USING R.F. UNITS

PRACTICAL TELEVISION

AND TELEVISION TIMES

1/-

EDITOR
F. J. CAMM

A NEWNES PUBLICATION

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FEATURED IN THIS ISSUE

PREMIER RADIO COMPANY

(Regd.) B. H. MORRIS & CO. (RADIO) LTD.

OPEN TILL 6 P.M. SATURDAYS

(Dept. P.T.) 207, EDGWARE ROAD, LONDON, W.2

Telephone : AMBASSADOR 4033 PADDINGTON 3271

THE COMPLETE TELEVISOR IS SAFE TO HANDLE, BEING COMPLETELY ISOLATED FROM THE MAINS BY A DOUBLE WOUND MAINS TRANSFORMER. ALL PRESET CONTROLS CAN BE ADJUSTED FROM THE FRONT, MAKING SETTING UP VERY SIMPLE.

The NEW PREMIER TELEVISOR

USING THE ENGLISH ELECTRIC CATHODE RAY TUBE T901

Brief Technical Details are as follows :

20 valves (plus tube) Superhet Receiver, tunable from 40-68 Mc/s without coil or core changing. Wide angle scanning Flyback EHT giving 14 kV, Duomag Focaliser, permanent magnet focussing with simple picture centring adjustments, suitable for any wide angle Tube, may also be used with a 12 in. Tube with very minor modifications.

VISION CIRCUIT. Common RF Amplifier, single valve frequency changer, two IF stages, Video Detector and Noise Limiter followed by special type of Video Output Valve. ALL COILS PRE-TUNED ASSURING ACCURATE ALIGNMENT AND EXCELLENT BANDWIDTH.

SOUND CIRCUIT. Coupling from anode of frequency changer, two IF stages, Double Diode Triode detector and first LF Amplifier. Diode Noise Limiter and Beam type Output Valve, feeding a 10in. Speaker. ALL COILS PRE-TUNED.

TIME BASES. 2 valve sync. Separator, giving very firm lock and excellent interlace.

LINE TIME BASE. Blocking Oscillator using a pentode driving a high efficiency output stage comprising Ferroxcube Cored Output Transformer with Booster Diode.

FRAME TIME BASE. Blocking Oscillator driving a Beam Output Valve coupled through a Transformer to the high efficiency FERROXCUBE Cored Scanning Coils.

POWER PACK. Double wound Mains Transformer supplying all L.T. and H.T. using two full-wave Rectifiers.

The Televisor may be constructed in 5 easy stages : **(1) Vision, (2) Time Base, (3) Sound, (4) Power Pack, (5) Final Assembly.** Each stage is fully covered in the Instruction Book, which includes layout, circuit diagrams and **point-to-point** wiring instructions. The Instruction Book also includes full details for converting existing Premier Magnetic Televisors for use with modern wide angle tubes. All components are individually priced.

Instruction book 3/6, Post Free. ***Send Stamp For Latest Catalogue.***

Console Cabinets in figured walnut can be supplied for the above receiver at a cost of £13/10/-, plus 21/- pkg. & Carr. H.P. Terms for cabinet on request.

Volume Controls

Midget Ediswan type. Long spindles. Guaranteed 1 year. All values 10,000 ohms to 2 Megohms.

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

COAX PLUGS ... 1/2
SOCKETS ... 1/-
LINE CONNECTOR 1/2
OUTLET BOXES ... 4/6

80 ohm CABLE COAX

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

8d. yd.

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

BALANCED TWIN FEEDER per yd. 6d. } 80
TWIN SCREENED COAX FEEDER per yd. 1/-} ohms
50 OHM COAX CABLE, 8d. per yd.

TRIMMERS, Ceramic, 30, 79 pf., 9d.; 100 pf. 150 pf., 1/3; 250 pf., 1/6; 600 pf., 1/9.

RESISTORS.—All values: ½ w., 4d.; 1 w., 6d.; 2 w., 1/-; 1 w., 1%, 2/-.

WIRE-WOUND RESISTORS.—Best Makes Miniature Ceramic Type—5 w., 15 ohms to 4 K., 1/9; 10 w., 20 ohms to 6 K., 2/3; 15 w., 30 ohms to 10 K., 2/9; 5 w. Vitreous, 12 K. to 25 K., 3/-.

WIRE-WOUND POTS. 3 WATT. FAMOUS MAKES Pre-Set Min. TV. Type. Knurled Slotted Knob. All values 25 ohms to 30 K., 3/- ea. 50 K., 4/-. Ditto Carbon Track 50K. to 2 Meg., 3/-.

Standard Size Pots. 2¼in. Spindle. High Grade. All Values, 100 ohms to 50 K., 5/6; 100 K., 6/6.

W/W EXT. SPEAKER CONTROL 10Ω, 3/-.

G/P TRANSFORMERS.—Heavy duty 70 ma., 4/6 ditto, tapped primary, 4/9. Tapped small pentode, 3/9.

L.F. CHOKES 10 h. 85 ma., 5/-. 20 h., 150 ma., 12/6, 15 h. 100 ma., 10/6. SIMPLEX 10 h 150 ma., 10/8.

MAINS TRANS.—Made in our own workshops to high grade specification. Fully inter-leaved and impregnated. Heater Trans., tapped prim., 0-200 v./250 v. 6.3 v. 1½ amp., 7/6. 12 v. .75 amp., 7/6. 6.3 v 3 a., 10/6. 350-0-350, 80 ma., 6.3 v. 4 a. 5 v. 2 a., ditto 360-0-360 ditto 250-0-250, 21/-. Viewmaster, auto type, 35/-. Teleking, 30/-. Lynx, 30/-. Coronet, 30/-. Simplex (modified with 4 v. tap), 35/-.

