATED GLASS, 16″ x 14″ x 3/16″, **10/-**, p.pd.

Mixed 4 B.A., 6 B.A. screws, mostly round and C.H. but some C.S. 500 for **3/6** (post 1/-).
Mixed rivets, alum. and copper, 500 for **3/6** (post 1/-).
4 B.A. Simmonds nuts, 500 for **5/-** (post 1/-).

PERSPEX UNSCRATCHED, post 2/- each size, 6 post free; sizes in ins. $14\frac{1}{2}$ x 11 x 3/16 clear, **5/-**; 12 x $9\frac{1}{2}$ x $\frac{1}{8}$ clear, **4/-**; 16 x 14 x 3/16 clear, **7/-**; 15 x 12 x $\frac{1}{8}$ tinted or clear, **6/-**.

Posted Orders to Worthing, please. Delivery by return. Terms:—One-third down and balance plus 7/6 in four equal monthly payments. Postage with down payment. (C.O.D. 2/- extra.)
These terms are applicable to all items except A.M.-F.M. chassis.
All goods are new unless otherwise stated.

GLADSTONE RADIO, 25 WORDSWORTH ROAD, WORTHING. Tel.: 235
58a High Street, Camberley, Surrey. Tel.: 2633; and 3, Church Road, Redfield, Bristol. Tel.: 51207

Practical Television

& TELEVISION TIMES

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TELEVIEWS

TAX AND TV TUBES

A GREAT step forward has been made in the question of liability to Purchase Tax on rebuilt tubes. Permission has now been granted by H.M. Customs and Excise to a large firm of tube rebuilders to rescreen cathode-ray tubes without incurring a Purchase Tax charge. When tubes are not rescreened after rebuilding there is an unavoidable drop of 10 per cent. in the maximum brilliance obtainable, although the efficiency of the tube is not lowered. This drop in brilliance is not apparent in normal viewing.

At present Purchase Tax must be paid by the customer on rebuilt tubes unless his own tube is rebuilt. In our opinion this is an intolerable state of affairs: Purchase Tax is paid when the tube (any tube) is bought and if tax is paid on a rebuilt tube then it will have been paid twice. It is to be hoped that these regulations will be altered in the near future.

It is with deepest regret that, as this issue goes to press, we have to inform readers of the sudden death of our Editor, Mr. F. J. Camm.

For many years, Mr. Camm's name has been synonymous with the "Practical" Group of journals, of which he was the originator, and the growth of which was largely due to his energetic and enthusiastic editorship.

He was one of the first to realise that there was a public demand for practical journals written in non-technical language, and he met this demand by producing the Practical Group of magazines that made his name a household word. Mr. Camm's extensive knowledge as a scientist and engineer enabled him to write many technical books in the engineering and radio field.

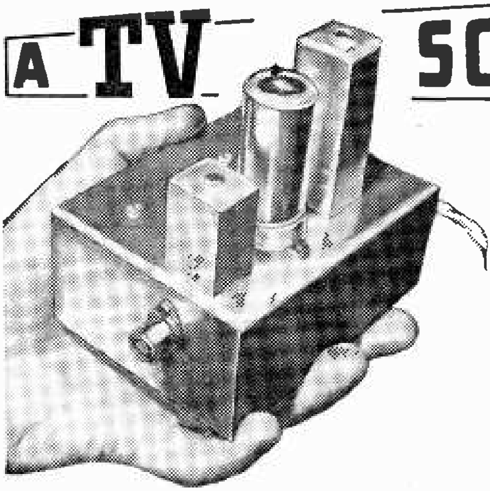
TRANS-OCEANIC TV

MANY schemes have been mooted for transmitting TV pictures and sound across oceans such as the Atlantic. These proposals have ranged from the use of earth satellites as passive reflectors without internal electronic equipment to the use of a multiple cable laid on the ocean bed. Yet another suggestion involved using aircraft which make regular trans-Atlantic crossings. The signal would be received at a great height and passed from one plane to another until it reached its destination.

All systems so far proposed would be very costly and uneconomic and trans-oceanic TV must await the appearance of a cheaper method of relaying the signals.

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

A TV SOUND TUNER



AN EASY-TO-BUILD UNIT USING A TRIODE-PENTODE AND A GERMANIUM DIODE

By R. Morgan and G. Jenkins

NUMEROUS TV programmes have entertainment value even when the sound alone is received. For example: this is particularly so with musical programmes, where a higher standard of reproduction can be expected than is achieved with medium or long wave reception. A TV sound tuner of the type described here will give excellent results when used to feed a "quality" amplifier.

Triode-pentode Valve

The circuit, shown in Fig. 1, uses a single triode-pentode valve, the pentode section acting as R.F. amplifier. A GEX34 crystal diode is employed as a detector, with the triode section of the ECF80 as A.F. amplifier. This arrangement provides a good A.F. output, so that an amplifier with several stages is not required. In favourable circumstances, enough volume can be obtained with a single output stage incorporating a high-gain output valve. For most general purposes a two-stage amplifier is sufficient. This naturally depends on the aerial, distance from the transmitter, volume required, etc.

A small chassis is satisfactory and dimensions and layout are shown in Fig. 2. Clearance holes are required for the screened coils, and it should be checked that the projecting tags of these do not touch the chassis. Each screening can and coil is held by a pair of 6 B.A. bolts, and holes for these are drilled as in Fig. 3. So that tags come in the correct positions, one pair of retaining screws is at right angles to the other pair, as shown. Valveholder tags are also best positioned to agree with Fig. 3.

Aerial and output sockets can be of any convenient type, but screened connectors will allow a shielded type of aerial lead and also simplify plugging in a screened A.F. output circuit lead. Screening of the latter becomes particularly important if the lead is at all long, and if a sensitive, high-gain, amplifier follows the tuner. In favourable circumstances, where it is only desired to use a single stage final amplifier, a *short* unscreened connection is possible.

Tag Board

All resistors, and some other parts, are wired directly to a tag board, as shown in Fig. 3. The

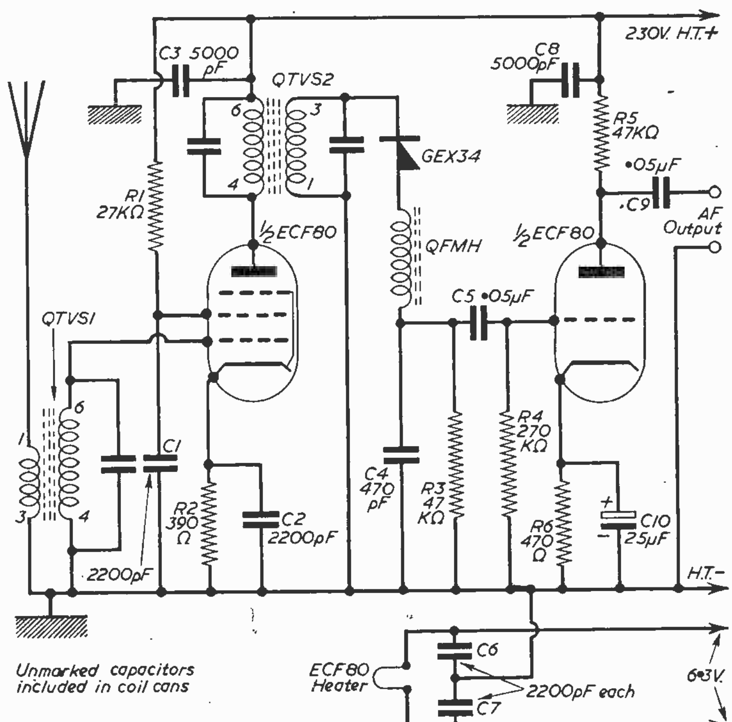


Fig. 1.—The TV tuner circuit.

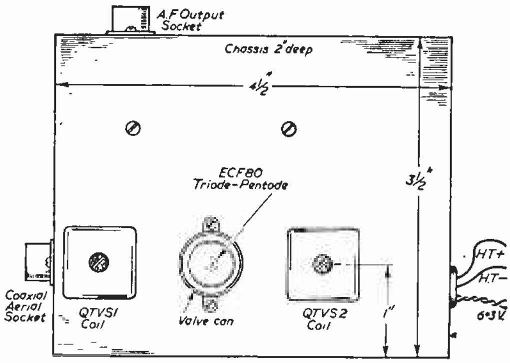


Fig. 2.—Plan view of the chassis.

tag board wiring should be completed before the tag board is fitted in position. It is important that resistors and other items are of approximately the correct values, and fitted in the proper circuit positions. Colour coding may be checked against the following, which lists the tag board components from left to right in Fig. 3.

1. 47 k. Yellow—violet—orange.
2. 470 pF. Yellow—violet—brown, if colour coded.
3. Small wire-wound choke (QFMH: Osmor).
4. GEX34 diode, red end to coil.
5. 390 ohms. Orange—white—brown.
6. 25 μF 25 v. condenser, red end to valve cathode.
7. 470 ohms. Yellow—violet—brown.
8. .05 μF.
9. 270 k. Red—violet—yellow.
10. .05 μF.
11. 47 k. Yellow—violet—orange.
12. 27 k. Red—violet—orange.

Various tags are also inter-connected, as also shown in Fig. 3, and short leads may be left to go to the valveholder, etc. The tag board can then be bolted in place, spaced slightly from the chassis. Tags or resistor leads, etc., must not touch the chassis or securing nuts.

Wiring may then be completed, to agree with Fig. 3. Points marked "M.C." must be soldered to tags bolted securely to the metal chassis. Neat, sound joints should be made throughout, with a really hot iron and cored solder. Unnecessary or prolonged heating of parts must be avoided. This is particularly so with the GEX34.

Flexible leads should be provided for H.T. and heater supplies. The 6.3 v. heater leads may be coloured yellow, with red for H.T. positive. A connection from the chassis itself is used for H.T. negative.

Amplifier Connections

The tuner is intended for use with an A.C. amplifier fitted with a mains transformer supplying both H.T. and heater currents. The valve heater takes .43 A at 6.3 v. and this extra load should normally be within the handling capacity of the mains transformer. It will also usually be possible to draw the 10 mA H.T. current required from the amplifier. A four-way socket may be fitted so that a plug attached to the tuner power supply leads can be inserted.

COMPONENTS LIST

Resistors ½W	Capacitors
R1—27 k ohms	C1—2,200 pF Ceramic
R2—390 ohms	C2—2,200 pF Ceramic
R3—47 k ohms	C3—5,000 pF Ceramic
R4—270 k ohms	C4—470 pF Ceramic
R5—47 k ohms	C5—0.05 μF Paper
R6—470 ohms	C6—2,200 pF Ceramic
	C7—2,200 pF Ceramic
	C8—5,000 pF Ceramic
	C9—0.05 μF Paper
Coils	C10—25 μF 25 v. wkg.
Type QTVS1 (Osmor)	
Type QTVS2 (Osmor)	
Type QFMH (Osmor)	Valve ECF80 (Mullard)
	Crystal GEX34 (G.E.C.)

SUNDRIES

2 Co-axial sockets.
1 ⅜in. grommet.
1 12-way group board (Osmor).
1 4½in. x 2½in. x 2in. chassis (Osmor).
1 B9A Ceramic v/holder with screening can.
10 screws—6 B.A. x 3/16in. cheesehead.
6 6 B.A. half nuts.
4 6 B.A. Shakeproof solder tags.
2 screws 4 B.A. x ¼in. cheesehead.
4 4 B.A. half nuts.

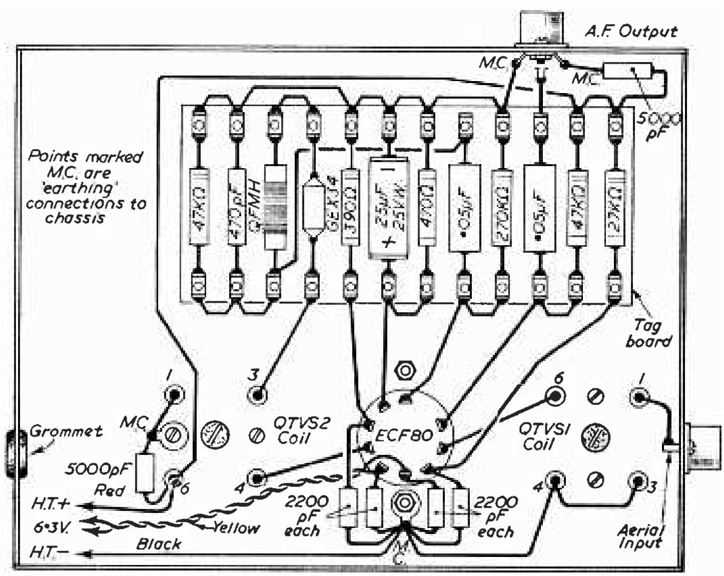


Fig. 3.—The complete wiring plan.

The A.F. output lead from tuner to amplifier should be kept separate from the heater and H.T. leads. It should also be noted that the .05 μF condenser connection in the tuner must go to the grid input side of the amplifier, or the equipment cannot work.

VOLTAGE & CURRENT MEASUREMENTS (Taken with an AVO model 8)			
H.T. : 230 volts.		Total current : 10 mA.	
Pentode Section		Triode Section	
Va	230 volts	Va	60 volts
Vg2	180 volts	Vk	2 volts
Vk	3 volts		
1 k	7 mA	1 k	3 mA

An amplifier circuit using miniature valves is shown in Fig. 4, and will give enough volume when signal strength is fairly good. If volume is poor, an improved aerial should be provided. The H.T. for the tuner is drawn from a point decoupled by a 2 k resistor and 8 μF condenser to avoid hum or instability. This resistor can be increased to about 7 k for an amplifier with 300 v. H.T. line, or to 12 k for a 350 v. line, as the tuner requires about 230 v. The voltage is not critical, but if rather low, some loss of sensitivity must be expected.

If it is necessary to use the tuner with an amplifier drawing H.T. directly from the mains, with a metal or half-wave rectifier, special precautions are necessary. The chassis connection should be taken to mains neutral; the equipment should be housed in an insulated cabinet, and isolating condensers should be added to make the aerial connections safe. In view of the fact that reversed mains connections may make the equipment alive at mains voltage, the use of an amplifier of this type is not recommended.

Aerials and Tuning

When signal strength is good an indoor aerial can be tried, and insulated flex may be used for this. The wire should be vertical and may be suspended from a curtain rail, or secured at the side of a door by insulated staples. A reasonably short continuation of the wire passes to the aerial socket of the tuner.

When an outdoor aerial is required, a short vertical wire may again prove sufficient. Indoor or outdoor dipoles can also be made from wire, the upper element going to the centre of the aerial socket via the usual feeder.

In areas where signal strength is too low for these methods to be successful, a conventional aerial can be used. It should, of course, be for the band upon which reception is intended. Simple wire aerials also function best when of appropriate length. It is not proposed to give full details of aerial construction here, but the aerial is not critical in localities where a good signal is available.

Tuning is pre-set to the desired frequency by adjusting the coil cores for maximum volume. An insulated tool is best for this, and should certainly be used for final adjustments. It can be made from a length of ebonite rod, filed to engage the cores, or from substitutes such as a strip of hardwood or an old toothbrush handle.

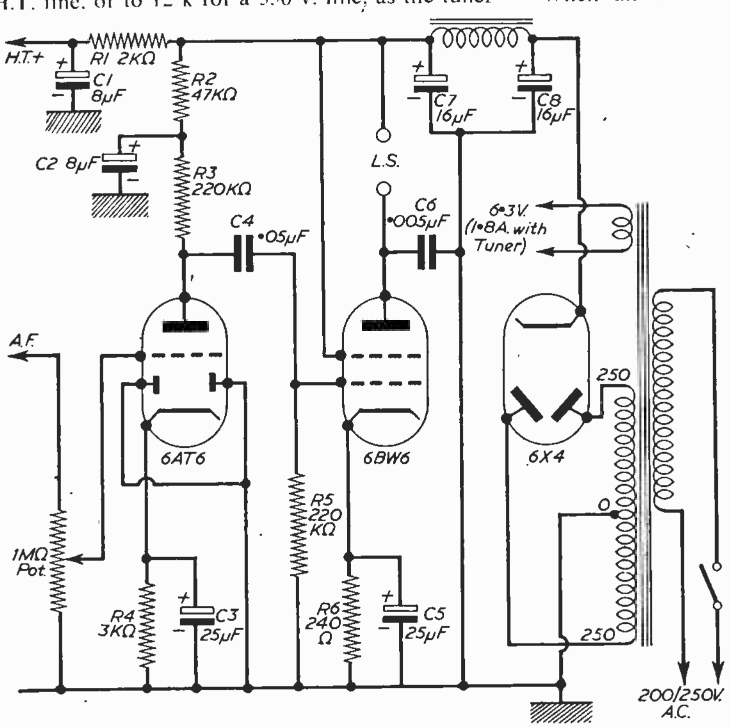


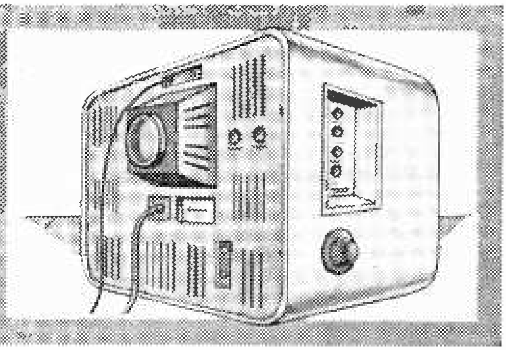
Fig. 4.—Amplifier using miniature valves.

TV in Atomic Submarine

"NAUTILUS" used a sensitive closed-circuit TV system which could virtually "see" in the dark during its recent trip under the polar ice pack. Among the details about the "Nautilus'" TV equipment which have been released are these:

The camera was mounted vertically in a pressurised one ton steel capsule in the conning tower of the ship, its lens aimed through a glass porthole. A cable was strung through two watertight seals into the periscope room, where a 21in. monitor showed a clear picture of the ice overhead. No artificial light was required.

Servicing Television Receivers



No. 46.—FURTHER INFORMATION ON THE PYE CW17 SERIES

By L. Lawry-Johns

THE symptoms of "sound—no picture" can be very confusing at times. So far we have only considered the simplest of faults which affect the line timebase. This is fair since the most common cause of this trouble is lack of EHT. Valves must always be checked if there is any doubt at all. The PCF80 drives the PL81, the PL81 drives the line output transformer, aided by the PY81 and supplied by it.

Line Output Stage

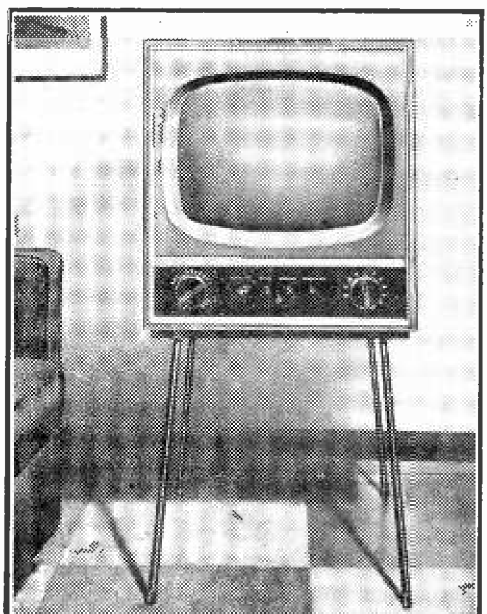
The line output transformer drives the EY86 and the scanning coils. The former supplies the high voltage for the C.R.T. final anode: the latter causes the spot to be deflected across the screen. Fortunately, even if there is no visual indication of life on the screen we are helped by the various noises which may present themselves. The whistle which is sometimes described as annoying is music to the ears of a busy engineeer. If it is normal, loud and smooth (comparatively speaking), all is well with the PCF80, the PL81 and the transformer—and, therefore, the PY81 and the H.T. supply. EHT is almost certainly present at the EY86 anode and if this valve is not lighting, a replacement will nearly always restore normal conditions. If it is lighting, EHT is also almost bound to be present at the C.R.T. final anode and if it is, the other tube supplies must be checked. The tube base pins should record approximately the following voltages. Pin 2: 0-140 v., varying with the setting of the brilliance control. If this voltage is zero and will not increase check brilliance control and associated resistors. The cathode voltage at pin 11 should record some 115 v. depending upon the input signal. The first anode at pin 10 should read over 400 v. on a reasonably sensitive meter. If this is absent, check the 220kΩ series resistor and 1μF decoupling capacitor. These components also supply the height control—H.T. to one section of the ECC82 frame oscillator. Pin 7—second anode—is normally strapped to pin 10, but may instead be connected to pin 11 (cathode).

Do not omit to check the C.R.T. heater voltage dropped across pins 1 and 12. A partially shorted heater will reduce the normal 6.3 v. to approximately half, resulting in either a very dull picture or no discernible picture at all depending upon the basic emission of the cathode.

The Ion-trap Magnet

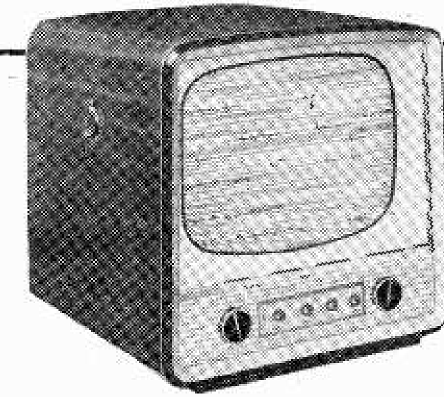
The ion-trap magnet must, of course, be correctly located on the tube neck and in some cases adhesive is required to keep this in position if it is a ring type. It is surprising how easily the correct position can be missed. The marks should be roughly in line with pin 3 (or the space provided for pin 3) or exactly opposite this. It should never be rotated quickly; if it is, the raster may not have time to form before the correct position has been passed.

(*Continued on page 442*)



The Pye CW17.

TELEVISION TROUBLES



Their Symptoms and How They May be Cured—8 By G. J. King

THIS month we deal with the Ferguson 991T series including models 990T, 991T, 993T, 995T and 997T. In this article we shall be concerned with frame and line timebase and sync separator faults.

These models feature the so called "flywheel" line synchronising system, and since when this section is operating incorrectly curious symptoms are produced, it may be as well to start with the line section and line sync stages.

The circuit of the oscillator, discriminator and reactance stages is given in Fig. 1. V16 is the oscillator, which, in conjunction with windings L32 and L33 on the transformer, produces a somewhat distorted sine wave signal for driving the line amplifier valve by way of C59.

The frequency of the oscillator is controlled by the reactance valve V15, which itself is controlled by a bias produced by the discriminator stage V17A/B in relation with winding L34 of the transformer. Sync pulses are applied to the discriminator through C64, and when the oscillator frequency coincides with the repetition frequency of the pulses, the picture locks horizontally on the screen. However, should the oscillator tend to wander off frequency, a correction voltage is produced by the discriminator and is fed to the reactance valve through R77. This causes an alteration in the virtual capacitance across the oscillator tuned circuit, which in turn brings the oscillator back into tune.

In this way the line sync pulses are not applied direct to the line oscillator, and for this reason any noise or interference on them will not cause irregular firing of the line oscillator and the ragged vertical edges which are characteristic of areas where the signal is weak and which are

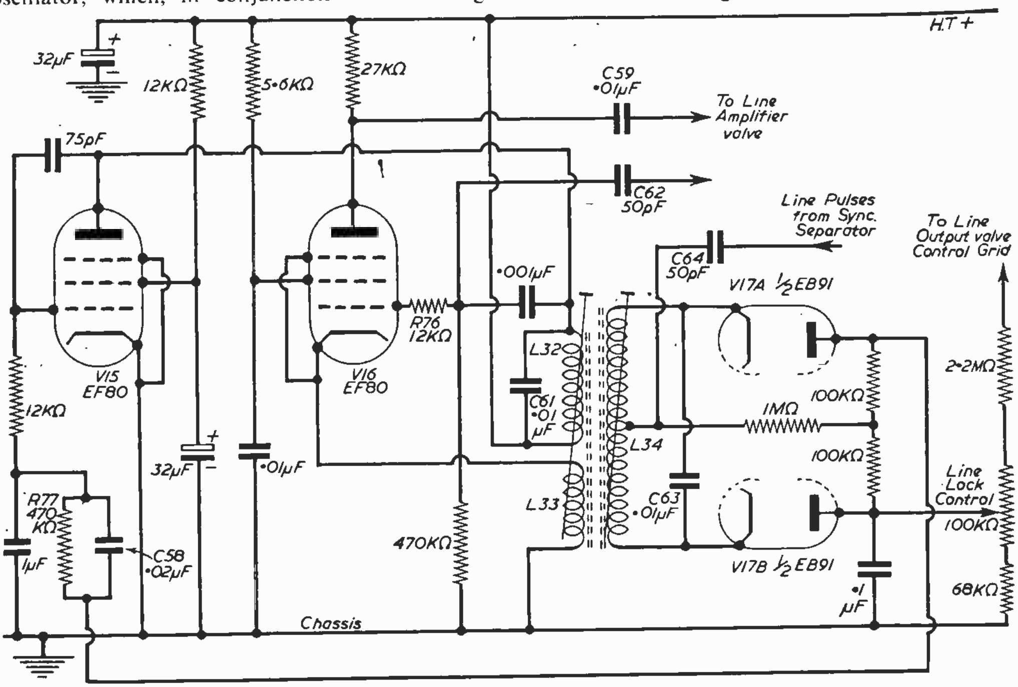


Fig. 1.—Line oscillator, discriminator and reactance stages of the Ferguson 991T series.

seen on sets which use a simple sync circuit. The time-constant of R77 and C58 also helps in this respect.

No Line Hold

On these models the line hold (lock) control does not work quite like the control on more conventional sets. Usually, and under normal working conditions, once the line has been locked it is impossible to unlock it by rotating the lock control over its entire range. What happens is that the picture moves in full form horizontally across the screen in a direction which depends on the way that the control is turned.

However, if anything happens which puts the control out of balance, then it may be absolutely impossible to lock the picture when the set is first switched on. In certain cases the picture may suddenly jump into lock when the set is really warmed up.

This symptom, or a similar symptom, may indicate that the correct oscillator frequency cannot be established within the range of the control, which, incidentally, applies an adjustable negative voltage to the discriminator and thence to the reactance valve. The 2.2 M and 68 k resistors connected to this control rarely deviate sufficiently from their correct value to cause the trouble, though in obstinate cases of the symptom they should, of course, be checked.

The trouble is usually caused by a drift in characteristics of one of the valves shown in the circuit. The oscillator, V16, is often the culprit, and it is frequently possible to change this valve with one of the other EF80's in the receiver with no ill effect. The same applies to the EF80 reactance valve (V15). Unbalance of the V17 diodes would upset the discriminator and give the same effect (faulty locking of the picture).

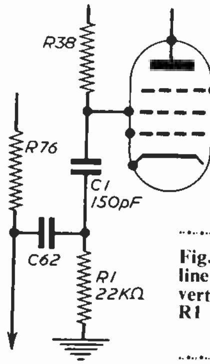


Fig. 2.—A modification to improve line lock and prevent bending of the verticals at the top of the picture. R1 and C1 are the extra components required.

If the valves prove to be in order, the following procedure should be adopted. Short the line sync pulses to chassis by connecting C64 to chassis (that is, the end removed from the discriminator). Set the line lock control to the centre of its travel. Adjust the core in L32/33 (adjustable by the threaded rod at the bottom of the line oscillator transformer screening can, this being located between V15 and V16 on the chassis) until the picture appears to lock horizontally (it will not really lock, of course, because the sync pulses are shorted). This setting is revealed when a very slight adjustment to the core causes the whole of the picture to move

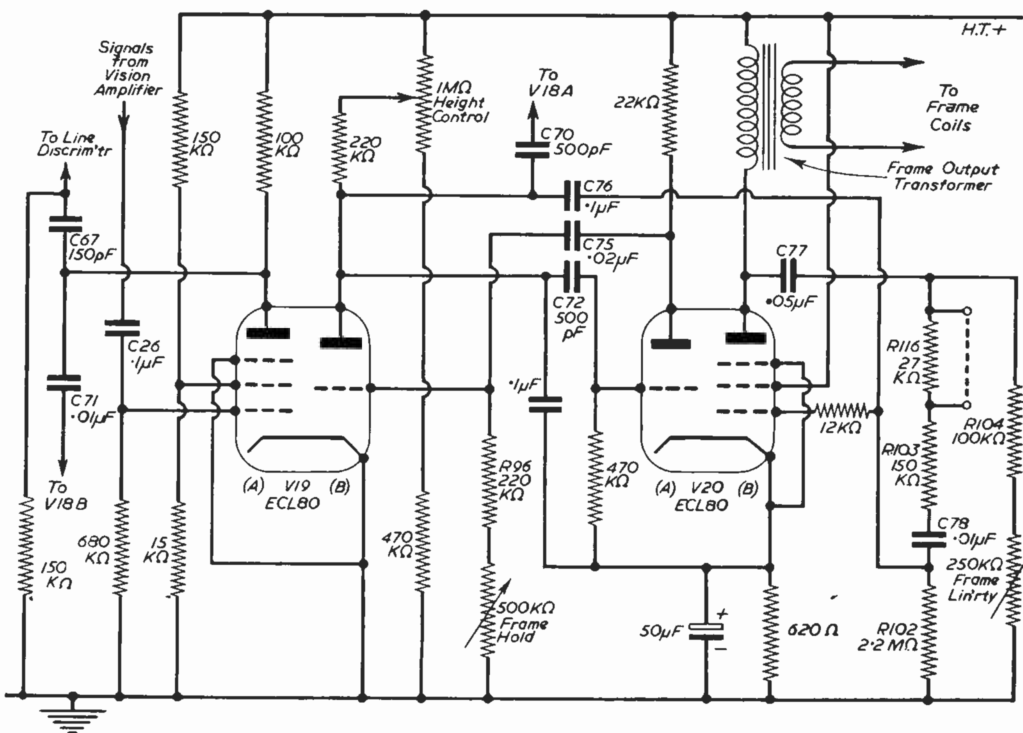


Fig. 3.—Frame timebase and sync separator sections.

either from left to right or from right to left across the screen.

The short from C64 should now be removed, and when the set is afterwards switched on, the picture should lock horizontally, and the horizontal hold control should behave normally as described at the beginning of the article. However, it may be found that the picture is displaced horizontally. If this is so, it should not be centred by adjusting the lock control, but the threaded rod at the top of the transformer should be adjusted to bring the picture to the centre of the raster. This operates the core in L34 and adjusts the phasing of the oscillator relative to the line sync pulses. It should be noted that the phasing adjustment shifts the picture *within* the raster, which is different from the raster *itself* being moved when the picture shift control—on the focus unit—is adjusted.

If this adjustment is intermittently destroyed and the horizontal lock again breaks up, attention should be directed to the 0.01 μF capacitors in the transformer can. these being C61 and C63 in the circuit. If there is any doubt, it is best to replace them. It has also been known for the winding L32 on the transformer former to become loose and shift slightly up and down the former. This. of course, causes intermittent operation of the line lock, and particularly so when warm, since then the cement tends to soften.

Insecure electrodes in one or more of the valves associated with the stages is another cause of the trouble, but this can be established easily by gently tapping the valves after the set is really warm, while watching the effect on the picture.

Bent Verticals

Slight bending of the vertical parts of a picture used to be troublesome at one time on these models. This was caused by residual phase modulation of the transmitted signal and could not easily be corrected without upsetting the desirable feature of the circuit. Of late, however, the effect is rarely observed owing to the necessary correction at the transmitting end. but on some outside broadcasts it may still be present to a small degree.

Bending may also be caused by a hum voltage in the reactance valve. When this is the cause it should be observed whether the bend reverses when the mains plug is reversed in the power socket. If it does, then hum is responsible. A slight heater-to-cathode leak in one of the valves should be suspected, a substitution test being best in this case. Attention should also be given to the various electrolytic capacitors in the circuit.

If the bending occurs at the top of the picture, and this may happen on some early models, the connection of a 150 pF capacitor between the screen of the PL81 line amplifier valve and C62 often effects a cure (see Fig. 2). It is also necessary to wire a 22 k resistor between the capacitor and chassis. as shown.

Another cause of bending accompanied by intermittent line slip. which may not be immediately considered during the course of general investigation. is partial failure of the vision detector germanium diode. This is a type 0A60, and is contained in the can of the final vision I.F. transformer.

The Frame Circuits

In this model the frame section would appear to be rather complicated. However, when it is divided into its various sections the problems disappear. Three ECL80s are used: the two in the circuit in Fig. 3 serve as the sync separator (V19A), the frame multivibrator (V19B and V20A) and the frame amplifier (V20B). The ECL80 in Fig. 4 acts essentially as a frame interlace filter and clipper circuit.

Back to Fig. 3. Here video signals are applied to the grid of V19A by way of C26. The line sync signals at the valve anode are conveyed through C67 to the line discriminator, while the frame sync pulses are carried to the grid of V18B through C71. The modified sync signals pass through sections A and B of V18 and appear at the anode of section A, whence they are injected into the multivibrator circuit (V19B) by way of C70.

The multivibrator frame signals are applied to the grid of the amplifier (V20B) through C76, and this valve is loaded in its anode circuit with the frame output transformer.

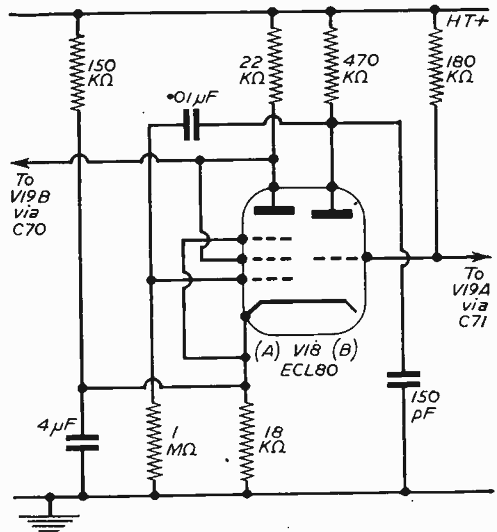


Fig. 4.—Frame interlace filter and clipper section.

No Frame Hold

Lack of frame lock or a weak lock should first lead to a check of V18 and V19 and the associated coupling capacitors, and as will be seen there are several of these, some of which are often overlooked when this trouble occurs. Usually, however, V18 is the culprit if the line hold is working reasonably well.

Frame Control at End of Range

If the frame tends to jump with changes of camera or with sudden bursts of interference and it is found that the frame hold control is at the

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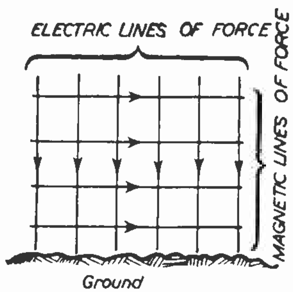


Fig. 1.—The lines of force acting on an aerial.

THE QUAD AERIAL

POLARISATION IS DEALT WITH IN THIS FURTHER ARTICLE

By L. S. King

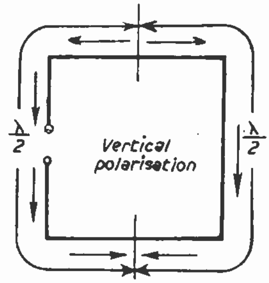


Fig. 2.—Distribution of current in a vertically polarised aerial —driven member.

THE quad aerial has been dealt with in earlier numbers of PRACTICAL TELEVISION: by S. A. Money in the July, 1958, issue, wherein loop dimensions for the various channels were given, and by the present writer in the January, 1959, issue, where the article covered a modification of those dimensions specifically for Channel 1. This was in order to get the driven and reflector elements within a cramped roof space, a difficulty that would probably only occur with the large frames of Channel 1.

Polarisation

But another aspect of the quad aerial is polarisation and whether it should be vertical or horizontal in a particular case. This was referred to by S. A. Money, but readers would no doubt like to have the form of polarisation associated with individual TV transmitters by name, particularly as the information regarding transmitter aerial systems may not be readily available to them.

Now some transmitting TV aerial systems are vertically polarised and some are horizontally polarised, a condition which will alter the the form of the driven member in a quad aerial.

The wave front of a plane wave, if it could be seen approaching an aerial installation, would conventionally consist of electric and magnetic lines of force mutually perpendicular as shown in Fig. 1. With the conventional directions for the lines as shown, the wave front (the whole of the grid) would be seen instantaneously as advancing out of the paper toward the reader. Reversal in direction of one set of lines would reverse the direction of travel into the paper and away from the reader. There would be no change in direction if both sets were reversed together, and, in fact, this double reversal does occur once each half cycle of the wave.

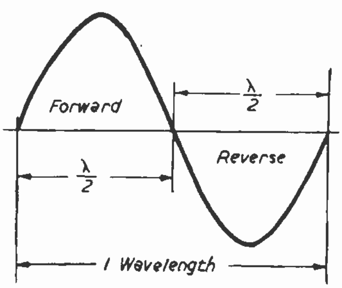


Fig. 3.—The current flow in an aerial.

A wave is said to be polarised in the direction taken by the electric lines of force, and in a wave as shown in Fig. 1, with "its feet on the ground," the polarisation is vertical. If the electric lines of force are horizontal, the wave is said to be horizontally polarised.

Both types of polarisation are used in TV transmission and in the table, V indicates those TV transmitters having vertically polarised aerial systems, and H, those having horizontally polarised aerials.

Now consider the application of this to the quad aerial.

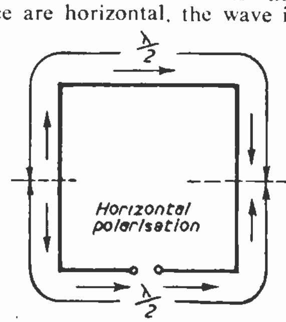


Fig. 4.—Distribution of current in a horizontally polarised aerial —driven member.

BBC TELEVISION TRANSMITTERS

Transmitter	Channel	Polarisation
Crystal Palace (London)	1	V
Holme Moss (Manchester) ...	2	V
Kirk O' Shotts (S. Scotland) ...	3	V
Sutton Coldfield (Birmingham) ...	4	V
Wenvoe (Cardiff)	5	V
Divis (Belfast)	1	H
N. Hessary Tor (Plymouth) ...	2	V
Rowridge (Isle of Wight) ...	3	V
Sandale (Carlisle)	4	H
Meldrum (Aberdeen)	4	H
Pontop Pike (Newcastle)	5	H
Truleigh Hill (Brighton)	2	V
Rosemarkie (N. Scotland) ...	2	H
Londonderry	2	H
Norwich	3	H
Blaen Plwy (W. Wales)	3	H
Channel Isles	4	H
Douglas (Isle of Man)	5	V
Peterborough	5	H
Orkney	5	V

I.T.A. TRANSMITTERS

Transmitter	Channel	Polarisation
Croydon (London)	9	V
Lichfield (Midlands)	8	V
Winter Hill (Lancashire)	9	V
Emley Moor (Yorkshire) ...	10	V
Black Hill (S. Scotland)	10	V
St. Hilary (S. Wales)	10	V
Chillerton Down (I.O.W.) ...	11	V
Burnhope (N. E. England) ...	8	H

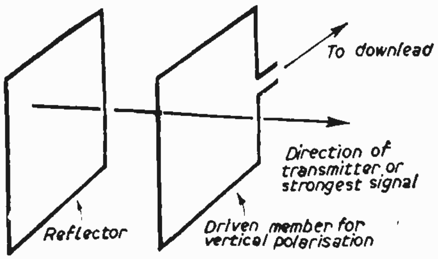


Fig. 5.—How a quad aerial pair should be sited in relation to the transmitter.

Fig. 2 shows the driven member which is mounted in a vertical plane, and corresponds to Fig. 3, page 302, PRACTICAL TELEVISION, January, 1959, "A Quad Aerial for the Loft." The sides of the quad are each a quarter-wavelength and so the loop has a conductor length of one wavelength.

Current Flow

The direction of current flow reverses at the junction of each half-wave section of wire (as can be seen readily from Fig. 3) so that in Fig. 2, the current direction reverses halfway around the perimeter of the loop and the instantaneous current is as shown by the arrows. The currents indicated by the horizontal arrows tend to cancel each other, while the current components represented by the vertical arrows are all in the same direction, namely vertical. The quad aerial of Fig. 2, with the terminals in one side member, is therefore vertically polarised and is responsive to those TV transmitters indicated as "V" in the table.

Now consider the quad with the terminals of the driven member located in one of the horizontal conductors as in Fig. 4—the loop being still in a vertical plane.

Again, the instantaneous currents are indicated in direction by arrows, but this time the vertical components tend to cancel each other.

Now the horizontal currents are all in the same direction, and so, placing the terminals in one of the horizontal sides makes the quad horizontally polarised, and responsive to those TV transmitters indicated as "H" in the table.

The quad aerial has a maximum reception in a direction perpendicular to the plane of the loop and a minimum in any direction in the plane containing the loop. The arrangement of the driven member and its reflector will therefore be as shown in Fig. 5, the reflector being "behind" the driven member; that is, farther from the transmitter or direction of maximum signal.

SERVICING TELEVISION RECEIVERS

(*Continued from page* 437)

Hum Bars

A disconcerting fault symptom may sometimes be met where the picture is completely marred by dark bands across the screen. For instance, only two horizontal bands of picture content may be present, the remainder being practically blacked out.

The immediate reaction and the correct one is to diagnose a heater-cathode short in a vision circuit valve. If no sound hum is present V3, V4, V5 and V6 may fairly be suspected.

Remedy

Valve replacement may well cure the symptom. In several cases the writer has encountered, however, the fault has been intermittent, and valve replacement has not cured it although it often appears to.