TV. AERIALS. Aerialite etc. full range all channels in stock. Indoor loft type Inv. T., 13/6 etc. etc.

TYANA.—Midget Soldering Iron. 200/220 v. or 230/250 v., 14/11. Triple Three mod. with detachable bench stand, 19/6. Solon Midget Iron, 19/6.

TAG STRIPS.—2- or 3-way, 2d.; 4- or 5-way, 3d.; 6-way, 4d.; 9- or 10-way, 6d.; 28-way, 1/3.

ENAMEL OR T.C. WIRE.—¼ lb. 14 to 20 s.w.g. 2/-; 22 to 28 s.w.g., 2/6; 30 to 40 s.w.g., 3/9.

XTAL DIODE.—Sensitive G.E.C. type, 3/6. H.R. Phones (S. G. Brown) or Hi-grade Amer., 15/6 pair.

SIMPLEX TELEVISION

Detailed price list available.

STAGE 1. VISION AND SOUND.
7 Valves ... 30/-
12 Resistors ... 3/-
16 Condensers ... 9/-
2 Potentiometers 6/-
7 Coil formers with cores 4/6
7 Valveholders ... 3/6
Sundries (with undrilled chassis) 22/6

STAGE 2.—TIME BASE.
6 Valves ... 29/-
20 Resistors ... 8/6
15 Condensers ... 15/6
5 Potentiometers 12/6
6 Valveholders ... 2/6
Sundries 1/6

STAGE 3.—POWER SUPPLY
2 Resistors ... 2/-
5 S.T.C. Rectifiers 27/6
5 Condensers ... 23/6
1 Choke 10/6
1 Mains Trans. Tapped 4 v. and 5 v. ... 35/-

STAGE 4.—C.R.T. NETWORK
9 Resistors ... 4/-
1 Condenser ... 6d.
4 Potentiometers ... 10/-
Sundries 3/6

COMPLETE SIMPLEX KIT (less tube) 12 gns.
Drilled Chassis, Screens etc., 17/6, or 10/- extra with KIT or Sundries (Stage 1).
VCR97 TUBE TESTED & GUAR., £2 (P. & p., 2/-).

NEW VALVES ALL GUARANTEED BOXED

1R5	8/-	6K8	9/-	6AC7	8/6	EF91	9/-
1S5	8/-	6L6	10/6	6C9	12/6	EY51	12/6
1T4	8/-	6P25	15/-	35L6	10/6	PL81	13/6
1S4	8/-	6Q7	9/6	80	9/-	PY80	11/6
3S4	9/-	6SL7	9/-	EA50	2/-	PY82	10/6
3V4	8/-	6SN7	11/-	EB91	7/6	SP61	8/6
2X2	5/6	6U5(Y63)	8/-	EBC33	9/6	U22	9/6
5U4	10/6	6V6	8/-	EF39	9/-	ECL80	12/6
5Z4	9/-	6X5	9/-	EF50		EF80	10/6
6AM6	9/-	VT127	(Pen Equip		5/6	12AX7	10/6
6AT6	10/6	807	9/-			ECH42	12/6
6H6M	3/6	12AT7	10/6	British	7/6	MU14	9/8
6J5	7/6	U25	12/6	Syl.Red	10/6	EF55	12/6

Huge Stock B.V.A. Valves at 1951 low tax prices.

TV. PRE-AMP.—Channel 1, easily modified to other channels or converter use. Midget chassis 6in. x 3in. x 1¼in. Complete with coax. lead, plug and EF42 valve. Brand new (boxed). Listed £3/15/-. Special clearance, 27/6, p/p. 1/6.

P. and P., 6d. £1 orders post free. Lists 3d.
ALL TRANS. P. & P. 1/- extra please.

T.R.S. RADIO COMPONENT SPECIALISTS

THO 2183

70, Brigstock Road, Thornton Heath, Surrey.

Buses 130, 133, 166, 159.

C.R.T. HEATER ISOLATION TRANS. Ratio 1 : 1.25 Low leakage winding with 25% sec. boost, 2 v. 10/6; 4 v., 10/6; 6.3 v., 10/6; 12 v., 10/6.

BRIMISTORS.—CZ1 .3 a., 3/6. CZ2 .15 a., 2/6.

CONDENSERS.—New stock. .001 mfd. 6 kV. T.C.C., 5/6. Ditto, 12.5 kV., 9/6; 2 pf. to 500 pf. Micas, 6d.; .001 Mica or Tub. T.C.C. 500 v., .01. Sprague 500 v., .02 N.S.F. 500 v. .1 mfd. 350 v. Micamould Tub. 9d.; Hunts Moldseal 500 v. .005, .01, 9d.; .05 mfd. and .1 mfd., 1/-; .25 mfd., 1/6. .5 mfd., 350 v., 1/9; .1 mfd., 1,500 v. T.C.C., 3/6.

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

ELECTROLYTICS ALL TYPES NEW STOCK

Tubular Wire Ends		Can Type, Clips, 3d. ea.	
2/450 v. B.E.C.	2/3	8+8/500 v. T.C.C.	4/6
4/300 v. Hunts	2/-	16/450 v. T.C.C.	3/6
8/450 v. B.E.C.	2/3	60/350 v. T.C.C.	6/6
8/450 v. T.C.C.	2/9	250/350 v. B.E.C.	9/6
8/500 v. Dubilier	2/9	8+16/450 v. B.E.C.	5/-
16/500 v. Dubilier	4/-	8+16/500 v. Dubilier	5/6
8+8/500 v. Dubilier	4/6	16+16/450 v. B.E.C.	5/6
16+16/500 v. Dub.	6/-	16+16/500 v. T.C.C.	6/-
32/500 v. Dubilier	5/-	32+32/275 v. B.E.C.	4/6
32+32/350 v. Dub.	5/6	32+32/450 v. B.E.C.	6/6
25/25 v. Hunts.	1/9	32/350 v. Dubilier	4/-
50/12 v. B.E.C.	1/9	60+100/350 v.	11/6
50/50 v. Plessey	2/-	100+200/275 v.	12/6

SPECIALS—500 mfd. 12 v., 3/-. 1500 mfd. 6 v., 4/6, 6000 mfd 6 v., 5/6, 1000+1000 mfd. 6 v., 8/6.

SENTERCEL RECTIFIERS.—EHT Type. Flyback Voltage.—K3/25 2 kV., 4/3; K3/40 3.2 kV. 6/-; K3/45, 3.6 kV., 6/6; K3/50 4 kV., 7/3; K3/100 8 kV., 12/6; K3/160 14 kV., 18/-. MAINS TYPE.—RM1, 125 v., 60 ma., 4/-; RM2, 100 ma., 4/9; RM3, 120 ma., 5/9; RM4, 250 v., 275 ma., 16/-.

KNOBS, GOLD ENGRAVED.—Walnut or Ivory. 1¼in. diam., 1/6 each. Not engraved, 1/- each.

LOUDSPEAKERS P.M., 3 OHM.—3in. Plessey, 12/6; Goodmans, 4in. square, 15/6; 5in., 14/6; 6¼in. 16/-; 8in. R. & A., 17/6; 7in. Elliptical, 18/6; 10in. R. & A., 28/-; 6¼in. with transf., 19/8.

SLEEVING.—Various colours, 1, 2 mm., 2d.; 3, 4 mm., 3d. yd.; 6 mm., 6d. yd. TOGGLE SWITCHES EX-GOVT. "On-Off," 9d. Ersin M'core solder, 60/40, 16 g. or 18 g., 4d. yd., 5/6 ¼ lb.; PVC Connecting wire, 10 colours. Single or Stranded 2d. yd.

VHOLDERS.—Pax: 10, 4d.; EF50, EA50, 6d.; B12A CRT, 1/3. Moulded: 10, 6d.; B7G, 9d.; with screening can, 1/6; B8A, B8G, B9A, 1/-; Ceramic: EF50, B7G, 1/-. All English, 5, 7, 9 pin and U.S.A. UX types. 1/-. VCR97 moulded holders, 2/6.

ALADDIN FORMERS and core, ¼in., 8d.; ⅜in. 10d.

INT. OCTAL CABLE PLUG (8-pin), with cover, 1/3.

Prices slashed at Clydesdale

INDICATOR UNIT TYPE 62
With VCR-97 tube and valves. 16-VR65-CV118 (SP61), 2-VR54 (EB34), 2-VR92 (EA50), etc. Dim. : 18in. x 18¼in. x 11¼in. Wgt. 42 lbs. In used, good condition. Loose stored.
ASK FOR D/E774 **39/6** each CARRIAGE 5/- EXTRA

INDICATOR UNIT TYPE 6
With VCR-97 tube and valves 4-VR91 (EF50), VR-54 (EB34), 3-VR92 (EA50), VR78 (D1), etc. Dim. ; 18in. x 8¼in. x 7¼in. Wgt. 21 lbs. In original wood case.
ASK FOR D/H524 **45/-** each CARRIAGE 5/- EXTRA

INDICATOR UNIT TYPE 6II
With VCR-97 tube and valves 4-VR91 (EF50), 3-VR54 (EB34). Dim. 18in. x 8¼in. x 7¼in. Wgt. 22 lbs. In original wood case.
ASK FOR D/E777 **59/6** each CARRIAGE 5/- EXTRA

POWER UNIT TYPE 285
Ready made for T.V.
A.C. Mains, Input 230 v. 50 cps. Outputs E.H.T. 2 kV. 5 mA., H.T. 250 v. 150 ma., L.T. 6.3 v. 10 a. and 6.3 v. 5 a. Fully smoothed and rectified with valves VU120, 5U4G, VR91 (EF50), plus con. resistors, etc.
ASK FOR S/H947 **£4.19.6** each CARRIAGE PAID

POWER UNIT TYPE 285
ALSO AVAILABLE
As above less valves. Slight internal damage. Transformers O.K.
ASK FOR H947A **£1.19.6** each CARRIAGE 7/6 EXTRA

R.F. UNIT TYPE 24
In original Carton.
With valves 3-VR65 (SP61), etc. Range 20-30 mc/s., switched tuning. Dim. : 9¼in. x 7¼in. x 4¼in. Wgt. 7 lbs.
ASK FOR D/H850 **10/-** each POST 1/6 EXTRA

R.F. UNIT 25
In original Carton.
Range 40-50 mc/s., otherwise as R.F.24.
ASK FOR D/H874 **12/6** each POST 1/6 EXTRA

R.F. UNIT TYPE 27
With Broken Dial Variable Tuning.
Range 65-85 mc/s., valves 2/VR135 (EF54), VR137 (EC52), etc. Dim. and Wgt. as R.F.24.
ASK FOR D/E771 **£1.9.6** each POST 1/6 EXTRA

RECEIVER UNIT R3601
Ref. : 10D/6037
With valves 2 VR136 (EF54), VR137 (EC52), 5 VR65 (SP61), 4 VR92 (EA50), VR91 (EF50), 6V6G, VU39A (R3), etc. I.F. 13 mc/s. Dim. : 18in. x 9½in. x 8in. Wgt. 38 lbs.
ASK FOR D/H493 **39/6** each CARRIAGE PAID

ION TRAP MAGNET ASSEMBLY
Mfg. Surplus.
Type 1T/6 by Elac for 35 mm. tube neck.
ASK FOR D/H919 **2/6** each POST 3d. EXTRA

REPRINTS FROM "PRACTICAL TELEVISION"
Components Price List Free on request.
The "Beginner's Receiver," modifying the R3170A... ... ... **1/6**
April to July :
The "Beginner's Timebase"... ... **1/6**
Argus Televisor, data and blueprint **2/6**
CIRCUITS AVAILABLE at 1/3 each. ASB3/5/7 or 8, type 62 R1355 R.F. 24, 25, 27 and R3601.