When first faced with this problem the writer spent some time before realising what was happening. For those well versed in radio servicing, the characteristic hum of a floating grid in an A.F. section must be familiar. Remembering this the chassis was upturned and the grid components of the video amplifier were disturbed whereupon the effect could be produced at will. An H.F. choke, enclosed in sleeving and partly enclosed in a screened section was extracted and although one end was correctly soldered, the other had been wound round the peg but never had been soldered. This choke is wired in series to the grid of the V7 PCF80 via a 330 Ω resistor, and if it is open-circuited the grid floats, having no direct connection to the 3.3 kΩ grid leak or detector diode. This has been met again but it is stressed that the fault is far more likely to be caused by poor heater-cathode insulation in a valve.

Weak Signals

Check aerial, tuner unit valves, effect of sensitivity and contrast controls, EF80 valves, PCF80 and ECC82 (V7 and 8).

No Signals

Raster in order, hiss on sound, check as above but particularly aerial and PCF80 in tuner unit (V2).

No Sound

Check PCL83 V19—V16 on some service sheets and Invicta manuals. Then EF80 sound valves and valve base voltages. Also check PCF80 in tuner unit V2 if hum can be heard when fine tuner is rotated.

Hum on Sound

Check PCL83 as above and EF80 valves for heater-cathode leakage if hum remains when signals are off. If the hum varies with picture content, reduce sensitivity to prevent overloading or fit aerial input attenuator.

Replacing C.R. Tubes–4

THIS MONTH WE DEAL WITH PYE RECEIVERS

By H. Peters

(*Continued from page 387 of the March issue*)

IT is important to note that all cathode ray tubes fitted to Pye receivers have a graphite coating which acts as an EHT reservoir condenser. Also remember to discharge the anode to chassis more than once, before handling the set, and to ensure that the copper springs which contact the graphite coating do make a good connection on reassembly. All chassis (except P.T.V.) connect directly into the mains and may be live.

17in. Model VT17

Covering the "Luxury 17" range and also early CTM17 and 17TCDL.

Unboxing

Remove the card back and the front control knobs (the inner knob grub screws are accessible through a hole in the outer knobs, which pull off). Loosen the two scews holding the aerial socket panel, and slip it out. Remove the loudspeaker plug, C.R.T. base and EHT cap and deflector coil plug. Undo the two 2 B.A. bolts holding the rear chassis flange and slide the chassis out.

C.R.T. Removal

Lay the cabinet on its face on a soft cloth, remove the loudspeakers (consoles excepted) by slackening their clips and turning them sideways. Remove the four clamping brackets which fasten the wooden tube mask into the cabinet. These are probably varnished over and will then need great care in removal. Paint strippers or oil will soften the varnish somewhat, but it is essential to use a large screwdriver with the right sized blade. There is no need to remove the screws entirely as the clamps will unclip when sufficiently loose. Withdraw the entire tube cradle and place face down on a cloth. Remove the scan coil socket plate from the cradle, take the ion trap off the tube neck, having roughly noted its position and sense. Remove the scan coil/focus assembly by undoing the four 2 B.A. nuts at the sides (see above if varnished), remove the four 2 B.A. nuts on the tube clamping plate and then remove that. Swing the four support straps clear of the tube and lift out the tube (not by the neck).

Reassembly

Thoroughly clean all parts before reassembling and slacken off the nuts which provide adjustment of the tube support strap length. Lower new tube complete with rubber ring and dust excluding band. Refit the clamping plate. Press well down before tightening up the adjustment screws on the tube support straps. Turn the washers supporting the scan coil/focus assembly right down, refit the assembly and its nuts and washers. Check that the "tilt" adjustment knob can still be moved and that the assembly is concentric around the tube neck, then turn the underneath washers back up until they touch the assembly all round. Tighten the nuts up, replace the ion trap and, after ensuring that the tube face and safety glass are clean and the dust seal is in position, lower the cradle into the cabinet and replace the clamping brackets. Tighten these up and righten the cabinet. Refit the chassis and interconnecting leads, connect the supply and the aerial.

Setting Up

Adjust the ion trap magnet for the brightest picture regardless of position. Correct tilt by the knob in the slot on the scan coils, and position the picture by the two rings around the front of the focus magnet. Adjust the focus magnet and recheck the ion trap setting. Tighten the ion trap, refit the knobs and the cabinet back.

Screen Cleaning

This can be accomplished by withdrawing the chassis to the extent of the leads, laying the set on its side and slackening off the tube cradle. The safety glass can then be slid down through its slot for cleaning. If the tube cradle is not

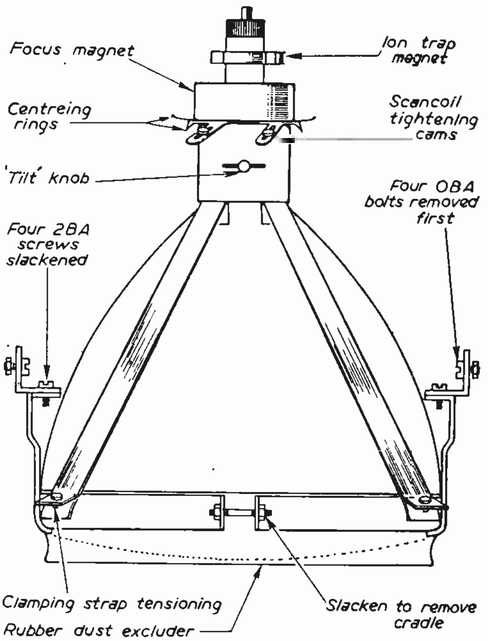


Fig. 7.—Tube and cradle of Pye Continental series with wired chassis.

loosened sufficiently the safety glass may be scratched.

Boosting the Tube (A.C. Mains Only)

Use a 6.3 volt plus boost C.R.T. isolating transformer. Remove the leads from pins 1 and 12 of the tube (adjacent to the keyway) and short

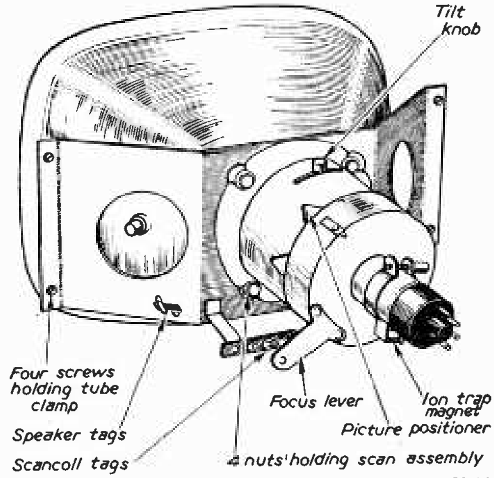


Fig. 8.—Tube and clamp assembly of Pye V4 and VT4.

them together to complete the heater chain. Fit the secondary of the boost transformer to the vacant pins 1 and 12 and the mains primary to chassis and the 200 volt tap on the voltage selector, i.e., on the switched side of the mains. If the boost transformer has a selection of mains tappings the one for your local voltage should be used (not 200 v. despite the fact that it is soldered in behind the 200 v. hole in the voltage selector).

Pye Continental and Contemporaries with Wired Chassis

(Covering CW17, CS17, CW17F, CS17F, CW17C, CW17CF, CS17C, CS17CF, CTM17T, CTM17F, CTM17S, LB17NF, and with slight variations VT21C, VT21CD, CTM21CD, CTM21, CTM21F.)

These receivers are a little easier than the VT17, but employ the same principles.

Unboxing

Remove the chassis in the same manner as the VT17. On some sets the rear flange is not bolted, but the chassis is fixed by four large woodscrews from underneath. Lay the set on its face and proceed to remove the tube cradle. To begin with take out the four hex.-headed 0 B.A. bolts with a flat spanner. Slacken off the adjacent four round-headed screws which loosen the tube support brackets so that they may be drawn away from the cabinet sides. Lift out the tube cradle. Mark and remove the ion trap and slacken off the four screws which hold the aluminium bands from the scan coils to the clamping strap around the tube face. Then slacken the bolts in the centre of the clamping strap until the tube cradle is free enough to be lifted off the tube. Clean all parts.

Reassembly

Refit the cradle over the new tube, working the clamping strap over the rubber dust excluder. The top of this rubber should be in line with the top of the clamping strap. Tighten the clamping strap and then the screws at the end of the aluminium straps until they are equally tight. This will result in the scan coil assembly being concentric with the tube neck. If the scan coils are loose on the neck the four screws holding the cam plate to the scan coil cover can be slackened and the plate turned until the scan coils are tight, but still movable by the "tilt" adjusted. Tighten up; replace ion trap magnet, check that the screen and safety glass are clean and refit the tube cradle. Turn the set upright, refit the chassis, connect up and switch on.

Setting Up

As for VT17.

Boosting

As for VT17.

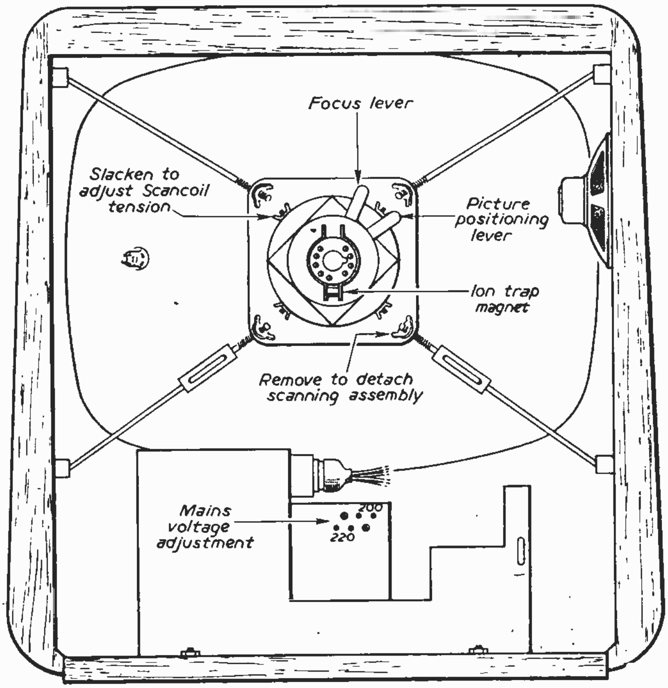


Fig. 9.—Later Continentals, etc., with printed chassis.

Screen Cleaning

Involves removing the tube cradle (Fig. 7) unless the wood rail above the safety glass is detachable, enabling the glass to be lifted out forward after being moved slightly sideways.

Printed Circuit Receivers, RTL17, CW17F, CTM17F, 17TCDL, CTM21F, CW17S, CTM17S, CW21S, CTM21S, SP17, SP17LB

This group follows the lines of the preceding two groups, but it is easier still to change the tube. Remove the chassis as for previous models and lay the cabinet face down on a cloth. Remove the ion trap and loudspeaker (except consoles), remove the four wing nuts around the front of the scan coils, lift the scan/focusing assembly off the tube neck, swing the "bicycle spokes" clear and lift the tube out. When reassembling, loosen the four wing nuts on the back of the scan coil assembly, and retighten these after the "bicycle spokes" are tight, checking that the scan coils move freely with the picture tilt knob but are not loose. Refit ion trap and chassis and set up as for VT17, etc.

Boosting

Proceed as for VT17, except that the boost transformer primary connects between chassis and the connection to the largest hole of the three on the 200 v. setting of the voltage selector.

Variations

Some early printed chassis have the same tube cradle as the wired "Continental."

CTL58 Series

On these sets the tube is a 90 deg. electrostatically focused type which is supported on the main chassis and withdraws with it.

To unbox, remove the four large concentric control knobs, the loudspeaker, and the rear two chassis fixing screws. The chassis and tube will then withdraw. To remove the tube, unplug the EHT and base connections, remove ion trap, centring magnet, metallised disc and polythene washer. Disconnect the scan coils (four plugs) remove the rubber wedge and the scan coils. Remove the tube and clamping strap by taking out the two outside hex.-headed screws from each side of the bottom tube clamping strap. Lay the tube face down, measure the exact distances between the table face and the sealing ring and the clamping strap, so that when refitting to the new tube they assume the same position. If this is not done the tube face may touch the safety glass and cause scratching.

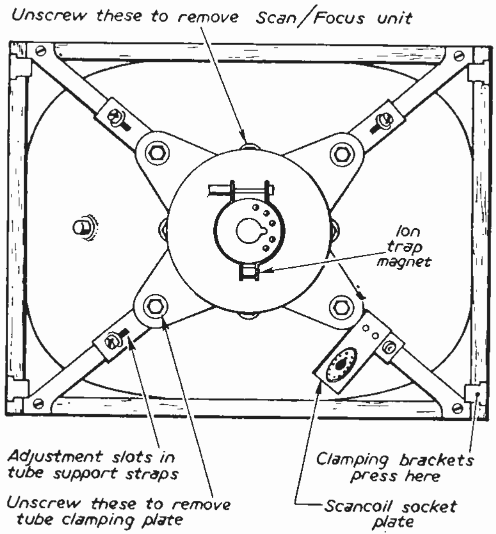


Fig. 10.—Wooden tube cradle assembly Pye VT17 (Luxury 17).

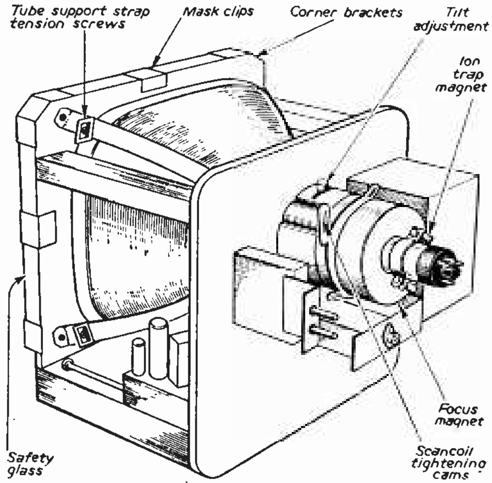


Fig. 11.—Tube and chassis, Pye V14 and V14C.

Boosting

As previously, connecting the mains primary between chassis and the centre contact of the voltage selector.

VT4

Covering VT7, V4, V7.

Unboxing

First remove the cabinet back, and on turret tuned models the turret knobs (the inner is grubscrewed via a hole in the outer, which is a clip-on type), and the tuner itself. This is withdrawn to the extent of its leads by removing the upper screw holding it to the cabinet, lifting the turret clear of the lower screw and tilting it downwards and outwards until it clears the focus assembly.

This may appear impossible at first sight but if the front inside edge is slid down the small gap between the scan coil housing and the focus magnet it can be done.

Then, on all models, withdraw the chassis to the extent of the leads by removing the two screws in rectangular washers which hold the rear cabinet flange.

(To be continued)

MENDLESHAM ITV STATION

SOME DETAILS OF INTEREST TO READERS IN EAST ANGLIA

A MAP has been prepared and is shown below, indicating the official limits of the projected service area, in which just over 2,000.000 people live. Of these, more than 1,000.000 are in the primary, and about 500,000 in the secondary service area. The remainder are in the fringe area. Most viewers who live in the primary service area should receive a consistently satisfactory service, unless they are situated in particularly unfavourable positions. Most of the viewers living in the secondary service area should also receive a satisfactory service.

Fringe Reception

Acceptable results should be secured in many locations. but the service may be subject to interference from fading and other phenomena. Wide variations in reception conditions can occur in such localities between points within quite short distances of each other.

In "fringe areas," meteorological conditions can have very disturbing effects on reception, so that it is by no means consistent, and interference from distant stations. even from those on the Continent. may at various times be perceptible. This interference can often be reduced, and at the same time, the quality of the picture improved, by a careful realignment, or possibly elaboration of the viewer's receiving aerial.

Coverage

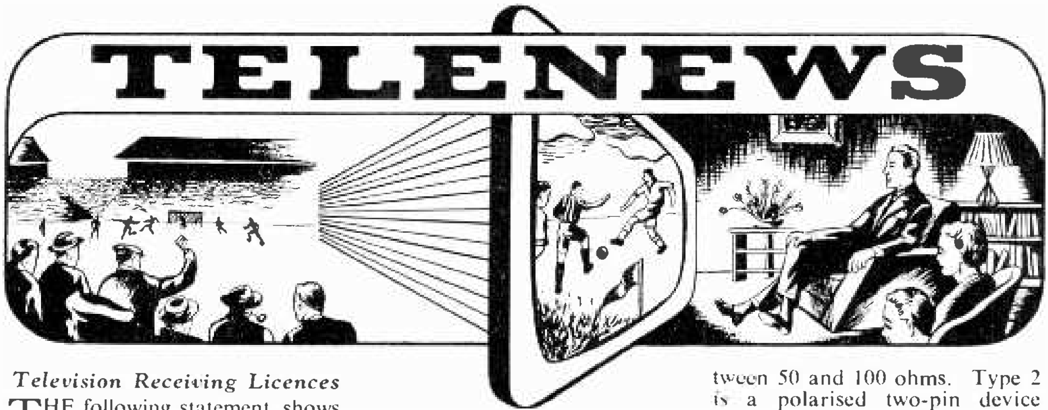
The map shows the estimated approximate coverage of the East Anglia Station, with 200 kW effective radiated power (E.R.P.). The shaded area gives the approximate limits of the primary service area. The nominal limit is defined by the 2mV/metre field strength contour. The area enclosed between the dashed line and the limits of the primary service area is the secondary service area. The dashed line is the ½mV/metre (500 μV/metre) field strength contour. The dotted line denotes the approximate limit of the fringe area, which is bounded by the ¼mV/metre (250 μV/metre) contour.

The Transmitter

The transmitting mast. designed by B.I.C.C.C. is being erected by them at Mendlesham. on a site which is some 200ft. above sea level. The height of the mast is 1,000ft.. making the aerial 1.150ft. above sea level. The aerial array will be supplied by E.M.I., and the transmitter, built by Pye. will operate on Channel 11, employing horizontal polarisation. The nominal transmission frequencies are sound: 201.75 Mc/s, and vision: 204.75675 Mc/s.

It is planned that commercial broadcasts will commence in November of this year. Low-power tests will begin three months before the scheduled start of programmes, and high-power tests, one month beforehand. The programme contractor is Anglia Television of Brook House, Park Lane, London, W.1, for whom studios are now being built in Norwich. The studio programme will be carried to the transmitter by means of a radio link supplied by Marconi's. The connection to the national network will be made by a G.P.O. V.H.F. radio link between London and Norwich.

The service area of the new station.



Television Receiving Licences

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

Region	*Total*
London Postal	1,666,304
Home Counties...	1,162,560
Midland	1,409,974
North Eastern	1,469,349
North Western	1,244,774
South Western	735,509
Wales and Border Counties ...	533,391
Total England and Wales ...	8,221,861
Scotland	720,286
Northern Ireland	102,231
Grand Total	9,044,378

Viewing Figures for Opening

ON the first day of transmissions from Burnhope, ITV/BBC homes in the area were tuned for the greater time to ITV, the comparative ITV and BBC programme ratings during the evening (5.00 p.m.-11.15 p.m.) averaging 67 per cent. and 12 per cent. respectively. A total of 197,000 homes—68 per cent.—viewed the opening ceremony. TAM states that 93 per cent. of all homes in the area able to receive ITV were switched to Tyne Tees Television at some time during the evening.

Making TV Tubes in Scotland

AN agreement has been entered into with the Radio Corporation of America, granting a manufacturing and technical aid licence to John Brennan, a private company, of Truvu Works, in Fifeshire.

The company at present assembles television tubes, but is now commencing to manufacture electron guns used inside cathode ray tubes. At present Truvu tubes are distributed nationally for replacement purposes with a 12-months' guarantee, and their output is about 1,000 a week, and by June it is hoped to step up production to 2,000 weekly. The prices are competitive, the 17in. tube costing £10 17s. 6d. including purchase tax.

British Standards

"RADIO - FREQUENCY Cables for Domestic TV and V.H.F. Broadcasting Receiving Aerials." B.S.3040: 1958. This 14-page publication specifies dimensional and performance requirements, together with methods of test. Price 4s. 6d.

B.S.3041: 1958. "Television and V.H.F. Broadcasting Receiving Aerial Feeder Connectors." This six-page publication deals with two types of feeder connector, each suitable for use with the forms of aerial feeder cable specified in the previous specification. Type 1 is a coaxial connector for use with coaxial cables having a characteristic impedance of between 50 and 100 ohms. Type 2 is a polarised two-pin device suitable for use with either coaxial cable or balanced twin feeders at frequencies up to, and including, Band II. Price 4s.

U.S. and Canadian TV

THE U.S. Information Agency now estimates there are 639 TV stations and 21,585,000 sets in use outside the U.S. and Canada. The U.S. has about 50,000,000 sets and 550 stations, Canada more than 3,000,000 sets and 55 stations.

Ski-ing with TV!

TV enthusiasts are now able to look at their sets even if they go to the winter sports. The transportable "Ekco" TV set enables them to watch

Ski-ing with TV!

television in the mountains, for the set can receive its energy from the battery of the car (12 volts) or from the mains. The set has 19 valves and 12 channels.