E.H.T. TRANSFORMER
For the P.T. T.V. Receivers (VCR-97)
Pri. tapped 230-250 v. Sec. (1) 3,000 3 mA. tapped at 2,500 v. (2) 4 v. 1 amp. (3) 4 v. 1 amp. tapped at 2 and 2.5 v. Dim. : 4¼in. x 3in. x 5in. Upright mtg. 4 hole fixing, 4¼in. x 1¼in. between centres. Weight 4 lbs.
ASK FOR D/H735 **15/-** each POST 2/6

E.H.T. TRANSFORMER
Pri. tapped 230-250 v. Sec. (1) 3,000 v. tapped at 2,500 v. (2) 4 v. 1 amp. C.T. (3) 4 v. 1 amp. tapped at 2.5 v. Dim. : 4¼in. x 4¼in. x 3¼in. Upright mounting. 4 hole fixing, 3¼in. x 2¼in. between centres.
ASK FOR D/H834 **35/-** each POST 2/6

E.H.T. TRANSFORMER
Pri. tapped 230-250 v. Sec. (1) 3,000 v. tapped at 2,500 v. (2), 4 v. 1 amp. C.T. (3) 4 v. 1 amp. tapped at 2.5 v. Dim. : 4in. x 3¼in. x 2¼in. Upright mounting, 4 hole fixing, 2in. x 1¼in. between centres.
ASK FOR D/H834 **19/6** each POST 2/6

E.H.T. TRANSFORMER
Pri. tapped 230-250 v. Sec. (1) 3,000 v. tapped at 2,500 v. (2) 4 v. 1 amp. C.T. (3) 4 v. 1 amp. tapped at 2.5 v. Dim. : 3¼in. x 3¼in. x 3¼in. Upright mounting. 4 hole fixing, 2¼in. x 2¼in. between centres.
ASK FOR D/H835 **37/6** each POST 2/6

MAINS TRANSFORMER
For the P.T. "Argus" T.V. Receiver.
Pri. tapped 230-250 v. Sec. (1) 425-0-425 v. 200 mA. (2) 6.3 v. 4 amps. (3) 6.3 v. 4 amps. (4) 5 v. 3 amps. Upright Mtg. Dim. : 5¼in. x 4¼in. x 4¼in. 4 hole fixing, 4¼in. x 2¼in. between centres. Wgt. 8½ lbs.
ASK FOR D/H833 **30/-** each POST 2/6
PLEASE NOTE.—Carriage and Postal Charges refer to the U.K. only. Overseas freight, etc., extra.

Order direct from :
CLYDESDALE SUPPLY CO. LTD.
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RADIO SUPPLY CO. (LEEDS) LTD.

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Post Terms C.W.O. or C.O.D. NO C.O.D. under £1. Postage 1/- extra under 10/- ; 1/6 extra under £1 ; 2/- under £3. Open to callers 9 a.m. to 5.30 p.m. Sats. until 1 p.m. S.A.E. with enquiries, please. Full list 5d.; Trade List 5d.

R.S.C. MAINS TRANSFORMERS (FULLY GUARANTEED)

Interleaved and Impregnated. Primaries 200-230-250 v 50 c/s Screened.

TOP SHROUDED, DROP THROUGH
250-0-250 v 70 ma, 6.3 v 2.5 a **12/11**
260-0-260 v 70 ma, 6.3 v 2a, 5 v 2a ... **14/11**
350-0-350 v 80 ma, 6.3 v 3 a, 4 v 2.5 a ... **15/11**
350-0-350 v 80 ma, 6.3 v 2a, 5 v 2a ... **17/6**
250-0-250 v 100 ma, 6.3 v 4 a, 5 v 3 a ... **21/9**
350-0-350 v 100 ma, 6.3 v 4 a, 5 v 3 a ... **21/9**
350-0-350 v 150 ma, 6.3 v 4 a, 5 v 3 a ... **27/9**

FULLY SHROUDED UPRIGHT
250-0-250 v 60 ma, 6.3 v 2 a, 5 v 2 a Midget type, 21-3-3in. **16/9**
250-0-250 v 100 ma, 6.3 v 4 a, 5 v 3 a ... **23/9**
250-0-250 v 100 ma, 6.3 v 6 a, 5 v 3 a, for R1235 Conversion **29/9**
300-0-350 v 100 ma, 6.3 v 4 a, 5 v 3 a ... **23/9**
350-0-350 v 70 ma, 6.3 v 2 a, 5 v 2 a ... **18/9**
350-0-350 v 100 ma, 6.3 v 4 a, 5 v 3 a ... **23/9**
350-0-350 v 150 ma, 6.3 v 4 a, 0-4-5 v 3 a **29/11**
425-0-425 v 200 ma, 6.3 v 4 a, C.T. 6.3 v 4 a, C.T., 5 v 3 a **47/9**
450-0-450 v 250 ma, 6.3 v 6 a, 6.3 v 6 a, 5 v 3 a **69/6**

FILAMENT TRANSFORMERS
All with 200-250 v 50 c/s Primaries ; 6.3 v 1.5 a, **5/9** ; 6.3 v 2 a, **7/6** ; 0-4-6.3 v 2 a, **7/9** ; 12 v 1 a, **7/11**; 6.3 v 3 a, **9/11**; 6.3 v 6 a, **17/9**.

CHARGER TRANSFORMERS
200-250 v 0-9-15 v 1¼ a, **11/9**; 0-9-15 v 3 a, **16/9**; 0-9-15 v 4a, **18/9** ; 0-9-15 v 6 a, **22/9**.

OUTPUT TRANSFORMERS
Standard Pentode 5,000 to 3 ohms ... **4/9**
Standard Pentode 7/8,000 to 3 ohms **4/9**
Standard Pentode 10,000 to 3 ohms● **2/11**
Small Pentode 5,000 to 3 ohms ... **3/9**

E.H.T. TRANSFORMERS 200-230-250 v 2,500 v 5 ma, 2-0-2 v 1.1 a, 2-0-2 v 1.1 a, for VCR97, VCR517 ... ... **36/6**

SPECIAL OFFERS.—Midget Mains Trans. Primary 220/240 v 50 c/s. Secs. 275-0-275 v. 70 ma, 6.3 v 3 a, **11/9**. Output Trans. 5,000 to 3 ohms. **2/9**.

SMOOTHING CHOKES
250 ma 3 h 100 ohms **11/9**
100 ma 10 h 200 ohms Potted **8/9**
80 ma 10 h 350 ohms **5/6**
60 ma 10 h 400 ohms **4/11**

CO-AXIAL CABLE 1in.
75 ohm 14/36 ... ... **7d** yd
Twin-Screened Feeder ... ... **10d** yd

TV. PREAMPLIFIER.—For Fringe Areas. Brand New. Complete with 6F13 valve. Only **22/6**.

SELENIUM METAL RECTIFIERS
RM2 125 v 100 ma. **4/9** ; RM4 250 v 250 ma. **11/9** ; RM3 125 v 120 ma, **5/9** ; G.E.C. 300 v 250 ma, **12/9** ; 120 v 40 ma. **3/9** ; 6/12 v 1 a F.W., **5/9** ; 240 v 50 ma, **5/9** ; 6/12 v 2 a F.W., **9/9** ; 250 v 80 ma, **7/9** ; 6/12 v 4 a F.W., **14/9**.

BATTERY SET CONVERTER KIT
All parts for converting any type of Battery Receiver to A.C. mains 200-250 v 50 c/s. Supplied 120 v 90 v or 60 v at 40 ma. Fully smoothed and fully smoothed L.T. of 2 v at 0.4 a to 1 a. Price including circuit **48/9**. Or ready for use **8/9** extra.

ALL DRY RECEIVER BATTERY SUPERSEDER KIT.—All parts for the construction of a unit (housed in metal case 5-4-4¼in.) to supply 90 v 10 ma, and 1.5 v 250 ma. Fully smoothed. From 200-250 v 50 c/s mains. For 4-valve receivers. Price inc. point-to-point wiring diagrams, **35/9**. Supplied assembled and tested. at **42/6**.

SILVER MICA CONDENSERS. Most values **5d.** ea., **3/9** doz. one type.

VOL. CONTROLS (standard long spindles). All values, less switch, **2/9** ; with S.P. switch, **3/9** ; with D.P. switch, **4/6**.

ELECTROLYTICS.—Tubular 8 mfd 450 v, **1/11**; 16 mfd 450 v, **2/11**; Can 8-8 mfd 450 v, **3/11** ; 8-16 mfd 450 v, **3/11** ; 16-16 mfd 450 v, **4/11** ; 32 mfd 350 v, **2/11** ; 32 mfd 450 v, **4/11** ; 32-32 mfd 350 v, **5/6** ; 32-32 mfd 450 v, **5/11** ; 64 mfd 450 v, **3/9** ; 60-100 mfd 350 v, **7/6**.

EX-GOVT. SMOOTHING CHOKES.—
50 ma 5-10 h **2/9**
100 ma 10 h 150 ohms Tropicalised ... **6/9**
150 ma 10 h 150 ohms **11/9**
250 ma 10 h 150 ohms **14/9**
250 ma 10 h 50 ohms **14/9**

EX-GOVT. MAINS TRANSFORMERS
Primaries 230/250 v 50 c/s 4 v 2.5 a, **4/9** ; 4 v 6 a (High Ins.), **7/9** ; 48 v 1 a, **9/9** ; 400 v C.T. 150 ma 4 v 6 a, 6.3 v 6 a 6.3 v 0.6 a, 4 v 6 a, 4 v 3 a, 5 v 3 a, 4 v 3 a, 5 v 2 a, **22/9** ; 300-0-300 v 120 ma 4 v 1 a, **17/6** ; 865-775-690-0-690-775-865 v 500 ma, **29/6** ; 610-0-610 v 150 ma, 300-0-300 v 150 ma, 1220 v 350 ma, **29/6** ; 460 v 200 ma, 6.3 v 5 a, **29/6** ; 460 v 200 ma, 6.3 v 5 a, **29/6**. Add 5/- carr. to types at 29/6.

EX-GOVT. E.H.T. SMOOTHERS
.02 mfd 8,000 v, **1/11**; .25 mfd 4,000 v (Block), **4/9** ; .5 mfd 3,500 v, **3/3**.

R.F. UNITS TYPE 26.—Brand new. Cartoned, **39/6**, plus carr., 2/6.