Hungary Planning New Eurovision Link

THE Hungarian Post Office Research and Telecommunications Research Institutes and engineers of the Pécs television relay station are carrying out the final survey to determine the siting of a further TV relay station at Sopron in Western Hungary. After this they plan to build a micro-wave relay transmitter there to bring in Eurovision transmissions from Western countries to South-east Europe.

The proposed micro-wave station will also be able to transmit programmes from Soviet TV transmitters to Western countries, to Belgrade. Ankara and other South-east European stations.

TV in Colour

A DEMONSTRATION of colour television of the future was given to about 500 guests at the Dorchester Hotel recently.

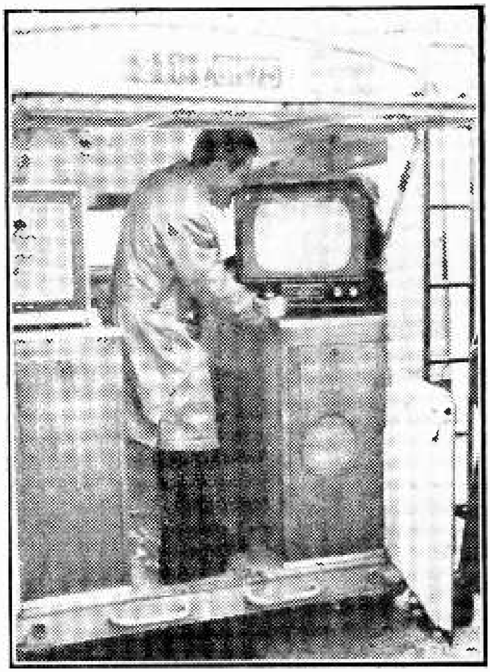
Most of the people who saw it were advertising men. A noticeable thing about the demonstration was that white shirts appeared bright pink. The Continental system of 625 lines was used instead of the British one of 405 lines.

The kind of television sets needed to receive this type of television would cost approximately £200 each.

Southern ITV Homes Increase

A MID-JANUARY survey of the Southern ITV area carried out by Television Audience Measurement Limited (TAM) revealed that 338,000 homes were then receiving ITV programmes. an increase of 157.000 over the opening night (August 30, 1958) total of 181,000.

An encouraging feature of ITV progress in the area was that after only four and a half months of ITV transmissions, 39 per cent. of all private households and 45 per cent. of all individuals in the area were able to view ITV programmes. There were also two interesting changes in audience characteristics compared with the previous survey carried out in November last year; the incidence of ITV households with housewives aged 35 and under rose from 22 per cent. to 24 per cent. and the incidence of ITV households containing two or three people increased by 5 per cent.. from 50 per cent. to 55 per cent. of all ITV homes.



A TV installation in a van.

TV for Engine Tests

A TV camera fixed to view any part of the engine under test and connected with a screen placed before the driver will permit the technicians to watch the functioning of the engine while driving on a highway. The first demonstration was held near Paris recently.

Norway to Join Eurovision

IN fierce competition, Marconi's Wireless Telegraph Co. Ltd. have been awarded contracts from the Norwegian P.T.T. Administration and the Royal Board of Swedish Communications for a combined multichannel radio-telephone and television link between the Norwegian capital, Oslo, and Karlstad (Sweden). A further section. carrying multichannel radio-telephony only, is to be installed in Sweden between Karlstad and Arvika.

Between Oslo and Karlstad two two-way paths and one reversible one-way path are to be constructed. Both will operate in the super high frequency band (4,000 Mc/s). One of the two-way paths will carry 600 channels of radio-telephony while the reversible single-path system will carry television signals. The second two-way path is to function as a standby for either. Broadcast speech circuits and control and supervisory signals will be transmitted via an additional radio link operating in the 400 Mc/s band.

Russian TV

RUSSIA now has more than 60 TV stations and over 3.000.000 television sets in use, Soviet Ambassador Mikhail Menshikov told a New York audience recently. He said more than 100 new stations will go on the air in the next few years. He conceded that most Russian television sets have been small-screen models, but asserted that 17 and 21in. sets are "now coming in."

The Soviet newspaper *Trud* announced that a giant television tower — the world's tallest — would be built this year in Moscow. It would rise 1,667ft., topping the present tallest man-made structure.

Hungary Makes TV Tubes

MANUFACTURE of glass for mass production of cathode ray tubes, hitherto imported by Hungary. has started at the Nagykanizsa glass works. An output of 20,000 tubes is planned for this year. stepping up to 200,000 by 1965.

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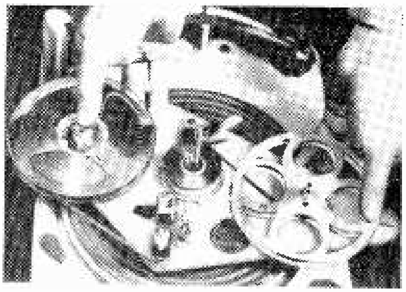

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A TV OSCILLOSCOPE—2

THE CIRCUIT DESIGN OF THE Y-AMPLIFIER

By R. Coates

(*Continued from page 390 of the March issue*)

THE only fundamental difference between these circuits is the method of bringing about the sudden fly-back when the capacitor reaches a predetermined voltage. The simplest, and oldest, is by using a gas-filled discharge tube, but this method has several disadvantages. Firstly, it necessitates a fairly wide sweep range, which increases the lack of linearity unless a very high H.T. voltage is used. Such circuits are frequently operated at an H.T. of 700 volts. Also, the gas tube is relatively difficult to synchronise, and unsuitable for high frequencies.

Probably the best circuit of this type is the Puckle, which uses a flip-flop, or monostable multivibrator as the switch. One section of the latter is usually a triode, but the other is often a pentode in order to provide an easy means of injecting a synchronising pulse. There have been a number of variations of the Puckle timebase published, which each provide one or more additional facilities, or refinements to the operation, but there is no need for the amateur to investigate these unless he feels a particular need for a specific feature to be incorporated for certain purposes.

Without special equipment, this part of the process is liable to be difficult, but the best method is by using a regular signal (such as the 50 c/s from the heaters), as a test, and synchronising the timebase in such a way that four or five cycles are displayed simultaneously: they should then all be identical. Even better, the timebase may be allowed to run freely with a frequency very close to that used above, when the cycles will be seen to move slowly across the screen; they can then be watched in their progress, and should not alter in form as they pass.

The Y-amplifier

The Y-amplifier is one of the most important considerations in the oscilloscope: there is obviously no point in using the oscilloscope to inspect the distortion in a waveform if the amplifier introduces its own distortion. Accordingly, some considerable amount of care must be taken over the design of this amplifier.

The first consideration is that of the output stage, and it is a great advantage here if a push-pull stage is used. The reason is that this arrangement reduces distortion owing to unbalancing of the tube, and also decreases distortion by reducing the output voltage required from one valve. It may be argued that the introduction of push-pull requires an additional valve as a phase-splitter, but this is quite untrue if we use the circuit known as the "long-tailed pair," or cathode-coupled pair. This circuit is very simple in design and operation, and was shown in Fig. 3 (given last month). The input valve operates both as a normal amplifier and as a cathode follower, while the second valve operates as a cathode input amplifier. If the value of the cathode load is high, the outputs from the anodes will be indentical, but in antiphase. The circuit employs no decoupling capacitor, and is equally suited to the amplification of both A.C. and D.C. signals, so we will investigate the possibility of providing a D.C. amplifier to feed it.

Load Resistors

The values of the anode loads shown are typical only, and may be altered to provide a different gain. The symmetry of output obviously depends on the similarity of these two resistors. The values of the other resistors will be discussed later. The gain of this amplifier, overall, using the anode loads shown and a double triode such as the 12AT7 or ECC81, will be about 30. As our specification requires a full trace from an input of 3 mV., and assuming this to require a peak-to-peak output voltage of 150 volts, it will be seen that the input to the cathode-coupled pair should be five volts. Thus, the gain of the preceding stages should be nearly 2,000.

To achieve a gain of 2,000 from one valve would be driving it hard and leave no reserve for negative feedback, so we must obviously use two. The input valve at least should be a low-noise type, such as the Z729 or EF86, and the second

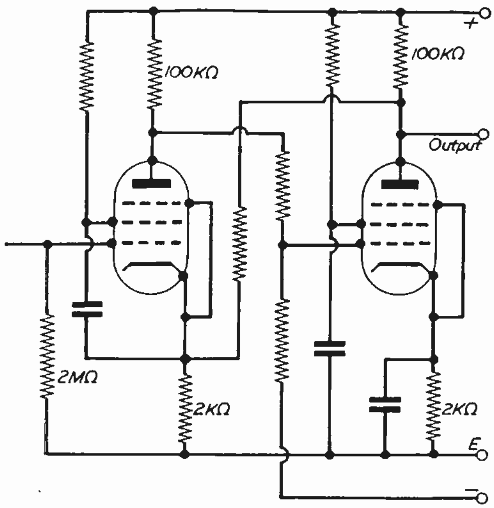


Fig. 4.—Negative feedback amplifier.

should preferably be similar. When building such an amplifier stage, remember that the overall gain is very high, and be careful to observe all the recommended precautions concerning the wiring and accessories, and also take care to ensure that no stray signals are picked up, as your oscilloscope will be useless if the signals are swamped with undesirable noise. With such a valve you can afford to use an anode load in the region of 100 kΩ, when the gain will be of the order of 600. Thus, two stages in cascade will give a gain in the region of 360,000, although this figure is not of great importance, but is quoted to show that a high degree of negative feedback is possible in order to bring this value down to 2,000.

Biasing

We can now see the full advantages of the power supply circuit of Fig. 1(a), when we want to construct an amplifier capable of handling D.C. signals: the method normally employed is shown in Fig. 4, where it is seen that the negative

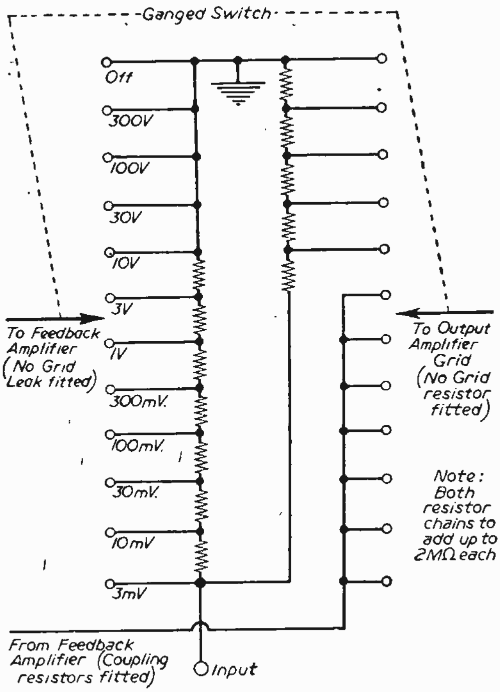


Fig. 5.—Input gain control. Both resistor chains to add up to 2 MΩ each.

terminal of the EHT is used as a negative supply in order to maintain the grid of the second valve at zero voltage for bias purposes. The D.C. signal cannot be fed through a capacitor, so we feed it down a potential dividing chain connected to this negative supply. The values of this chain are easily calculated if the anode current of the pentode is known. For instance, suppose that this current is 2 mA, then the voltage dropped across the 100 kΩ anode load will be 200 volts. If the potential dividing chain carries ½ mA, then the current in the anode load will be 2½ mA, so that the voltage drop across it is 250 volts. Then the required voltage drop across the anode-grid resistor is H.T.—250=200 volts, so that the resistor should be 400 kΩ, as it is passing ½ mA. Then the other resistor in the chain will be 900 kΩ, dropping another 450 volts to the negative rail. The same values will be perfectly suitable for the output pentode.

Loss of Gain

Notice that the signal is then attenuated by the dropping chain, in such a way that only 9/13 of the anode signal reaches the grid. This has two effects; firstly, it reduces the overall gain of the pentodes to about 250,000, and it reduces the gain of the double triodes to about 22, thus increasing the required gain of the negative feedback amplifier to 2,500. This loss of gain is unavoidable in a simple D.C. coupled system.

Feedback Resistor

We must now determine the feedback resistor connected between the anode of the second pentode and the cathode of the first. As the gain without feedback is very much greater than the gain with feedback, we can say that this resistor should be the value of the cathode resistor multiplied by the required gain. From the valve characteristics we can determine the value of the cathode resistor, say, 2,000 ohms, from which the feedback resistor for a gain of 2,500 will be 5 MΩ.

Decoupling Capacitors

It will be noticed that, although we have said that the amplifier should be able to handle D.C., three decoupling capacitors are shown in Fig. 4. The effect of these will be to increase the gain of the amplifier for an A.C. signal, and the D.C. gain will be lower than the A.C. gain. For the feedback value given above, the gain may well remain constant to as low a frequency as 5 c/s, but below this frequency will drop to the D.C. gain value. There are two methods of levelling the frequency response to D.C., one by removing the capacitors, which will have the effect merely of reducing the A.C. gain to the D.C. value, or alternatively the capacitors may be removed and positive feedback applied (or negative feedback reduced) in order to return the gain to its present setting. In either case, an additional valve will be required to provide a linear response to D.C. at the specified gain with the present amount of negative feedback. Although this would be in some ways an advantage, it will not really justify the additional expense and complications. The high frequency response will depend entirely upon the valve and wiring capacities, and this should be borne in mind when wiring the circuit, when all anti-phase leads should be well separated from each other and clear of the chassis.

Input Impedance

Looking back once again at the specification, we will remember that the question of input impedance is mentioned in item 10. The normal input impedance of this amplifier at operating frequencies is roughly equal to the value of the grid leak resistor, although it is shunted to some extent by a small capacitive component. The effect of the negative feedback is, however, to increase this value very considerably, so we will have no trouble on this score if we use this amplifier configuration.

Now to determine the final design of the output stage: it will have been noticed that in the above description of this circuit it was stated that the cathode resistor should have a high value. In order to make this resistor as high as possible, we may connect the lower end to the negative EHT supply, and its value will simply be the supply voltage between the negative terminal and earth divided by the required cathode current, remembering that this cathode current is twice the current carried by each individual anode. Therefore, in the place of the "E" in Fig. 3, we may write instead "—." The diagram will then be correct if D.C. coupling is used, except that the "spare" grid should still be earthed.

The voltage on the spare output valve grid gives a very convenient method of providing Y-shift: if this voltage is altered, the relative currents in the two sections will be different, although the total current will not change much. Thus, the D.C. voltages on the anodes will be different, which will give a shift on the screen. Therefore, by connecting this grid to a potentiometer across the + and −H.T. supplies, we can vary the D.C. voltage on the grid, and so provide a shift. In practice, such wide voltage variation will not be required, so a fixed resistor may be connected to the two ends of the potentiometer and the other ends of these resistors taken to the supply terminals. The upper fixed resistor may conveniently be partly used for X-shift, as already described, in which case the 1 MΩ fixed resistor mentioned would be replaced by, say, a ½ MΩ fixed resistor which is connected, not to earth, but to the Y-shift potentiometer, which may also be 1 MΩ. The lower end of the latter potentiometer will then be connected to the negative supply via a 0.75 MΩ fixed resistor.

Gain Control

The gain will be best controlled by the normal method of tapping off the required voltage from the input resistor. One point should be noted, however, and that is that the amplifier following the gain control is of very high gain, and any noise generated by a faulty contact in a potentiometer is likely to be very much amplified and displayed on the screen. A far better arrangement is to provide a switched gain control, when the contact noise is greatly reduced and the blades can easily be cleaned as becomes necessary. There are two further advantages of this suggestion: the first is that the input switch positions may be marked in the voltage which corresponds to full-trace display, and an approximate assessment of the A.C. component of the voltage being measured can be obtained. The other point to consider is that when inspecting a voltage of the order of 100 volts it is a rather pointless procedure to reduce this voltage to the order of 3 millivolts by a potential divider and then to amplify this low voltage once more to around its original value for display.

Resistor Chains

A far more direct method of going about the job is to switch the higher voltages directly to the input of the output stage, and this may be brought about quite easily when we are using a switched gain control. The suggested circuit is shown clearly in Fig. 5; no resistor values are shown here as they are easily calculated, being a direct ratio, and their inclusion would complicate the diagram unnecessarily. Both resistor chains should add up to 2 MΩ each, i.e., 1 MΩ for the two in parallel. Note that when not in use the input to the high-gain amplifier is earthed to prevent instability: note also the provision of an "off" position; this is not intended to switch off the mains supply to the unit, but rather to permit the disconnection of the inputs from the circuit under test in the event of any such temporary requirement. The switch used is a two-pole twelve-way type, although fewer positions will be required if the range is to be reduced at all. The two wafers of the switch should be spaced fairly far apart in order to reduce the possibility of positive feedback taking place on the low ranges owing to capacity between the tags, leading to instability or even oscillation.

In the event of a pure A.C. amplifier being required, all the couplings should be replaced by conventional C.R. networks. As was explained earlier, this will increase the gain, increasing the stability of the negative feedback amplifier and the input voltage of the output amplifier. This latter fact should be counteracted by the increase of the feedback ratio; for the value of cathode resistor stated earlier, and a required gain of 2,000 the feedback resistor will then become 4 MΩ. As the feedback is then taking place through a smaller resistor, the feedback ratio is increased, thus reducing the gain. Note that the grid leaks of all stages should be taken to earth, and not the negative EHT supply: all other arrangements may remain the same except that the input should be via a capacitor.

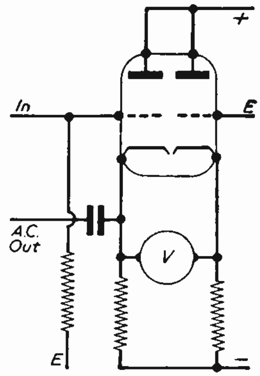


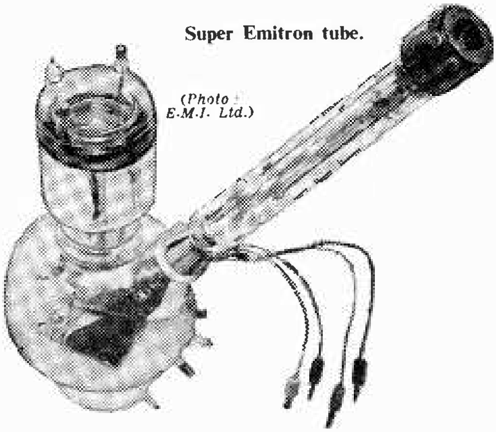
Fig. 6.—Simple D.C. valve voltmeter with high input impedance.

The Valve Voltmeter

In an A.C.-coupled oscilloscope, it is often found convenient to fit a simple voltmeter for measuring the D.C. component of the signal being inspected. Obviously, a voltmeter connected across the input will not satisfy the requirement of high input impedance, as the relatively low resistance of the meter will shunt the input. A high impedance meter is required, particularly for measuring any charge on a grid or other high-impedance circuit.

The accent here must be on the simplicity of the system employed, rather than on the absolute accuracy. A circuit which fulfils this requirement quite easily is the cathode follower voltmeter, but this system does carry a considerable inherent error: a modification which is not difficult or expensive to carry out is the double triode version shown in Fig. 6.

(*To be continued*)



Super Emitron tube.

(Photo E.M.I. Ltd.)

TELEVISIO

AN ACCOUNT OF THE DEVELOPM
FROM THE EARLY MECHANICAL

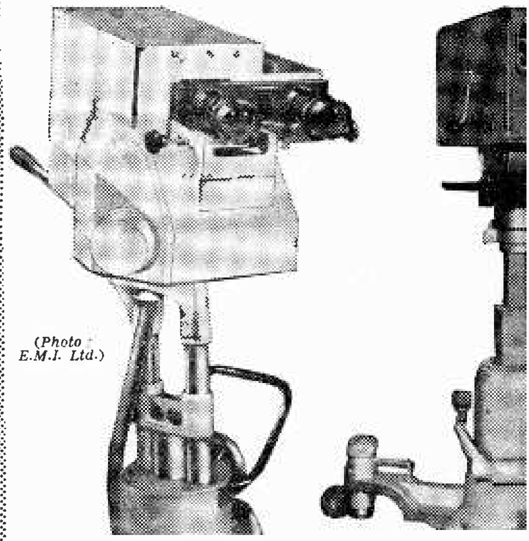
IT must be admitted at the outset that the term transmitter is apt to be misleading and it is therefore necessary to clarify the position. All the early attempts at producing television pictures with any degree of success followed the same pattern. First there was the mechanical device in one form or another which had to scan the person or scene in order to break it up into elemental areas each with its own degree of light and shade. Associated with this scanning mechanism, but quite separate from it physically, was the photo-electric device whose purpose was to convert the elements of light and shade into corresponding electrical signals of proportional strength. These in turn were sent by wire or wireless to a receiver for reconstitution into a visual replica of the subject at the transmitting end. Hence the term television transmitter became a loose but common description of the equipment. Modern practice as exemplified by the electron camera embodies the dual function of scanning and photo-electric conversion in one piece of equipment, so the reader will appreciate that for the purpose of this article the expression "television transmitter" has to apply to both old and new to cover the period of over 30 years of development.