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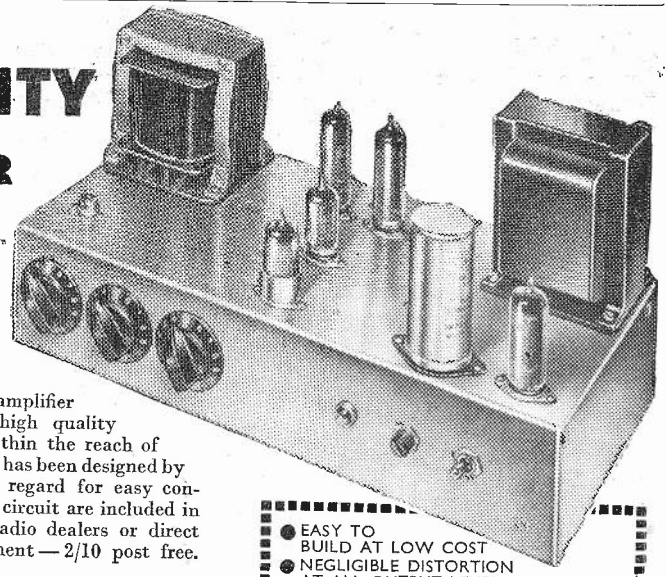

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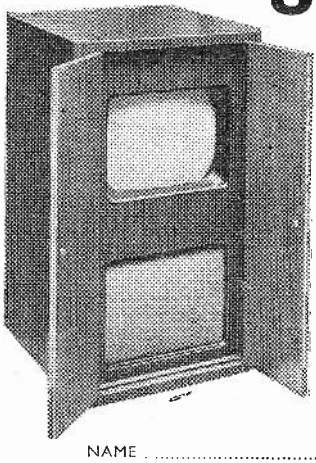

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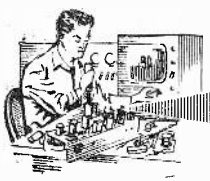

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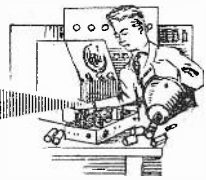

& TELEVISION TIMES

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Televiews

HOME-CONSTRUCTED TV SETS

THERE is evidence that component manufacturers are beginning to evince a lively interest in the constructor market, and we are fortified in this view by the number of inquiries we receive from manufacturers asking our opinion as to the number of home-constructed TV receivers in existence. Indeed, we received an inquiry from the BBC some time ago on this subject.

The number of home-built TV sets is far larger than most people imagine. We have means of estimating fairly closely the total number of such receivers, because each of them incorporates one or more special components, and it is from the sales of these that our estimates are prepared. We have taken into account not only the receivers sponsored by this journal, such as the PT/TV, the Argus, the Simplex, the Supervisor, and VCR97 conversions, but also the View Master and other designs sponsored by contemporaries.

A careful check brings the total of home-constructed TV receivers to well over 400,000, or approximately 1 in 10 of the total number of viewers.

The number of constructors interested in building their own receivers grows daily, and if further evidence is necessary to demonstrate the size of this expanding market it is provided by the very large circulation of this journal. Of course, a large number of home-built receivers are constructed round ex-Government equipment, such as the VCR97, but the highest percentage of sets are built from sponsored designs using standard equipment. A much greater fillip could be given to this market if components were more readily available, and we believe that several firms are now contemplating entering this market.

TUBES AND PURCHASE TAX

THE Chancellor of the Exchequer has been asked to remove purchase tax from cathode-ray tubes used for TV. The approach has apparently been made by the British Radio Valve Manufacturers' Association. The tube is the most expensive item in the TV receiver, and in these early days of TV development we think that the industry should be encouraged by the removal of the tax on tubes. It would stimulate sales, and in view of the large surplus in National revenue, the Chancellor could make this gesture without affecting national economy, since the sum involved is not large.

ITA FREQUENCY TO BE OFFSET

THE Postmaster General recently stated in the House of Commons that the frequency of the London Independent Television Authority's TV station will be slightly offset to avoid interference. He announced also the wavelengths which have been promised for commercial TV and the following is the list :

	Vision (Mc/s)	Sound (Mc/s)
London	194.75675	191.27
Lancashire	194.75	191.25
Birmingham ...	189.75	186.25

The London and Lancashire stations are to work on Channel 9 of Band III, and will have the same wavelengths, but the London wavelengths will be offset by 6.75 kc/s for vision and 20 kc/s for sound. It is thought that this will avoid possible interference.

The Postmaster was also asked questions regarding commercial television for Wales and Scotland, and if wavelengths have yet been made available for such stations.

In his reply, Mr. Gammans said that no wavelengths have so far been allotted to the ITA for Scotland or for Wales, and that discussions will not be held concerning programmes for Scotland, Wales or elsewhere until the Authority has advertised for, and received applications from, potential programme contractors to serve such areas.

From this reply it must be concluded that such applications have not yet been received.—F. J. C.

Modifying the ZC8931 (APR4790)

CONVERSION DETAILS FOR A VISION AND SOUND RECEIVER

By B. L. Morley

DUE to the generosity of a large number of readers who have loaned the primary data, it has been possible to supply suggested conversion details for this useful unit.

Basically, it is very similar to the R3118, for which conversion details were supplied in the May and June issues of PRACTICAL TELEVISION, and it is possible to use the information given there to effect a conversion.

The two units, however, are not identical. The ZC8931 (also known as the APR4790) has only one stage of R.F. amplification against the two stages in the R3118, and it has no magic-eye tuning indicator nor cathode follower circuit. Because of this, the available room on the chassis is restricted, but by the use of crystal diodes it has been possible to devise a circuit using sound and vision receivers on the one chassis.

Unlike the R3118, no power pack is included on the chassis, and a separate power pack must be built. The opportunity thus provided enables the sound output stage to be included in the power supply.

Description of the Unit

The ZC8931 is a 1½ metre superhet covering a frequency range of about 180-210 Mc/s.

It is essentially an I.F. strip with detector and video output stage preceded by an R.F. oscillator and mixer stage. This latter stage is in a complete unit by itself, and can be easily converted to cover the TV frequencies. It comprises one R.F. stage with a triode oscillator and a diode mixer. For Band I a pentode mixer would provide a greater gain, but for general purposes it is not necessary to go to the trouble of altering this particular stage.