First Attempts

For the first demonstration of real television early in 1926, as distinct from shadow pictures, Baird used a crude, lensed disc, slotted chopper disc, insensitive photo-electric cells, unstable amplifiers and intense flood lighting. Definition was of the lowest order compatible with making the received picture just recognisable as a human face so substantiating a claim then hailed as "seeing by wireless."

From this starting point attention then focused towards equipment improvement, both mechanically and electrically, in the transmitter. Instead of a flood-lit subject suffering intense discomfort from the heat and brilliance of the lamps and a lensed image being broken up by the scanning mechanism, a reversed procedure was evolved and used successfully in 1928.

A sheet metal disc just over a foot in diameter with a single spiral of 30 holes round its periphery was rotated at 750 r.p.m. in front of a focused beam from an arc or projection lamp. By interposing a mask cut out to the correct picture ratio, each disc hole, as it revolved, enabled a solitary light beam of high intensity to pass and in this way the subject was scanned in a series of lines of light. At any one instant the tiny



(Photo E.M.I. Ltd.)

The Super Emitron camera.

ray of light illuminating the subject had a measure of this light reflected back to a bank of small photo-electric cells. The driving motor, lamp, disc, mask, etc., were housed in one room separated from the studio in which was the subject and the cells by a wall with an opening in it just under the bank of photo-electric cells.

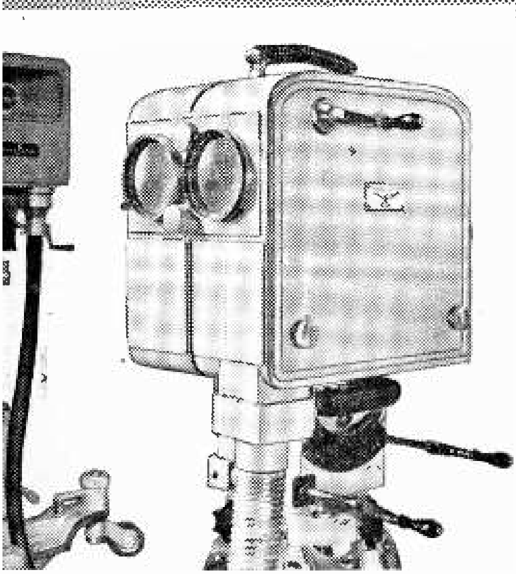
Similar forms of television transmitters were designed and used successfully both in the U.S.A. and Germany but in both these countries all scanning was undertaken horizontally and not vertically as in England, while the picture aspect ratio conformed to that of the cinema.

Logical improvements took place in the types of photo-electric cells; they became larger, more

N TRANSMITTERS

ENT OF ELECTRONIC TELEVISION
STEM By H. J. Barton-Chapple, B.Sc.

sensitive and could be used in banks mounted on heavy floor stands to give improved picture quality as a result of their careful placing in relation to the subject being televised. Amplifiers became more stable, the frequency response of the electrical chain was studied and more ambitious scenes were televised and seen by those amateurs who had built receivers and radio sets



wo pre-war German TV cameras.

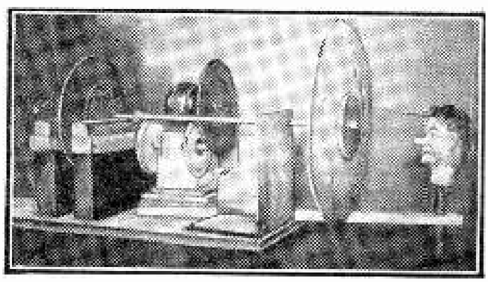
capable of being tuned in to the experimental transmissions being radiated regularly.

The Mirror Drum

One big drawback was immobility. The disc scanner was fixed in position and all action had to take place within a very narrow scanning field compass. It was natural, therefore, that the protagonists of the mechanical method should turn to the design of scanners which at least had a degree of mobility. For this to happen the apertured disc gave way to the mirror drum. Suitably mounted surface silvered mirrors were placed at regular angular intervals on the outside of a drum, each being set at a slightly different angle axially with reference to its immediate neighbour. The effect of this was to make a narrow beam of light, focused on the revolving drum trace out a series of lines of light which covered a bigger area than the disc scanner. In addition this mirror drum spotlight scanner could be mounted and housed in a large gun-like structure that was capable of slow vertical and horizontal panning and which could be moved to the subject or scene, set up in front of the photo-electric cell banks. The P.T.T. in Paris employed one of these scanners and the Baird Company had one designed to use in conjunction with a series of big screen demonstrations both in this country and abroad.

BBC Progress

This work was carried out in the very early 1930's and bearing in mind the small amount of research that was being undertaken and the non-availability of highly efficient cells, etc., the progress from January, 1926, was really remarkable and testifies to the enthusiasm of the teams of engineers engaged in the work, here no less than on the Continent and in America. Indeed the advance in technique received official recognition by the installation in a sub-basement studio B.B. at Broadcasting House of a specially designed mirror drum scanner, photo-electric cells in banks of five on movable stands and the associated amplifiers with a first-class frequency response capable of working in conjunction with the BBC's own broadcasting stations. The scanner could sweep through a wide horizontal angle by means of runner mountings while vertical panning was accomplished by the aid of an adjustable apertured mask through which passed the scanning beam. The arc lamp employed was seated on runners also, so that with this variety of adjustments and movements, dancing acts, vaudeville turns, close-ups, etc., all came within range of the producer for the regularly radiated programmes. Apart from minor improvements in technique, this low definition service bridged the gap between August, 1932 and August, 1936, when the world's first high definition service was opened by the BBC at Alexandra Palace.

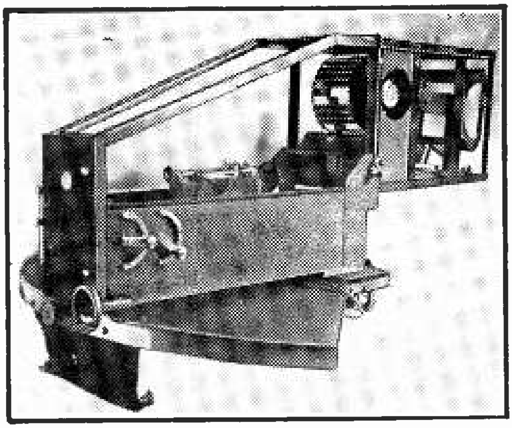


Some of the early apparatus used by Baird in his initial experiments.

The Electronic Camera Appears

In 1931, von Ardenne in Germany successfully transmitted and received a film by television using what is know as velocity modulation with the aid of cathode ray tubes and no mechanical devices at all. Although it was beginning to be accepted that cathode ray tubes would form the basis of a receiving set adaptable to the higher definition pictures which all agreed were necessary for sustained entertainment or educational value, little was made known of any form of electronic application for the transmitting end.

The solution to this problem, however, was found by Zworykin in the Iconoscope and Farnsworth in the image dissector tube, both these devices being developed in the U.S.A. The Emitron camera in this country was similar in function to the Iconoscope while the Germans followed on the same lines too. Prior to this the mechanical spotlight scanner had been brought up to the standard of 240 lines and the Television Advisory Committee appointed by the P.M.G. was so undecided on the relative merits of mechanical and electronic high definition pictures that a field trial was arranged with the equipment side by side, at Alexandra Palace. This site ultimately became the home of the world's first high definition public television service.



The 30-line mirror drum scanner used by the BBC at Broadcasting House.

Death of the Mechanical System

It is a matter of history that after a few months' trial, the ease of operation and higher definition of the Emitron equipment dealt a death blow to the immobility of the mechanical system, coupled with the difficulties caused by minute particles of dust lodging in the scanning holes in spite of running the disc in a pump exhausted casing.

This storage tube electronic device with its sensitised mosaic on which is directed both the optical image of the subject to be televised as well as the scanning beam of electrons has been improved over the ensuing years. Its sensitivity is much higher and the space charge effects eliminated so that to-day the device represents a most efficient form of "transmitting" for close-ups, outdoor and indoor scenes of wide compass, films, etc.

European Developments

Side by side with these developments in this country was the work in Europe (particularly Germany before the war) and America. Not only the storage tube but the image dissector tube was brought to a high degree of efficiency. The last named device differs in operation in that the whole electron image is scanned across a fixed aperture and the electron stream collected after amplification provides the picture signal.

Many cameras working with this unit are in use to-day, particularly in the industrial television field—an important application of television which is so often relegated to the background in the face of the more spectacular accomplishments of television in the field of entertainment and education.

There was a halt in development brought about by the war when work on television stopped for a period of nearly seven years, so that the step from crude lens discs to efficient electron cameras only covered an active period of a quarter of a century. This is a wonderful achievement and has been backed up by an energetic press imbued with a determination to keep the public alive to all the work that has been accomplished.

TELEVISION TROUBLES

(*Continued from page* 440)

far end of its range, a check should be made of V19 and V20, since a valve characteristic alteration is often responsible.

If the valves are normal, R96, C75 and C72 should be checked for value, and replaced if found to be out of tolerance.

Poor Frame Linearity

If the frame linearity control will not correct this trouble sufficiently, the resistors associated with the frame linearity network should first be checked for value. In most cases, it will be discovered that R116 and R103 are out of tolerance. These components, along with C77, are mounted on the top of the frame output transformer in the far left-hand corner of the chassis when viewing from the rear of the cabinet. R116 is connected between two tags which can be shorted, if necessary, by means of a wire link. This link can be connected (or removed if it is found connected) before delving too deeply into the circuit, for this simple exercise often serves to balance the linearity circuit.

Cramping at the bottom of the picture should lead to an emission or substitution check of V20.

(*To be continued*)

TURRET TUNERS

HOW TO ADAPT THESE CONVERTERS FOR USE WITH A "STRAIGHT" RECEIVER WITHOUT ALTERATION TO THE SET ITSELF

By Hugh Guy

EXTENDING the operation of a superhet receiver to Band III by using a turret tuner is straightforward and merely involves the replacement of the R.F. stage (if any) and the mixer/local oscillator in the receiver by the two valves comprising the tuner circuit.

The tuner then converts the frequency of any of the channels to which the device is pretuned, to an intermediate frequency of either 11-16 Mc/s or 34-38 Mc/s, depending on the requirements of the receiver in use. Channels are selected by a rotary switch, and the chosen one is first amplified by a cascode stage and then converted and amplified in the following triode-pentode stage. The latter doubles as a mixer and I.F. output stage.

Straight Set Requirements

The problem of conversion for straight (or T.R.F.) sets is simple. Whereas the converter as supplied gives an output at the frequency of the I.F. stages of superhet sets, an I.F. output is required which will cover the band of frequencies to which the straight set is normally tuned. In the London area, for example, this band should cover at least 41.5-45 Mc/s. Consequently the first requirement is a change of oscillator frequency together with an appropriately retuned I.F. output.

As supplied the converters have an oscillator frequency which is higher than the channel frequency to which the tuner is set. When tuned to the BBC on Channel 1 for instance, at 45 Mc/s, the oscillator will be working at 45 *plus* the intermediate frequency in use on the device. The reason for this is fairly obvious: if an oscillator frequency *lower* than the channel frequency were used, then it would be unattainably low when trying to receive a channel in Band I.

Now if the existing oscillator frequency were merely raised from its present mid-tuned value of either 36 Mc/s or 13.5 Mc/s above the signal to one of 43 Mc/s above the signal, in order to receive a channel in Band III, a signal would result in which the sound and vision channels were transposed. Consequently the local oscillator frequency must be arranged to be lower than the received signal.

Thus when tuned to the London I.T.A. channel of Band III on approximately 191.5 Mc/s the local oscillator must function at roughly 146 Mc/s. This detuning of the local oscillator is easy to accomplish, and has no adverse effect on the reception of Band I signals. On Band I at 45 Mc/s, for instance, the incoming signal will be coupled, unconverted, to the anode circuit which is tuned to 45 Mc/s. This last-mentioned effect is achieved by removing the tuning capacitor which is wired across the primary of the output transformer in the converter.

The second feature that the tuner must incorporate is some protection against Band I interference when switched to Band III. In the simplest instance this is achieved by using an aerial system which is tuned to the Band III channel only by use of the appropriate lengths of dipole element. Under persistent conditions of crosstalk, however, it may be necessary to introduce some filtering in the input stages of the converter.

Adapting the Converter

The steps required to modify the converter may be listed as follows:

1. Change tuning range of I.F. output transformer to 45 Mc/s.
2. Change local oscillator frequency coverage.

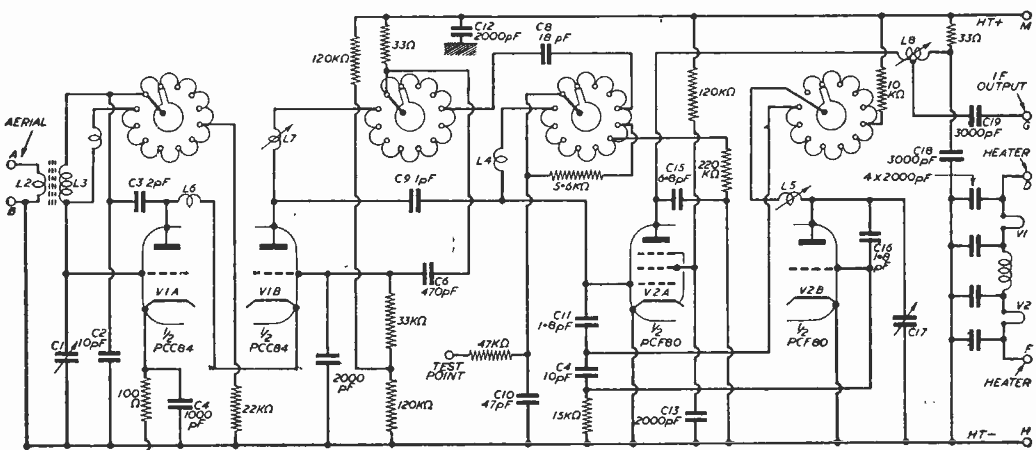


Fig. 1.—The circuit diagram of the turret tuner.

3. If necessary incorporate Band I stop filter on Band III switch positions.

In addition to the above, some extra work is associated with the installation which is common to both superhet and straight-set conversions:

4. Connect gain control (i.e., contrast) in converter, or short out appropriate terminals.

5. Fit converter in cabinet, wire heaters in series with existing heater chain, and couple H.T. and earth to set.

6. Modify aerial array to suit.

Dealing with each modification in turn the work should follow the procedure outlined below. The details refer specifically to the adaption of a model with an I.F. output of 36 Mc/s to use on the London Channels of Band I and Band III television programmes—viz., Channels I and 9 respectively. However, the same lines can be followed to suit the various Bands I and III channel combinations peculiar to districts throughout the country.

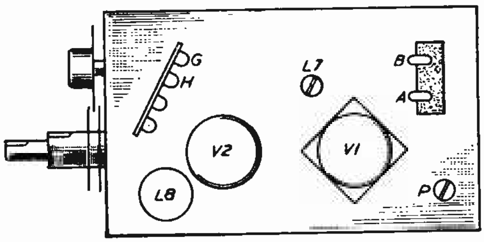


Fig. 2.—Plan view of the tuner.

I.F. Output Transformer

Reference to the converter circuit diagram of Fig. 1 shows the presence of C15, a tuning capacitor across the primary of the auto-transformer comprising the I.F. output transformer. This capacitor, together with the stray capacities associated with the anode circuit of the pentode portion of V2 tunes the output transformer over the band 34-38 Mc/s.

This capacitor must be removed to retune the transformer to cover the 45 Mc/s band.

Remove the screening cover from the converter, and the capacitor in question will be seen soldered in between pin 6 of V2 and earth in a corner of the chassis.

As the plan view of the converter in Fig. 2 shows, V2, a PCF80 valve, is the valve in the circular valve can. The inductance of L8, the I.F. transformer, may be varied by means of the iron dust core, accessible from the top of the chassis, and the frequency band at 45 Mc/s is adequately covered by the adjustment attainable. It is highly probable that the higher frequency bands associated with the provincial BBC transmissions can also be covered by this adjustment.

Local Oscillator

The oscillator coil is comprised of an inductance L5 wound on a small former and pre-tuned by means of a brass slug, plus sections of an inductance connected between switch segments on the turret control. On Band III the majority of the inductance in circuit is provided by L5 itself, since the switch mounted inductors are of very small value.

The inductance of L5 has to be increased to reduce the oscillator frequency, involving an increase in the number of turns. This coil, L5, is accessible from the switch control end of the converter and consists of a small polythene former with about three turns of tinned copper wire.

Unsolder the connection to this coil and giving the square head of the coil a slight turn, withdraw it from its mounting on the front of the converter. The turns of wire must now be stripped off and a new coil wound. This new coil should consist of five turns of 22 s.w.g. single strand tinned copper wire, insulated with p.v.c. The presence of the insulation is not of great importance but enables one to achieve the correct spacing between turns by straightforward close-winding of the covered wire. The wire gauge is not critical and almost any p.v.c. covered single strand interconnecting wire is suitable. Having wound it, the coil should be replaced and wired in circuit.

(To be continued)

Publications Received

"SPOTLIGHT ON BBC TELEVISION," a 24-page booklet, price 9d., is published by the BBC for readers with little or no technical knowledge who are interested nevertheless in learning something of what goes on behind the scenes in television—and in getting the best out of their television sets. The booklet is enlivened by a number of humorous drawings by the well-known cartoonist "Artie."

The booklet describes in simple terms "How Television Works" and goes on to give advice about the reception of BBC Television. Problems of interference are discussed (with illustrations) and there is a useful and practical section on "How to Adjust Your Television Set." The booklet ends with some Do's and Don't's for television viewers.

"Spotlight on BBC Television" is available through newsagents and booksellers, price 9d., or (by crossed postal order for 9d.) post free from BBC Publications (Spotlight), 35 Marylebone High Street, London, W.1.

E.M.I.'s Closed-circuit TV Equipment

E.M.I. ELECTRONICS LTD., Hayes, Middlesex, has just produced a new folder to introduce to business executives the company's closed-circuit television equipment which has proved so successful in various fields of industry. The folder is in two colours on art paper and has a novel construction of two and a half leaves, which is in keeping with the theme of this modern management tool.

Various applications are described, ranging from visual control of several widely separated operations, observation of dangerous processes, training and surveillance to such uses as sales conferences, demonstrations in department stores and the transmission of blueprints, signatures and other data. Emphasis is placed on E.M.I. television's plug-in construction and printed-circuit techniques, and the last page is devoted to the specification and detail of various accessories.

TRANSISTORS IN TV RECEIVERS

THE FOURTH ARTICLE OF A SHORT SERIES DEALING WITH THE USE OF TRANSISTORS IN MODERN TELEVISION EQUIPMENT

(*Continued from page 394 of the March issue*)

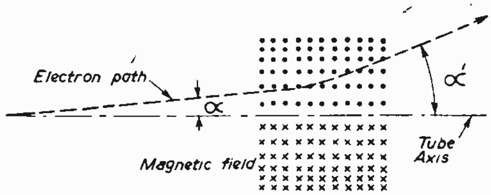


Fig. 11.—Diagrammatic representation of basic scan magnification system.

Synchronising Pulse Separator

THE synchronising pulse separator stage is the part of the television receiver which, at first sight, lends itself most readily to the use of transistors. A pulse clipper is required; the transistor is a good pulse clipper. The volt-amps to be handled are small and the switching speed requirements are not too demanding. However, a closer examination reveals many interesting problems associated with this apparently simple stage (see Fig. 10 on p. 394 of last month's issue).

The information given in this short series is taken, with permission, from a Paper read to the Television Society by B. R. Overton, B.Sc.(Eng.), A.M.I.E.E., and published in the Journal of that Society.

The transistor synchronising pulse separator like its valve counterpart must clip off both the noisy tip of the synchronising pulse as well as the vision signal. It must do this for a wide range of input signal amplitude. Its operation must not be disturbed by transistor leakage current over a wide range of temperature and it must be free of such effects as "pulling after whites." The first two requirements will obviously be met by a grounded emitter stage self-biased by positive going synchronising pulse tips and having a sufficiently large collector load to bottom the transistor even for weak signals (i.e., the direct analogy of the pentode synchronising pulse separator).

On large signals the heavy bottoming of the transistor will result in hole storage and a lengthening of the output pulses which may make the frame pulse separation difficult.

Adequate steepness of output pulse edges can be achieved, even with audio type transistors operated with grounded emitter, by over-driving the transistor, but apart from the hole storage difficulty there is then the possibility of significant direct feed through of video signal via the collector-to-base capacitance. Finally, it is most desirable for the source of signals for the synchronising pulse separator to be sufficiently low impedance and provide a polarity of signal which causes the transistor to conduct during the pulse only. If the alternative clipping process, involving conduction during the vision period of the line, is employed then the output will not be sufficiently free of the vision signal and a second clipping stage will, very probably, be required.