The I.F. stages cover a range of frequencies from about 9.5 Mc/s to 14 Mc/s, and the bandwidth is therefore quite suitable for TV purposes.

Three tuning controls are fitted, one each for R.F. stage, oscillator, and mixer, and a gain control which can be used as a contrast control is built in.

One very useful feature is test points arranged on the front panel so that each valve circuit can be tested. Five stages of I.F. amplification are provided, the output being fed into a diode detector and thence to a video output valve.

The valve line-up is : R.F. EF54 ; mixer EA50 ; oscillator EC52 ; I.F. valves SP61 (5) ; detector EA50 ; video output SP61.

The unit is usually advertised by various firms in this journal.

The frequency range of the unit as it stands would appear capable of covering the new Band III, though the writer has not been able to check this point at the time of going to press.

Although the unit can be converted on the lines given for the R3118, a slightly different method is suggested to make the utmost of the available space and the conversion details have been provided for two cases, the first being a moderately powerful vision plus sound receiver, and the second being a powerful vision or sound receiver for the fringe areas.

R1	240 Ω	R8	67 Ω	C6	10 pF
R2A	100 K	R9	22 K	C7	30 pF
R2	470 Ω	C1	30 pF	C8	30 pF
*R3	680 Ω	C2	6 pF	C9	30 pF
R4	4.7 K	C3	30 pF	C10	20 pF
R5	22 K	C4	30 pF	C11	10 pF
R6	22 K	C5	500 pF	C12	50 pF
R7	400 Ω				

Mods. (a) Change R3 to 6.8 K
(b) Short circuit C2
(c) Modify coils as Data

Converting the R.F. Section

The R.F. section with mixer and oscillator can be converted in a manner similar to that given for the R3118, but for those who may not have had that particular issue of PRACTICAL TELEVISION the following details should be followed :

Fig. 1 shows the theoretical circuit of the unmodified R.F. section. Very little work is necessary to convert to Band I.

The complete R.F. section should be removed from the chassis by undoing the screws at the bottom of the sub-chassis and unsoldering the connecting wires on the tag strip.

Before withdrawing the sub-chassis, the tuning knobs should be disconnected at the coupling points adjacent to the chassis. The coils should then be wound in accordance with the data given in the coil table.

Note that it is not necessary to alter the tap on L1 ; it is possible to close up the existing turns a little and then to add the extra turns being wound with about 28 gauge enamelled wire.

The two 3pF condensers forming C2 (in some units one 6pF condenser is used) should be short-circuited so that the grid of V1 is connected directly to L1.

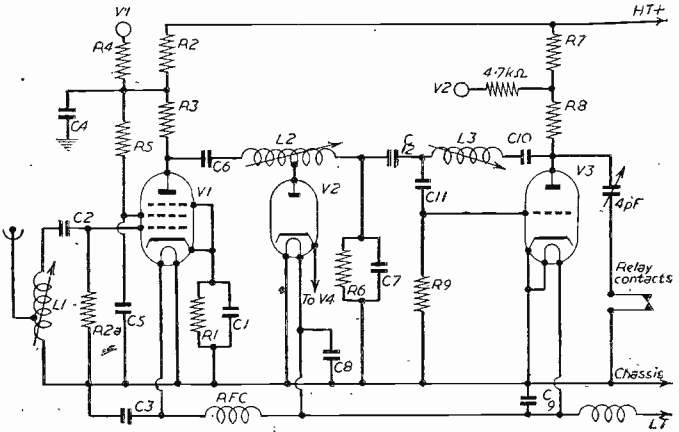


Fig. 1.—RF Section unmodified.

Mixer Stage

No modifications required beyond the coil L2 requiring additional turns. Note that the turns given in the table are the total number of turns on each coil including the existing turns.

Oscillator Stage

Generally, it will not be necessary to alter the coil in this stage as an 0-30 pF condenser connected across the existing coil should enable the range to be covered.

Note that some units may have a 680 ohm resistor for R3. This should be changed to 6.8 K.

I.F. Stages

In order to effect the greatest economy the I.F. stages are divided into two sections so as to provide a sound I.F. section as well as a vision I.F.

No modifications are required up to and including V6, which thus provides for three stages of I.F. amplification for the vision section.

The I.F. stages are shown in Fig. 2, and it will be noted that a cross has been marked on the diagram at a point between the 0.0002 μF condenser and L7. From this point the circuit, including V7 should be modified as given in Fig. 3.

A germanium crystal diode B.T.H. type CG5M is used as a detector and is mounted in the L7 screening can, together with the 15 pF condenser C113 and the small choke and resistor R119.

V7 is turned into a video output valve and is modified as shown in the diagram. The video output is taken to the output socket on the front panel via a piece of coaxial cable. If no plug is available to fit the socket, then the socket can be replaced with an ex-Government Pye type.

Cathode Modulation

The circuit as shown is suitable for grid modulation. If it is desired to use cathode modulation, then the anode and cathode of the detector must be reversed (i.e., the positive must be taken to C113 and the negative to L7), and the cathode bias resistor R120 must be increased to 270 ohms.

Sound I.F. Stages

V8 becomes the first sound I.F. stage. A small coupling coil of two turns is wound on top of L8, using about 22 s.w.g. wire preferably insulated. A similar coil is wound on to L5 and in each case one end of the coil is connected to chassis (earth) while the other end is taken to the centre conductor of a short length of coaxial cable which is connected between the two cans. The sheath of the coaxial cable should be earthed.