Previous work, in which these problems have been tackled, has been mainly concerned with introducing transistors into synchronising pulse separator stages of receivers having conventional valve video stages. The obvious source of signals for the transistorised synchronising pulse separator has been the cathode of the video amplifier and this has been a major factor in arriving at a suitable design. The different video stages possible for the future all-transistor television receiver may involve some fresh thinking for the synchronising pulse separator.

The circuit employed in the experimental receiver was shown in Fig. 10 last month. Tr23 clips the video signal and has substantially picture-free synchronising pulses at its collector terminal. The base bias resistor R100 is kept small to minimise the effect of the collector-base leakage current change with temperature.

The network R103, C86 provides the appropriate integration and the transistor Tr24 the clipping for conventional frame synchronising pulse separation.

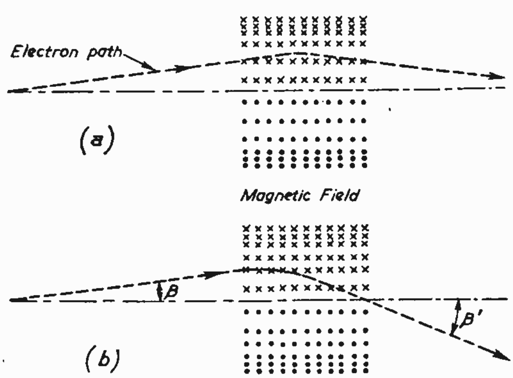


Fig. 12.—Diagrammatic representation of deflection in plane at right-angles to that shown in Fig. 11.

The Scanning System

The power requirements for the timebases in the experimental receiver are approximately one-fortieth of the requirements in a conventional receiver. This economy is largely due to the use of a system of scan magnification.

Full details of the work leading to a practical arrangement will be published elsewhere, but as the invention is so pertinent to the use of transistors in television receivers some features of it will now be discussed.

Scan Magnification

Magnification in one direction.

The basic idea of magnifying the scan is shown in Fig. 11. A fixed magnetic field having opposite sense on either side of the cathode ray tube axis is placed between the deflection assembly and the luminescent screen such that the deflection imparted to the beam is increased. This is not a new idea, but reference to Figs. 12 and 13 will show one of its shortcomings when the simple idea is applied to a television type deflection system. The required field can only be practically achieved in one plane so that when deflection is applied in the other plane scan demagnification results (Fig. 12(a)).

Magnification in two directions.

If the field strength of the magnifying lens is increased beyond a certain point the scan is again magnified with a reversal of sense (Fig. 13b). This is the essence of the new system used in the experimental receiver.

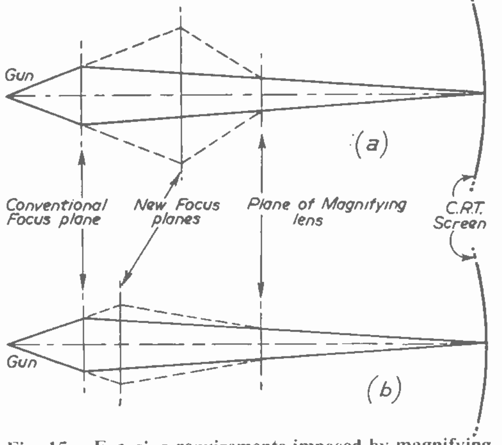


Fig. 15.—Focusing requirements imposed by magnifying lens: Optical Analogy in which the lenses have been replaced by their principal planes. Solid lines represent extremes of beam in conventional tube. Dotted lines show modification imposed by magnifying lens. (a) Horizontal plane (b) Vertical plane.

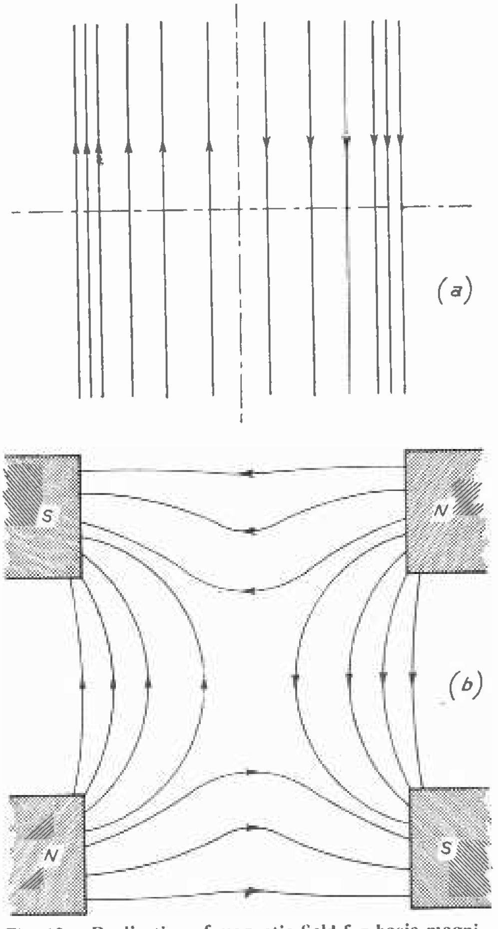


Fig. 13.—Realisation of magnetic field for basic magnification system. (End view of field looking from gun.) (a) Idealised but impossible field shape. (b) A practical field shape.

Spot Size

It is clear that the magnifying lens will magnify the spot size as well as the scan and yet the final spot must be similar in size to that on a normal picture tube. The method adopted to achieve this good spot size is best understood by considering the optical analogy. The magnifying lens or quadrupole has an optical counterpart shown in Fig. 14. Thus we may depict the optical analogy of the normal picture tube electron system and the effect of the insertion of the quadrupole by two diagrams, one for each of the two orthogonal planes as in Fig. 15. (Throughout the discussion the line (horizontal) scan will be assumed to take place in the plane in which the magnifying lens is diverging and the field (vertical) scan in the plane in which the lens is over-converging.) It will be seen that in the horizontal direction the focusing element must handle a wide beam and be so positioned that its image distance to object distance ratio (magnification) is small. This may mean in practice that the deflection assembly and the desired focus arrangement will compete for the same place along the tube neck.

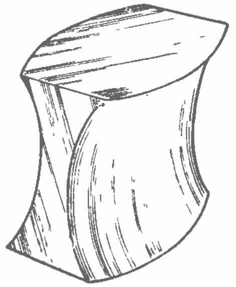


Fig. 14. — Optical counterpart of magnifying quadrupole.

In the vertical direction the conventional position of the focus unit may be tolerated.

These conditions are met in the experimental receivers by lengthening the tube neck somewhat and using a pair of quadrupoles as the focusing system in conjunction with an experimental wide beam triode gun. These focusing quadrupoles are similar and spaced a short distance apart.

(To be continued)

Relaxation Oscillators—5

CIRCUITS INVOLVING PULSE OPERATION

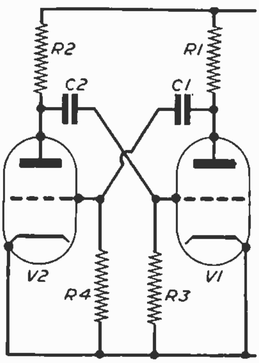
By R. Couvela

(*Continued from page 392 of the March issue*)

SO far in this series, we have dealt only with square and triangular waveforms generated by relaxation oscillators. We now come to the generation and handling of pulses, in their various forms.

Generating Pulses

Probably the amateur's simplest method of generating pulses lies in the multivibrator. This can be done simply by making the two time constants considerably different. The approximate duration of the pulses will be given by one C.R.



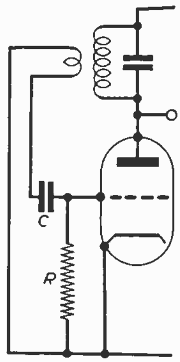


Fig. 1 (Left).—Pulse-producing multivibrator.
Fig. 2 (Right).—Tuned anode oscillator.

product, and the duration of the intervening period will be given by the other. For example, in Fig. 1, if we should want a pulse of 100 μS at 1 kc/s repetition frequency, we would make

$$C2R3 = 10^{-4}$$

which would be satisfied by $R3 = 100\ k\Omega$

$$C2 = 0.001\ \mu F.$$

The intervening period is thus 900 μS long, so

$$C1R4 = 0.0009$$

which would be satisfied by $R4 = 100\ k\Omega$

$$C1 = 0.009\ \mu F.$$

All these values are, of course, approximate.

Positive pulses will be obtained from the anode of V1, while the anode of V2 will give simultaneous negative pulses. The circuit may be synchronised to a signal injected to either grid, but preferably that of V2.

Blocking Oscillator

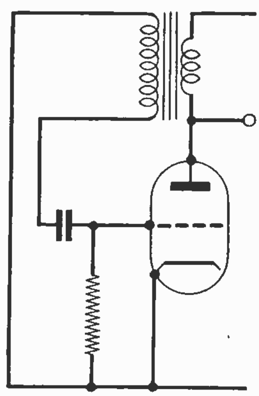
Another method of generating pulses, which is very widely used, is the blocking oscillator. In the circuit of Fig. 2. the oscillation is by virtue of the positive feedback through the transformer, the frequency being that to which the primary is tuned. This is the orthodox tuned anode oscillator, the grid C.R. network being used to provide bias. Now, suppose we remove the tuning capacitor, we cause the oscillations to rise to a very high frequency, a small value of capacity remaining owing to strays.

We will now consider the grid C.R. bias network. If C is discharged, there can be no voltage across it, and the grid is at the same D.C. potential as the cathode. Now, if we inject an A.C. signal on to the capacitor, the grid-cathode voltage will alternate between positive and negative, but when the grid is positive with respect to the cathode, grid current will flow. The effect of this current will be to charge C to a value which will be sufficient to give a negative D.C. potential on the grid which will prevent the grid from going positive with respect to the cathode except on the tips of the cycle. The grid will always go positive on the tips of the cycle in order to make up for leakage through R. This is the normal method of bias used, for example, in the oscillator of a superhet receiver, which is usually a Colpitts circuit. In this application, both C and R are quite small.

Final Circuit

If, however, we increase the values of C and R, and also increase the step-up ratio of the transformer in order to apply a very large signal to the input, we may well drive the grid right beyond cut-off, because the large pulse will provide a considerable current to charge C, which will not easily leak away through the large value of R. Thus, we have derived the blocking oscillator, Fig. 3. The coupling of the transformer is increased to such an extent that the first positive half cycle of oscillation drives the grid well beyond cut-off. This charge then leaks through R, until the valve is able to operate again, when the cycle is repeated.

This operation is really a landslide, similar to those we have already met. Any increase in anode current will, by inducing an EMF in the grid circuit, drive the grid positive, which will assist the increase of anode current, simultaneously charging C with such a polarity that, when the anode current reaches a maximum and



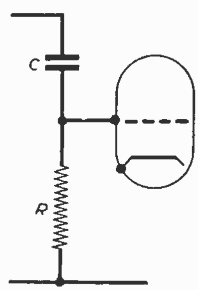


Fig. 3 (Left).—Blocking oscillator.
Fig. 4 (Right).—Differentiating network.

can increase no more, no further EMF is induced in the grid circuit, the grid becoming negative with respect to the cathode. This will cut off the anode current, which will induce a negative EMF in the grid circuit, which will reduce the grid voltage further. The circuit will then relax until the grid voltage rises sufficiently to allow anode current to flow, when the cycle is repeated.

Fig. 5.—Grid waveform for Fig. 4 if C and R are large.

The anode voltage of the valve remains at H.T. value for most of the time, with negative-going pulses. The pulse repetition frequency is controlled by the grid C.R. network, and the pulse width may be increased if desired by the addition of capacity to the primary of the transformer.

Interstage Coupling for Pulses and Square Waves

In Fig. 4, we see the normal interstage coupling network. If we try to pass pulses through it, we must take care to avoid trouble. The reason is that the circuit tends to differentiate our signal. For instance: if we apply a square or pulse wave to a network made up of a small C and R, and we consider the first change to be negative-going, the grid will be carried negative by C. All is well, until C starts to charge through R, when the grid voltage will rise exponentially to zero. Now, when the pulse ends, the effect is that the grid will rise again, and again move exponentially to zero. Thus, for our one square pulse, we obtain two triangular ones, one negative and one positive. Thus, to avoid this situation, we must make the values of C and R larger.

Whatever the values of C and R, there will always be a tendency for the grid to drift towards earth potential, so we must expect to receive a waveform as in Fig. 5 at the grid. If we only want to amplify negative-going pulses, we can overcome the difficulty by reducing the cathode bias resistor, perhaps to zero, so that the valve will automatically clip off the positive section. Of course, the same problem arises with positive pulses, where it can be cured by increasing the cathode resistor, so that the valve is permanently cut off, except during the pulse.

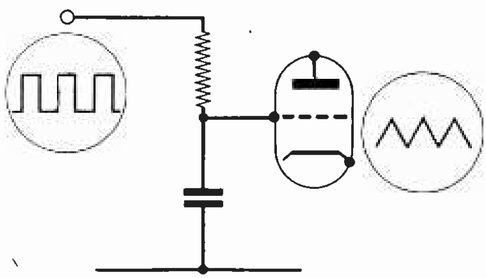


Fig. 6.—Integrating network.

It will then ignore the unwanted negative section.

Difficulties arise also in dealing with pulses in the form of interelectrode capacities in valve amplifiers, which tend to "round off" the sharp edges of the pulses. The techniques for dealing with this problem are very specialised, and will not be discussed here.

Production of Other Waveforms

The above disadvantages of circuit components can be put to good use when irregular waveforms are desired. For example, the above C.R. coupling network could use its very small values of C and R to produce very short pulses alternately positive and negative. These might be required for switching a bi-stable multivibrator, for example. A square wave would produce the alternate pulses equally spaced, while a pulse wave would produce them in pairs. Note that this is making use of the differentiating properties of the network. Conversely, an integrating network could be used to produce a triangular waveform of alternately positive and negative slopes. Fig. 6 would do this job.

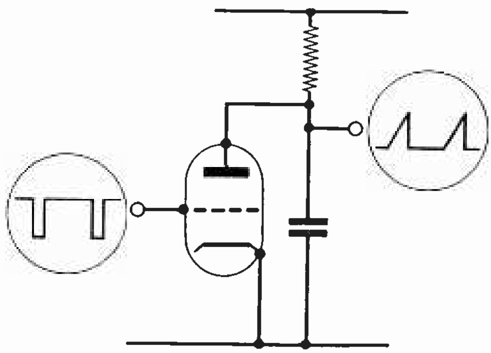
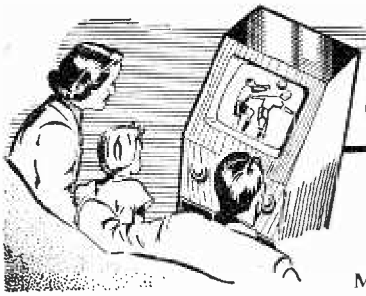


Fig. 7.—Production of triangular pulses.

Again, a modification will give triangular pulses, as in Fig. 7. Here, the grid is held at zero, so the valve short-circuits the capacitor, as a result of which the anode is held at a low positive potential. On the advent of a negative pulse on the grid, the valve is cut off, and the anode voltage rises slowly until the end of the pulse, when the capacitor discharges rapidly through the valves. It is true that the amateur seldom finds a practical use for pulses, but let us hope that this series has opened new vistas of experimental possibilities in this exciting, but rather strange, direction.



UNDERNEATH THE DIPOLE

A MONTHLY COMMENTARY

By Iconos

Spectaculars

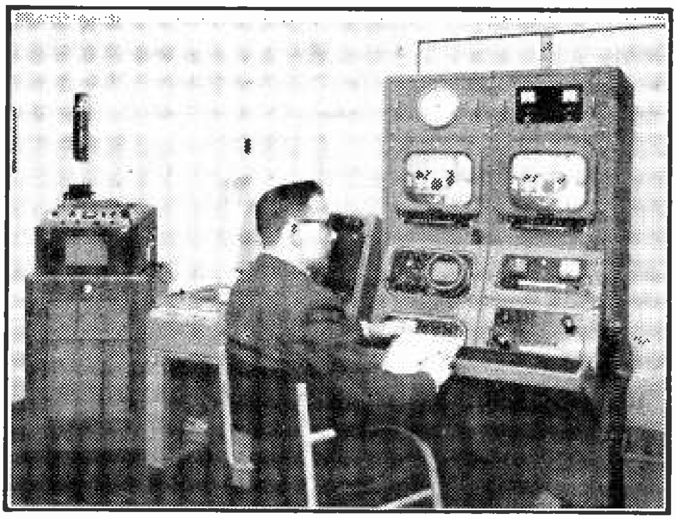
"SPECTACULARS" seemed to me to be going a little out of fashion or out of popularity, to be replaced by comedy of characterisation. The success of the Tony Hancock, Benny Hill and Peter Sellers shows seemed a pointer to future trends. Yet now and again the spectacular show registers strongly with viewers, providing the stars have pleasing personalities and each individual item is trimmed so that it does not outstay its welcome. The Dave King Show was a smooth mixture of sophisticated comedy, slapstick, pleasing dance routines and cheerful, well-arranged music, through which Dave King, Macdonald Hobley and Roy Castle moved with relaxed confidence. A good script, first-class production by Brian Tesler, striking settings by Jon Scoffield and excellent technical values all contributed to a show one would like to see repeated. I wonder if it was Ampex—recorded on magnetic tape? It would be nice to think that such exceptionally good presentations like the Dave King Show are not lost to the world, after their ephemeral half-hour or so's appearance on our screens.

"Alfred Marks Time"

BENNY HILL is not the only comic who can get the laughs with wigs and costumes. Alfred Marks excelled in one of his recent shows in which he played the part of Little Willie to Jimmy Hanley's Kaiser in a glorious piece of costume foolery. Plenty of moustaches, beards, baldheads and the Ruritanian-looking uniforms of 1914 German "Court Circles" provided good props for the comics to play with. Alfred Marks is a quick moving and versatile comedian, good at the difficult art of non-speaking visual comedy—and even better when enunciating remarkable gibberish which may or may not be the German language. He is equally at home with dialogue comedy. One satirical item in the same Alfred Marks Time Show, which did not quite come off was the burlesque called *Private Wives*. It failed, I think, because it was not sufficiently slapstick for true burlesque. The Crazy Gang would have handled this sketch in a much more "robust" manner. Still, excluding *Private Wives*, it was first-class entertainment.

Master Controls

ONE of the most enlightening of recent technical lectures at the Television Society was that given by Mr. Bernard Marsden on *Master Control Techniques*. Mr. Marsden, who is a senior engineer of A-TV, has had the problem of sorting out methods of handling a large traffic of picture and sound between several London TV stations, various telecines, the I.T. News, outside broadcasts, advertising slots and so forth. Timing is to a split second. Cue-dot generators enable secret signals to be inserted just outside the frame of the picture, to enable warnings to be circulated to all stations on the network prior to advertising slots—other than those which are scheduled for fixed times. This is one of the I.T.A.'s answers to the accusations that advertising is arbitrarily inserted in the middle of dramatic sequences. It gives the producer a latitude of up to 10 or 15 minutes during which he can select a convenient moment for the advertising slot. The complications of the newest



A view of the Control Room showing the Transmitter Control Desk, which is part of the equipment supplied by Marconi's Wireless Telegraph Co., Ltd., for the new I.T.A. station at Burnhope, near Durham. The station came into full programme service on January 15th this year.

A-TV master control room in London are many. The problems are very different at the latest smaller-area television stations. There, the traffic is almost wholly one-way. Most of these stations started with relatively simple switching arrangements. but the introduction of more and more slide and caption machines. Ampex and photographic film telerecording, echo rooms. telecine and so forth are beginning to complicate the internal switching controls. Many I.T.A. programme centres started up with only two telecine machines. Now, installations commonly include four or five telecine installations, each capable of coping with 16 mm. and 35 mm. film and slides. Flying spot telecines are gaining in popularity. but the Vidicon type is still much used and is being improved steadily. One of the best run Vidicon telecine installations is a group of four Pye machines at the BBC's Alexandra Palace television news centre. The technical and operational standards here are absolutely first-class.

Monitors Too Good

I HAVE often felt that television producers listen to the sound and watch their monitor screens under conditions far removed from the average home television receiver. Both sound and picture are definitely "hi-fi" in the producer's monitor room. It is a different matter in most TV homes. Hetre the set is often not very well tuned and has a tiny loudspeaker in one side of it. which blows the sound into the curtains or other furniture. with consequent serious attenuation of the "highs." Brightness and "presence" of the voices is lost in the blanket of obstructions, which soak up the sibilants and blunt the consonants. The TV producer does not get this effect at all in the ideal listening conditions of his monitor room. Sublimely unaware of the wear-and-tear he is inflicting on viewers, he blithely allows—or even encourages—the actors to mumble their dialogue in poor microphone positions, to get the so-called natural effect of the "method" school of acting. Noisy feet, rustling clothes, loud sound effects. extraneous studio noises and fortissimo music are other contributory factors which add to the mumbo-jumbo which sometimes emerges from the customers' loudspeakers. The same over-confidence as regards the video side is encouraged by the beautiful closed-circuit results on the producer's picture monitor. Possibly I have overstated my case—but every week I see and hear at least one important programme which fails for this reason—that the producer has not allowed for picture and sound degradations which take place. mainly in the bad viewing and listening conditions in many homes, apart from lesser but inevitable slight losses on microwave links, co-axial trunk lines and transmitters. On the whole, the I.T.A. companies are bigger offenders than the BBC in this "method school" acceptance of unintelligible or inaudible dialogue.

Laughter—By Request

MANY erudite books have been written on the subject of humour, its cause and effect. Even weightier tomes have been produced about the psychological and physical end-product: laughter. There are times when even the best television comedy directors seem to forget the elements which build up receptive atmosphere and prepare the way for unrestrained merriment. First. the ice must be broken!

The art of "warming up" an audience is almost an applied science, taken seriously in their differing ways by such masters of stagecraft as Noel Coward, Peter Sellers, Bea Lillie, Bud Flanagan and the Crazy Gang. It was, therefore. surprising to me that *The Larkins,* A-TV's new domestic situation-comedy, should start off with roars of laughter from the studio audience at the most trivial writer's quirk or actor's grimace. What was performed was really quite amusing, but the frequent "belly laughs" from the invited audience almost killed the show stone dead for me. The reason is not far to seek: the studio audience must have been "warmed up" for at least half an hour or so before the transmission (or its Video recording) commenced and they were in the mood for laughter. I wasn't—and neither were any of my friends who also watched the start of *The Larkins.* Maters were made worse by the studio sound technician allowing much too high a level on background noises, including the hearty laughter. I imagined the instruction board "LAUGH!" being held aloft by the studio manager at the end of each comedy line. This series will settle down, no doubt, and in due course will collect the laughs as easily as The Army Game, especially with such fine artists as Peggy Mount and David Kossoff in the cast—so good luck to it! Apart from the studio audience noise, it should shape up very well indeed.

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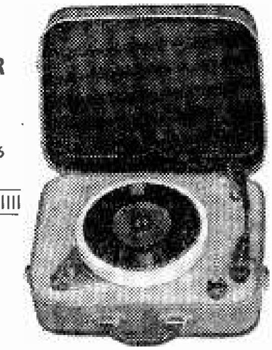

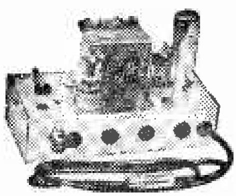

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6X5	7/6	ECH42	10/6	EZ81	8/6	UF41	10/-
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7Y4	8/6	ECL80	12/6	PCC84	10/6	UY41	8/6
DAF96	9/-	ECL82	12/6	PCF80	10/6		

SPECIAL PRICE PER SET
1R5, 1T4, 1S5, 1S4 or 3S4, or 3V4 ... ... 27/6
DK96, DF96, DAF96, DL96 ... ... 35/-
6K8, 6K7, 6Q7, 6V6, 5Z4 or 6X5 ... ... 35/-

RE-GUNNED TV TUBES

GENUINE OFFER
New Heater, Cathode and Gun Assembly can now be fitted to your old Tube—Reconditioned virtually as new. Fully guaranteed to highest standards—as used by our own Service Dept.
12in. £8. 14in. £8.10.0. 17in. £10.
Regret only Mullard and Mazda types at present. Delivery approx. 7 days. Carr. & ins. 12/6.

ELECTROLYTICS ALL TYPES NEW STOCK

Tubular Wire Ends			
25/25 v., 50/12 v.	1/9	32+32/350 v. B.E.C.	5/6
		Can Types, Clips 3d. ea.	
25/50 v. T.C.C.	2/-	8/500 v. Dub.	3/-
50/50 v., 4/500 v.	2/-	8+8/450 v. T.C.C.	4/6
100/25 v., 2/450 v.	2/-	8+16/450 v. Hunts	5/6
8/450 v. T.C.C.	2/3	16+16/450 v. T.C.C.	5/-
8+8/450 v. B.E.C.	4/6	32/350 v. B.E.C.	4/6
8+16/450 v. T.C.C.	5/-	32+32/275 v. Hunts	4/-
16/450 v. B.E.C.	3/6	32+32/450 v. T.C.C.	6/6
16/500 v. Dub.	4/-	250/350 v. B.E.C.	8/6
16+16/450 v. T.C.C.	5/6	60/350 v. T.C.C.	6/6
32/350 v. B.E.C.	4/-	60+100/350 v. B.E.C.	11/6
32/500 v. Dub.	5/-	60+250/275 v. B.E.C.	12/6
50+50/350 v. B.E.C.	6/6	100+200/275 v. B.E.C.	12/6

MULLARD 3-3 QUALITY AMPLIFIER.—A first-class Hi-Fi Companion Unit to the Jason Tuner. H/Duty Mains Trans. allows for H.T. and L.T. Power supply. Mullards latest circuit. 3 valve, 3 watt. Freq. response 40 c/s-25 Kc/s + or —1db with special sectionalised O/Put Trans., Punched Chassis, all components, valves, etc. Only **£6.19.6.** Ready wired and tested, **8 gns.** Carr. and ins. 4/6.

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 8 in., 3/-; 12 x 12 in., 4/6; 12 x 15in., 6/-; 24 x 12in., 8/-, etc.

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

SPEAKERS P.M. 3 ohm 2½in. Elac, **17/6.** 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/-.**

EMITAPE Recording Tape ALL NEW & BOXED.

	Type 88 (Stand).	Type 99 (Long Play).
3in. ...	175ft., 7/-	250ft., 9/-
5in. ...	600ft., 19/-	850ft., 24/-
5¾in. ...	850ft., 24/6	1,200ft., 31/6
7in. ...	1,200ft., 30/-	1,800ft., 45/-

Spare Reels (Unboxed) 7in. metal, **1/6**; 7in. plastic (EMI), **3/6.**

RECORDING TAPE.—1,200 ft. on 7 in. Plastic reel 88 type. Hi Quality Product. Each boxed, **22/6**

NEW REDUCED PRICES!

80 OHM CO-AX CABLE

Semi-airspaced, low-loss, high quality 80 ohm co-axial. Stranded conductor, standard ¼in. dia. Famous make. ONLY 8d. per yard.
See what you save by ordering:
20 yds. ... 12/6 Carr. 1/6. 40 yds. ... 20/- Carr. 2/-.

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

TRANSFORMER & COIL WINDING CAPACITY AVAILABLE FOR PROTOTYPES & SMALL RUNS

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

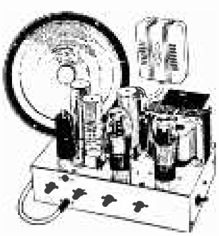
RADIO COMPONENT SPECIALISTS (Est. 1946)

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

50 yards Thornton Heath Station. Buses: 130A, 133, 159, 166 and 190

COMPLETELY BUILT

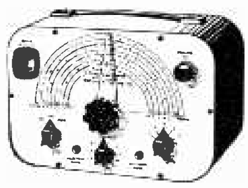
8 WATT PUSH PULL AMPLIFIER



Complete with Crystal Mike and 8" Loudspeaker A.C. Mains 110/250 v. Size 10½ in. x 6½in. x 2½in. Incorporating 6 valves, H.F. pen., 2 triodes, 2 output pens., and rectifier. For use with all makes and types of pick-up and mike. Negative feedback. Two inputs, mike and gram, and controls for same. Separate controls for Bass and Treble lift. For use with Std. or L.P. records, musical instruments such as Guitars, etc. **£4.19.6** Plus P. & P. 7/6

Or 35/- deposit plus P. & P. 7/6 & 3 monthly payments of 25/-.

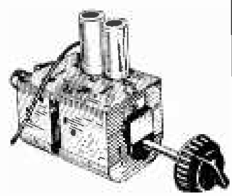
SIGNAL GENERATOR



£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 6½in. x 5½in., 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%.

FAMOUS MAKE

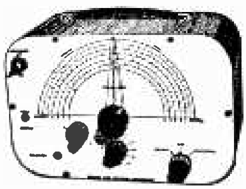
"TELETUNER"



Covers all Channels, Bands I and III. Valves used: PCC84, R.F. double triode, cascode R.F. amplifier. PCF80, triode pentode f.c. and mixer. I.F. output 33-38 Mc/s.

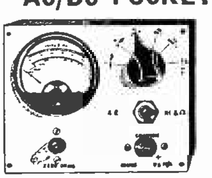
Post 2/6 **59/6** Knobs 3/6 per set extra.

SIGNAL & PATTERN GENERATOR



25/- deposit plus P. & P. 5/- and 6 monthly payments of 21/6. Cash £6.19.6 plus P. & P. 5/-. 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.

AC/DC POCKET MULTI-METER KIT



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

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

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

13 CHANNEL TUNER

34-38 Mc/s. Complete with PCF80 & PCC84. These have been removed from chassis.

19/6 Plus P. & P. 2/6. Knobs 3/6 per set extra.

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

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

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

TELEVISION TUBES

AS PREVIOUSLY ADVERTISED

GOVERNMENT SURPLUS AND MANUFACTURERS CLEARANCE

I.T.A. AERIALS. New and Boxed. 3 element, 22/6. 5 element, 27/6. **CO-AX CABLE, 6d.** per yd. **AIR SPACED, 9d.** **NIFE CELLS.** 3 x 2¼ x 1". Unused, 5/- ea., 48/- doz.

GERMANIUM CRYSTAL DIODES, 1/-. 10/- per doz.

TORCH BULBS. Ever Ready, 3.5 v., 16/- per 100, 9/- per 50.

HEADPHONES. Moving iron, low impedance, 6/-, high, 9/-. Balanced armature, low, 10/-, high, 15/-. Moving coil, low only, 10/- per pair.

GLASS FUSES. 1¼", 2 and 10 amp. only. 5 for 1/-.

MAINS POWER PACKS. 250 v. 80 m/amp. or stabilised 150 v. 80 m/amp. with 6.3 v. winding, 30/-.

RELAYS. High speed. 1,000+1,000 ohms, plat. cont., 7/6.

VALVES. All valves tested before despatch on MULLARDS latest ELECTRONIC TESTER.

1L4	5/-	6C4	6/-	6V6	6/6	50C5	10/-	EF92	8/-
1T4	6/6	6D2	6/-	6X4	7/-	807	6/-	EL32	5/-
1U4	6/-	6F6	7/-	6X5	7/-	EA50	1/6	EL91	5/6
3A4	6/-	6F13	7/6	8D2	4/6	EABC80		EY51	6/-
5Z4	9/6	6J5	6/-	9D2	5/-		8/-	EY51	9/-
4D1	4/-	6J6	6/-	10F1	7/6	EB41	7/6	P61	4/-
6AG5	5/-	6J7	6/-	12A6	7/6	EB91	5/6	Pen46	7/-
6AL5	5/6	6K7	4/6	12AH8	8/-	ECH42	9/-	SP61	4/-
6AM5	5/-	6L6	6/6	12AT7	7/6	ECL80	10/-	VR150/30	
6AM6	7/6	6SA7	7/-	12AU7	7/-	EF36	6/-		5/-
6AQ5	7/6	6SC7	4/6	12AX7	8/6	EF50	3/6	UL84	9/-
6AU6	8/-	6SJ7	6/-	12BH7	10/-	EF50	5/-	VR138	25/-
6BA6	8/-	6SK7	5/-	12SH7	6/-	EF37A	9/-	VR139A	
6BE6	7/-	6SL7	7/-	12SJ7	7/6	EF39	5/6		25/-
6BH6	5/-	6SN7	7/6	12SK7	6/-	EF80	8/6	VCR97	
6BW6	6/6	6U5	7/8	15D2	6/-	EF91	7/-		15/-

SECONDHAND VALVES. YOUR CHOICE. £1.0.0 for EIGHT PL81, ECL80, 6C4, 6AM6, 6AG5, 6J6, EF50, 6BE6, 3A4, PCF80, EF80, SP61, P61, 6J5.

HUGGETT'S LIMITED

2-4 PAWSONS ROAD, WEST CROYDON

SUPER-VISION LIMITED

Every Item Brand New and Guaranteed at Low Prices

ENAMELLED COPPER WIRE
12 to 45 S.W.G. from **11/6** lb. Also available in smaller quantities.

VALVE HOLDERS
Int. Octal, **4d.** each. B7G, **4d.** each. B9A, **6d.** each. CER. B9A with screen, **1/9** each.

CONDENSERS
2 to 100 pF., **5d.** each. 220-5,000 pF., **7d.** each. .01 to .1, **8d.** each.

RESISTANCES
Variable T/V type pots. 3K, 5K, 25K and 1M, **2/6** each.

EGEN SLIDER TYPE
3K, 5K and 25K, **1/9** each.

VOLUME CONTROLS
.5M, **2/9** each. .5M with DPS switch, **4/3** each.

ELECTROLYTICS
60/100 mfd., **5/6** each. 32+32+16 mfd., 350 v., **3/6** each.
Clips, **3d.** each. 50 mfd., 12 v., **8d.** each.

AUTO TRANSFORMERS
50 w. to 1,000 w., from **£1.10.0** to **£9.0.0.**

PLEASE INCLUDE SUFFICIENT TO COVER POSTAGE.

13 CHANNEL TURRET TUNED projection T/V chassis, also suitable for driving 17in., 21in. or 24in. tube. **38 gns.** Packing and carriage, 10/-. **OPTICAL UNIT** for above, complete with tube, deflector coils, focus assembly and connecting cable and plug. Suitable for picture sizes of 24in. to 48in. **33 gns.** Packing and carriage, 10/-. **25KV. E.H.T. CANS** containing 3 EY51's and components. Manufacturers' rejects. **15/-**. Post and packing, 2/-. *Send for List, Price* 3d.

SUPER-VISION LIMITED

136 High Street, Teddington, Middlesex. KINgston 4393

News From the Trade

H.M.V. and Marconi Television Receivers

DIRECT TV REPLACEMENTS, 138, Lewisham Way, New Cross, S.E.14, have introduced a line output transformer Type L 1744 as a replacement for :

H.M.V. 1840, 1841, 1842, 1843, 1844, 1845, 1846, 1847 and 1848.

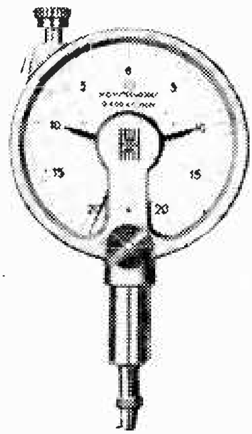
Marconi VC 153.

These transformers are of a completely new design and owing to open construction, overheating and leakage of insulating compound is avoided. The plug-in rectifier valve can be easily seen and if desired replaced without the necessity of unsealing the transformer. No circuit modifications are required with these replacements and the screws fit the existing holes. The side panels form a screen against radiation. The retail prices is 55s. net.

Another new replacement for the H.M.V. range is line output transformer L 1288 which is an exact replacement for models:

H.M.V. 1824, 1824a, 1825, 1825a, 1826, 1826a, 1827, 1827a, 1829, 1829a.

Marconi VT 84 DA, DT 69 DA, VRC 83 DA. Retail price 55s.



(Left) View of the dial gauge and (right) the comparator Stand.

New Mullard Output Pentode

THE EL360, a new output pentode introduced by Mullard Ltd., Mullard House, Torrington Place, W.C.1, is rated for three distinct applications in radar equipment: as a pulse modulator, scanning valve or series regulator. As a scanning valve or regulator it is also suitable for television studio equipment.

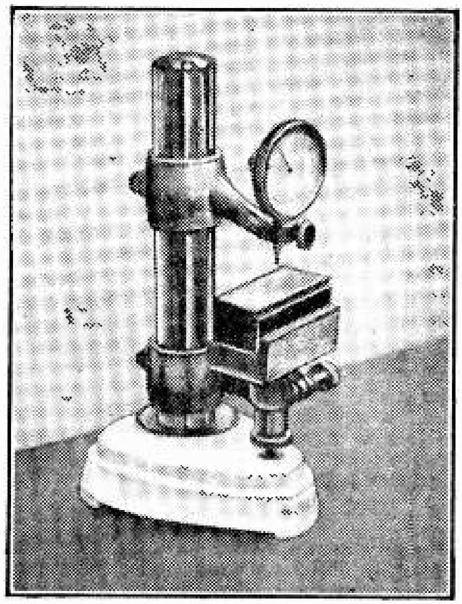
Its versatility, especially in radar, will assist designers to reduce the number of different valve types used in a particular equipment. As a pulse modulator, the EL360 can be operated at 5 kV with a duty factor of 0.001 and a peak cathode current of 4 A. Maximum pulse duration is one microsecond. For scanning applications the maximum anode supply voltage, Va(b), is 1 kV and the permissible anode dissipation 15 W. Peak positive anode voltage is 7 kV maximum. The high voltage rating achieved for this application is due largely to the use of ceramic insulators in the valve.

For series regulator use, triode-connected, and with anode voltages of up to 400 the maximum anode dissipation is 18 W. Under typical operating conditions, with an anode voltage of 100 and anode current 128 mA, the A.C. resistance is 340 ohms. The EL360 is octal based, with top-cap anode, and has a 6.3 v., 1.27 A heater. Its physical dimensions are: overall height 110 mm. maximum, overall diameter 33 mm. maximum.

Dial Gauge and Comparator Stand

RUBERT & CO., LTD., Demmings Road, Cheadle, Cheshire, have sent us details of their "Microcontact" dial gauge which is a jewelled type high precision instrument (made by the watch factory "Junghans"). Its accuracy is ± 0.5 per cent., and it is supplied complete with electric cable, plugs and flexible lifting cable. It can also be supplied with 0.0001in. or 0.0005in. scale divisions. It is connected to an indicator box, and the tolerance for the electrical indication is adjusted by two lateral screws.

The high precision comparator stand, shown here, has fine adjustment, double sided work table, and is lapped to 0.00001in. flatness (without



dial gauges). The length of column is 12in.

The Rubert-Hommel Electro-Mechanical Comparator enables not only "go" or "no go" gauging of up to 20 dimensions simultaneously, but also provides the operator with a means of reading the amount of error outside the tolerance on each dimension if the indicator shows "no go."

C.R.T. Introduce the "Golden Touch"

A NEW method of complete rebuilding of the gun in a cathode ray tube has been introduced by C.R.T. Ltd., Royston Road, Baldock, Herts. This involves an exclusive metallising process which, it is claimed, will improve the emission characteristics and suppress secondary effects, which are found existent in normally reconditioned guns.

CORRESPONDENCE

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

BAND III CONVERTER

SIR.—The author wishes to apologise for the omission of the details of the oscillator coil L5 in the article on the "Improved Band III Converter" in the November and December, 1957, issues. To avoid further correspondence the details are as follows:—1. Enamelled copper wire; 2. Gauge 22 s.w.g.; 3. spaced diameter of wire. Also at the bottom of page 209, December issue, Fig. 5 should read Fig. 4 and Fig. 6 should be Fig. 5.

It is wise to box in the bottom of the unit to prevent any radiation from the unit causing patterning on its own or neighbouring receivers which may occur with some older models depending on the receivers oscillation frequency. When fitting the box allow for air circulation. A wire mesh could be provided and made rigid with strengtheners.—"DIADEM."

EKCO MB272

SIR.—I am writing to thank you for the advice you gave me during October and December in connection with a fault in the sound section of my set. I am pleased to say this trouble has now been eliminated and the set is functioning perfectly. In case it may be useful to others I will describe the way I corrected the fault. I discovered, after many similar attempts, that the sleeving on the wire connecting L37 to V6 was just short enough to permit the wire inside to contact the wire from V6 to earth. The two wires cross one another in such a way that the fault was almost impossible to see. After correcting this and realigning L17, L18, L36 and L37 the set performed perfectly.—G. R. SIMPSON (Weston-Super-Mare).

SERVICE DATA

SIR.—A reader's letter, that of Mr. Frank Malpass (February issue), referring to service data, has prompted me for the first time to write to your magazine. Mr. Malpass's contention is to have patience and wait until the information appears in this magazine, or to obtain "Radio and Television" volumes, or finally to study a faulty receiver.

Who, after spending an average of £70 for a receiver is going to pay another £10 or so for a series of volumes merely to obtain some data on their receiver?

I would also point out that I own copies of "Radio and Television Servicing" and the information in them can be very limited indeed, depending upon the manufacturer. My own set is a Murphy V310 and Murphy are reluctant to pass on full servicing information "except to accredited agents." A note to that effect will be found on page 456, Vol. 6.

When buying an electric drill for instance, you obtain an exploded diagram showing each part. Buy a car and you can get a booklet about it; so why this attitude of withholding data from radio and TV purchasers? After all, from a manufacturer's financial point of view the customer is the "goose that lays the golden egg," but in reality the manufacturers appear to think of the customer merely as a goose! The more information a manufacturer passes to a client the more trust and respect he will obtain. For example, if "X" withholds and "Y" freely gives information, then I'll obviously go to "Y."—J. MCEACHRAN (Greenock).

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.

AUSTRALIAN TV

SIR.—At the beginning of this year you published a report of Australian TV being received in New Zealand. Now, once again, this freak reception has occurred and although this is by no means a world record for TV reception, I think the rebroadcasting of such may be unique in the TV world. As a result many keen enthusiasts like myself were able to enjoy a Christmas night TV show originating some 1,200 miles away. As TV is still only in the experimental stages in New Zealand it was very interesting to witness a real TV programme from overseas.—ROBERT G TURNBULL (Auckland, N.Z.).

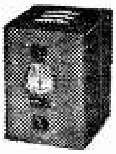
COLOUR TELEVISION DEMONSTRATION

SIR.—In November of last year, I was one of a large, very interested audience present at the British Amateur Television Society's demonstration of colour television given at the Radio Hobbies Exhibition in London. I understand that this was the first such show to be open to the general public in Britain.

On the stand were three 21in. receivers, two showing colour pictures and the other black and white. The Society's demonstrators explained that, as no colour tubes were available in this country, American tubes, supplied by R.C.A., were used in this experiment. This firm also supplied the line output components. All other parts, we were told, were of standard British manufacture.

It was made quite clear to us that home colour viewing in this country was at least five years away. Assuming that the tubes and line output equipment were by then available here, the cost would still be in the region of £300 per set. Although I was very impressed with what I saw, I am afraid that the price would have to be considerably reduced before colour television reaches my fireside, and I imagine that other readers will feel the same.—J. F. HITCHCOCK (Redhill, Surrey).

Battery Charger



High output car battery charger, gives quick (car start charge) or trickle charge. Input standard A.C. mains, output 6 or 12 volt at 1-2½ or 4 amps. With meter and variable charge selector. Complete in hammer finish louvred case. Only **75/-**, plus 4/6 carriage, or **10/-** deposit and 8 fortnightly payments of **9/-**. New and unused, guaranteed for 2 years.

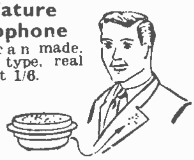
FREE GIFT

All purchasing this month, will receive as a free gift, a pair of heavy duty charging clips.

T.V. 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/-**.

Miniature Microphone

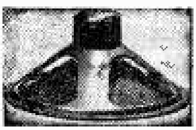


American made. Dynamic type, real bargain at **1/6**. Post 6d

"Dim and Full" Switch

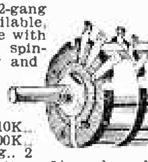
Particularly useful for controlling photoflood lamps which have only a short life at full brilliance. This toggle switch has three positions, the first position puts two lamps in series at half brilliance for setting up, the second position is off and the third position full brilliance for the operational shots. Also useful for controlling night lights, heaters, etc. etc. Price **2/6** each, post 9d. Circuit diagram included.

Speaker Bargain



12in. Hi-Fidelity loudspeaker. High flux. Permanent magnet type with standard 3 ohm speech coil. Will handle up to 12 watts. Brand new by famous maker. Price **32/6**, plus 3/6 post and insurance.

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., 50K., 100K., 250K., 1 meg., 2 meg. Gang type, 3/- each—valves available: 5K + 5K., 100K. + 100K., ½ meg. + ½ meg., 2 meg. + 2 meg.

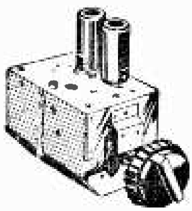
Assure Your Future

The ownership of a good instrument has been the turning point in many a famous career. You can own the latest 'AVO' Test Instrument which has 10,000 O.P.V. sensitivity. It measures: Volts 0-1,000 (5 ranges A.C.) (7 ranges D.C.). Current 0-1 amp. (5 ranges). Resistance 0-2 megs. (2 ranges).

Free gift—all purchasers will receive our exclusive Range Extender Scale for measuring capacity 50 pF.—1 mFd., inductance, E.H.T., etc.

Sent for **10/-** deposit and 19 fortnightly payments of 10/- (plus post and insurance 3/6). Cash price **£9.10.0**.

LATEST TYPE Turret Tuner



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THIS MONTH'S SNIP

Terrific Manufacturer's Surplus Offer

Constructor's parcel: to build Pocket 6 Transistor Set as currently being sold at £1?.17.0. Parcel comprises Motiffed two-tone cabinet as illustrated, tuning dial, two gang tuning condenser, combined bakelite chassis / printed circuit and easy to follow circuit. Costing value 57/6—offered while supplies last at only **29/6**, plus 2/6 post. Suitable for your own circuit or to build original circuit. All parts available at highly competitive prices. Do not miss this tremendous bargain.

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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.

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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 meter, selected resistors, wire for shunts, range selector, switches, calibrated scale and full instructions. Price **19/6**, plus 2/6 post and insurance.

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For many applications, show cases, desk lamps, bathroom and dressing table mirrors, illuminated signs, automatic venders, amusement machines where standard size fluorescent tubes cannot be accommodated new miniature fluorescent tubes are now available.

Like all fluorescent tubes these give an intense light, have very long life and consume very little current, running costs can in fact be disregarded. For example: a 6 watt tube (9in. long) can be operated continuously night and day and the cost is only approximately one penny per week.

Four lengths of fittings are available as follows:—

6in.,	4 watt	43/6
9in.,	6 watt	44/6
12in.,	8 watt	45/6
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All prices include tube and all fittings use choke ballast and interference suppressed starter. Postage and insurance 2/6.

Kit of Parts

For those places where the metalwork cannot be accommodated we offer kits of parts including the tube, two holders, the starter, the starter holder and the choke together with wiring diagram. Price as follows: 6in., 9in. and 12in., **29/6**; 21in., **35/-**, post and insurance 2/6 per set.

Twin Sets

In some places, mirrors for instance, a pair of tubes are required and economy can be effected by running two tubes off one ballast. For the 6in., 9in. and 12in. tubes the price is **49/6** per set plus 2/6 post and insurance. Note: Two 21in. tubes cannot be operated from one ballast, therefore if a pair of these are required then two complete 21in. kits are required.

All items advertised can be obtained from the following Companies. If ordering by post, address your order to the Company nearest to you and please include postage.

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Phone RUISLIP 5780.
Half day, Wednesday.

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.

Your PROBLEMS Solved

Whilst we are always pleased to assist readers with their technical difficulties, we regret that we are unable to supply diagrams or provide instructions for modifying surplus equipment. We cannot supply alternative details for constructional articles which appear in these pages. WE CANNOT UNDERTAKE TO ANSWER QUERIES OVER THE TELEPHONE. The coupon from p. 477 must be attached to all Queries, and if a postal reply is required a stamped and addressed envelope must be enclosed.

G.E.C. BT1155

After the set has been working for about two hours the sound becomes distorted, giving the effect which one gets when a speaker requires re-centering. The sound otherwise is very good. As I have no circuit of the set, could you please state the position of the faulty part ?—E. Roberts (Bryn Refail).

Firstly, have the sound output valve checked. If this is O.K. the output transformer is the next suspect. This will be found under the main chassis towards the front and can be located by leads to the loudspeaker coming from it. Also check the resistance which supplies H.T. to the output transformer, and replace, if necessary.

FERGUSON MODEL 992T

I have changed the tube MW36-44, but I am unable to get a picture although the raster appears O.K. and there is plenty of sound. I think the tuning is at fault. As I have no circuit of this set I am unable to test the vision section. Can you give me the valve line up and which trimmers I should try in order to get a picture ?—I. J. Lloyd (Rhondda).

Channel tuning is by the large knob on the rear right side. If tuning this produces no picture at all, it is not likely that the I.F. circuits have been seriously disturbed. We therefore advise you to check the EF80 valves just to the right of the tube, the voltages applied to pins 7 and 8 should be checked at each valve base. Where absent check associated feed resistor and decoupling capacitor. Check crystal diode in foremost I.F. transformer can.

FERRANTI 14T3

I have recently added to the above set a Brayhead converter type 16S with a 16 BA2 adaptor. The result is that I have improved reception of BBC on Channel 5, but nothing from Burnhope I.T.A. Channel 8.

I have an unobstructed view of the Burnhope mast 3½ miles away and people all around me get good reception on the proverbial piece of wet string.

I have established that my converter is in good order and correctly fitted and the aerial is more than adequate, but my receiver and converter, when fitted to a neighbour's aerial, still bring in Channel 5 only.

When switched on, the I.F. valve, No. 4 (EF80), runs much hotter than the other valves apart from rectifiers. I have changed this valve and still get the same effect.—L. Grindle (Stanley, Co. Durham).

You omitted to say whether V4 runs hot on BBC as well as on ITV. If so, reduce the input to the receiver and check the decoupling—R14, C25, R13, C19, C15, etc.

If no signals are received on ITV, change the PCF80 valve in the tuner unit and recheck the oscillator coil core alignment.

ITV sound should be received with no aerial at all in your position.

PHILCO 1737 CONSOLE 17in.

One day there seems to be lack of drive and picture is dull and lifeless. Another day after the warming up period the picture comes on with plenty of drive and is perfect. It appears to me to be poor EHT regulation because when the picture is good, on switching off, the spot flicks off right away, but when the picture is dull and lifeless the spot lingers before going off. The mains taps are 1-210 volts; 2-228 volts; 3-245 volts. I am using the 228 volt tap. Could mains fluctuation cause this trouble ? The mains voltage here is 230 to 240 v. Also my focus control lever is at its top limit and is no use in any other position as the picture goes out of focus.—T. Pearson (Salford).

You do not say if the width is affected by the dullness, etc. If it is, check the ECL80 line oscillator and the PL81 and also the metal rectifier. However, if the width is unaffected, check the heater of the tube. Notice the intensity of the heater glow when the picture is good and when it is bad. If the heater is dull when the picture is bad, suspect a partial short in the heater element.

SOBELL T224

My trouble started with insufficient height and a black band 1½in. top and bottom of picture. I got valves tested and found that three ECL80s were low in emission. After having returned valves to set I found the picture had dropped leaving a black band of 3in. at the top. On switching off I found the spot was about 3in. from the bottom of the tube. What picture I get is good, but lacking slightly in brilliance.—John Smith (Glasgow).

Reset shift lever protruding from focus magnet assembly to centre picture properly. Reset focus and ion trap magnet to obtain optimum focus and brilliance. Then replace the 39 KΩ resistor wired in series with height control.

FERRANTI 20T4

Before replacing the tube in the above set I removed tube which has a small centre burn, carefully marked positions, and replaced, in order

to get the hang of the job. This proved very successful, giving a very good picture, except that another small burn has appeared on the tube, in the fresh focusing position. I am hesitating to put in new tube, in case another burn occurs. As a first year TV student, I have had considerable advice—and the burn has been attributed to many different causes. I have very carefully followed the service sheet and can find nothing wrong with my line-up of focus and scan coils.—S. O. Scarff (Co. Durham).

As the picture is good apart from the ion burn, all circuits, with the possible exception of the protection circuit, must be in order. Observe the spot on the tube face when the receiver is switched off. This should be a decaying blob not a prolonged brilliant spot or pin point.

If it appears too brilliant for too long, check the ECL80 valve, located in the centre of the chassis. If the spot does not linger, we presume a new tube will not be affected.

ULTRA V80

The above set has no EHT although valve voltage readings are not very far out. I tried substituting U801; 6K25; 6P28 and U25. This produced a variation in the line whistle, which then stopped altogether.—L. Levier (Fordingbridge).

We assume that H.T. can be recorded at the line oscillator, 6L1, triode anode. Check for negative voltage at the grid. If present it may be assumed that the oscillator stage is in order. If absent, check the hold control and associated resistors. Then check 6P28 screen voltage. If present, at pin 4, continue checks to line output transformer. Remove EHT smoothing capacitor (to check for leakage) and check the line output transformer windings.

STELLA ST1480U/15

My set is working quite well, apart from a 1in. black line on the right-hand side of the screen. The BBC test card is oval in shape instead of round. I have replaced the following valves: UL44, UAF42. There are two UAF 42s and one UL41 situated together. At the moment the set is working quite well with the exception of the above fault, with a UF42 in place of one of the UAF42s. If I use two UAF42s the sound goes practically to zero and there is no difference in the picture reception.—C. Burgess (Newcastle).

You should have the PZ30 and UY41 valves tested. The PZ30 may well be "down."

You have done the correct thing in replacing the UAF42 with a UF42.

MURPHY 180

When I switch my set on there is an extreme brightness in the EB91 valve, which then reverts to normal. This valve has been tested and I am told it is O.K.

At the rear of the set there is a brightness and volume control combined, but this has no effect on the brightness. Would the valve have anything to do with this ?—A. G. Denny (Basildon, Essex).

It is normal for the EB91 to light up brightly upon switching on. There should not be a brightness or volume control at the back of this set, only a vision sensitivity control. Your fault is more likely to be due to lack of EHT which is associated with the line scan generator stage (6K25 and EL38) located on the top left-hand corner of the inner upright chassis.

VIDOR CN4213

Since fitting a C.R.T. transformer to the above set I have suffered from patterning which varies from wood-grain to fine horizontal stripes. I have tried screening the transformer and leads to C.R.T., also earthing one side of the heater winding which has improved the position but not cleared the fault.

I have called in the G.P.O. and am informed this patterning is caused by the set and have returned the C.R.T. wiring to the original circuit and this cures the fault, revealing that the transformer is causing radiation of some type.—M. Webb (Nottingham).

Remove the transformer. Wire a 5 KΩ 10 watt resistor from the centre screw of the mains adjustment (or any other mains point) to pin 12 of the C.R.T. base (or 1 if the wiring has been transposed). This will boost the C.R.T. without introducing wiring which produces the patterning.

MARCONI VT53DA

The above set, which had a reconditioned tube fitted last year, has lost height. I have a new B36, KT33C, but this only improves the picture; not the height. When the contrast is advanced there is a roar on sound and the picture breaks into black and white lines.—K. G. Colwill (Torrington).

Check 2.2 KΩ bias resistor of KT33C (pin 8 to chassis). Also 50 μF electrolytic capacitor also connected to pin 8 but located on top of the chassis (horizontal). Check fit of screening cans on Z77 valves and alignment of vision coil cores after having ensured that the aerial is properly connected and located.

MURPHY V150L

My set suffers from overscan of the line timebase and underscan of the frame timebase. I have a circuit diagram, but no other information.

An exchange of valves between frame oscillator and frame output positions makes no difference to picture height, which is about two-thirds.—C. Caple (Farnborough).

Excessive width is normally due to wrong setting of the scan-coil tappings and loading coils, but if these have been tried we suggest you check C33 (680 or 500 pF). Low frame amplitude can be due to a low 25 μF condenser C59 and we suggest you replace R75 and R76 if a new C59 does not help.

BUSH TV24

I have been using a "Channel" add-on converter and a 5-element aerial with a Pye V4, which has been highly successful. I tried the same converter with a 7-element aerial on a Bush TV24, but the picture was so "mushy" as to be not worthwhile viewing.

I should be grateful if you could tell me the I.F.s of this set. Would you recommend a turret

(Continued on page 477)

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3S4	8/9	6X4	6/9	EBC33	6/9
5Y3G	7/9	6X5GT	7/9	EB91	8/9
5Z4G	9/9	6SN7GT	8/9	ECC91	4/6
5U4G	8/9	6L6G	11/9	EF91	8/9
6J5G	4/9	807	7/9	EL32	3/9
6K8G	9/9	12A6	7/9	EL91	5/9
6SJ7GT	6/9	35Z4	9/9	FW4/500	8/9
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50 mfd 12 v	1/3	32-32 mfd 450 v	5/9
50 mfd 50 v	1/9	150 mfd 450 v	5/9
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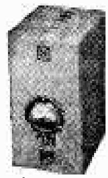

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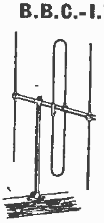

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tuner or an add-on converter? I should appreciate your views on why the TV24 was unsuccessful with the "Channel" converter. This is a fringe area for Channel 2 and Channel 10.—F. Binns (Partington).

The Bush TV24 is not as sensitive a receiver as the Pye V4 despite the apparent similarity in valve line up, and if you are in a fringe area it may not be possible to improve your results much. The I.F.s are 19.5 Mc/s sound, 16.0 Mc/s vision, local oscillator beating high. If you do use a Turret Tuner we suggest you wire it in to get the extra stage of gain provided by the former mixer valve.

PYE VT4

I have a very good picture on I.T.A., but on switching to BBC I have a good picture for about 30 seconds which then suddenly turns negative. This cannot be put right by reducing contrast or brilliance. I have cleaned the channel switches. Can you please suggest the cause and remedy?—P. J. Phillips (Slough).

The cause of your fault is an intermittent collapse of the A.P.C. circuits, causing overloading on the stronger signal. The valves concerned are the ECC82 near the back beneath the turret, and the EB91 in the centre of the chassis near a large transformer. Another possible cause of trouble is grid emission of one of the two EF80s controlled by the A.P.C.

G.E.C. BT1252

My set is burning out the barretter type 305 at intervals of about one month. The heater chain voltage tap is correctly set and the thermistor appears to be functioning correctly. Can you suggest any method by which I could do away with this barretter or any reason why it should fail so frequently?

The set is run off an A.C. supply at 240 volts. —J. H. Pope (London, N.W.10).

Some of these type 305 barretters were very short-lived, but the fault is more likely to be a faulty booster rectifier which is the first in the heater chain. Have this checked either in another set or by replacing it.

PYE FV1

The frame hold on this set reached the end of its travel and failed to lock. This was cured by replacing ECL80 frame scan oscillator. The symptom recurred six months later, and the same replacement effected a cure, but on the latest occasion this failed to work. I have a service sheet.—J. Blake (Gillingham, Kent).

The commonest cause of your trouble is a faulty blocking oscillator transformer, but if this fails to cure the trouble, suspect the metal interlace rectifiers and the 470 K in series with the frame hold control.

EKCO TC206

My set was fitted with a C.R.M. 141 tube. I obtained the T217 series service sheet which shows a C.R.M. 171 tube but states the chassis is identical to the TC206. I have tried a second-hand C.R.M. 171 tube in my set and although the picture height, width and definition are good, brightness is lacking. Is there anything I can do to improve it?—H. Dewhurst (Darwen).

You have probably got hold of a faulty C.R.M.171. Check its heater voltage and if it is low (nominal 12.6 v.) we suggest you fit a C.R.T. transformer to restore it to its proper value.

ULTRA V8-15

Now that the new I.T.A. station at Burnhope has started I should like to receive this programme. Is this receiver suitable for use with a converter and if so could you advise me on the type required?—J. S. (Middlesbrough).

The type of conversion recommended is by turret tuner. You should use the Cyldon U38H or Brayhead 35S (with "U" series valves). Use tuner to replace V1, 10F1 and V2, 10C2, R.F. and mixer valves.

H.M.V. UNIVERSAL 1807

When I switch on, the rectifier valve lights up normally, but soon afterwards starts to glow very brightly. The bottom part of the dropper also starts to get overheated and this blows the fuses of the set. Can you give me any idea what the trouble can be?—A. E. King (London, S.E.25).

You will find it necessary to change two valves, the U31 and the B36. In the unlikely event of the symptoms remaining, check Z63 (next to B36) for heater-cathode leakage.

MURPHY 12in. V150

I now have a very good picture after replacing the tube, but after the set has warmed up for about half an hour, the picture goes jumpy, very much like sound on vision, and at times the vertical slips slightly and brings in the frame flyback lines, but if I increase the volume control it does not go any worse. I may add that the jumping is worse with music, than when there is talking.

There is one other thing wrong, the scanning lines at the bottom of the picture are very close together but they go further apart as they go up the screen. When they reach the top of the picture, they are twice as far apart as they are at the bottom. I have a service sheet for this model.—F. R. Vincent (St. Austell).

We suggest you carefully re-align the sound rejector and first sound acceptor to improve your sound rejection. This is best done on a test card using the steady tone. The rejector is in the cathode lead of the vision I.F. valve, and the first sound acceptor connects between the anode of the 10C1 via a 3 pF condenser and the grid transformer of the sound I.F. valve.

QUERIES COUPON

This coupon is available until APRIL 22nd, 1959, and must accompany all Queries sent in accord with the notice on page 473.

PRACTICAL TELEVISION, APRIL, 1959.

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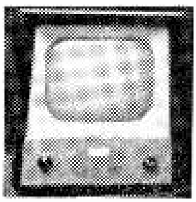

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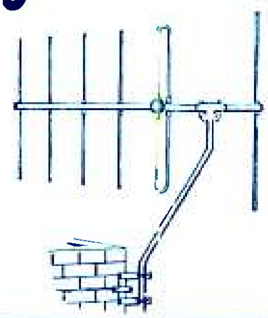

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