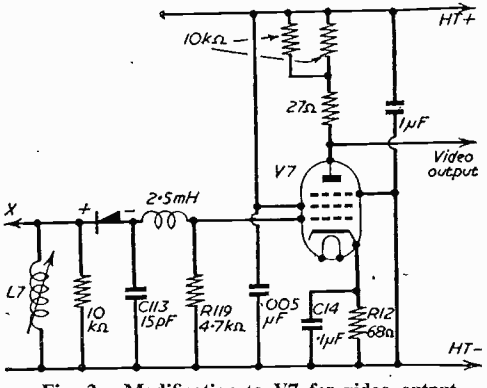


Fig. 3.—Modification to V7 for video output.

If normal $\frac{1}{4}$in. diameter cable is used it can be taken up through the bottom of the coils by enlarging a spare hole in the paxolin base.

From point "W," Fig. 2, the detector circuit V9 is modified as shown in Fig. 4. A crystal diode (B.T.H. type CG6M) is mounted in position and acts as a noise limiter. The output is fed into V10 which is modified as a triode providing the first stage of audio amplification.

The input to V10 is made via a 500K potentiometer for use as a volume control, and this control can be mounted on the front panel.

Decoupling of the cathode of V10 is made by a 25 μF condenser which should have a working voltage of 25 volts.

Output from V10 is taken to a coaxial socket which can be mounted on the front panel.

The 16 μF condenser connection in the anode of V10 should be transferred to the screened grid of V7.

Contrast Control

As it stands the gain control which becomes the contrast control is operative on the sound as well as the vision, as V4 which is common to both comes under the influence of this control.

To overcome the difficulty the 100-ohm resistor in the cathode of V4 should be disconnected at point "Y" in Fig. 2, and the resistor taken instead directly to chassis.

To enable the sound to be tuned correctly an 0-30 pF condenser should be connected across L8 and another across L9.

Power Units and Sound Output

The circuit of the sound output stage and power supply is given in Fig. 5. The output from the receiver is fed to the grid of the KT63 tetrode which is used as the power output valve.

A supply of 100 mA minimum is necessary for the H.T. supply and heater current of just under 5 amps at 6.3 volts is required.

No difficulty should be experienced in constructing the power supply, using an aluminium chassis for the unit.

The chassis of the receiver is equipped with two power supply sockets, one at the front and one at the rear; these sockets are connected in parallel. Pin 1 and pin 4 of the sockets are connected to chassis; pin 2 is the heater connection and pin 3 is the H.T. rail.

If no plug is available for the socket then it can be replaced by an ordinary electric outlet socket of the three-pin type taking the earth pin to chassis, the left-hand pin to the heater line and the right-hand pin to the H.T. rail.

The output transformer feeding the loudspeaker should be permanently connected in the anode circuit of the KT63. If the valve should be run with screen connected to H.T. and the anode disconnected, a heavy current will be drawn by the screen and the valve will be damaged.

There are available on the market, power units for the R1155 communications receiver which contain an output stage. The power outputs are approximate to the requirements of this modified unit except

for the heater supply which is generally at 4 amps, whereas actually 4.95 amps are required. It is possible to risk the heater overload and use one of these units directly, but it would be preferable to add a small heater transformer for feeding the R.F. section heaters separately. If this is done the ready-made power supply can be used quite successfully.

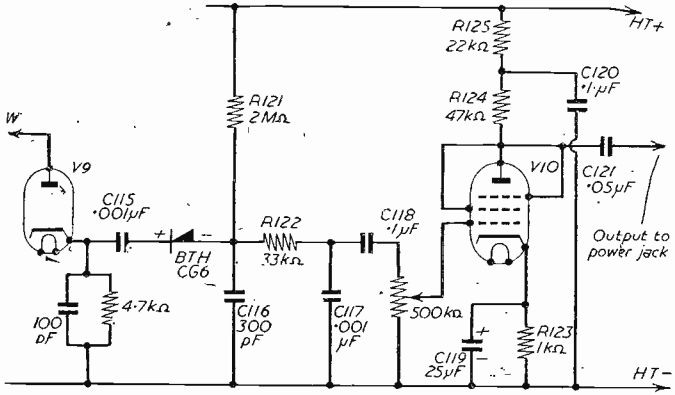


Fig. 4.—Modified V9 and V10 circuit.

It will be noted that in Fig. 2 the cathodes of the I.F. valves are not shown decoupled. Some of the units do have decoupling on each I.F. cathode, and if it is desired to increase the gain an 0.01 μF condenser can be connected across cathode and chassis of V's 4 to 8.

Condensers

Most of these units have been in store for some time like other ex-Government apparatus, and it has been found that the weakest part of such units is in the paper condensers. It is wise to check these before connecting the power and to reject any that show any sign of leakage.

Alignment

To align the receiver, connect a pair of earphones or a loudspeaker to the video output socket inserting a condenser of about 0.1 μF in series with one of the leads.

After allowing the receiver to warm up, the aerial should be connected and the contrast set to maximum (i.e., minimum resistance).

The vision signal should now be tuned in by the aid of the tuning knobs, setting the R.F. and mixer stages to minimum and rotating the oscillator from minimum to maximum. If nothing is heard, then shift R.F. and mixer tuners up to about 5 points and retune with the oscillator. The process should be repeated until the vision signal is heard.

At this point R.F. and mixer trimmers should be set for maximum vision reducing the contrast control as necessary.

The next step is to tune in the sound on the loudspeaker. Set the postage stamp trimmers of the sound I.F. coils to maximum and then, with volume control at maximum swing the oscillator trimmer until the sound is heard on the normal loudspeaker (not on the loudspeaker used for tuning vision ; this should be ignored for the moment).

When the sound is heard, adjust the I.F. trimmers for maximum volume and then turn the oscillator towards the vision channel a little. This will weaken the sound which should be retrimmed on the I.F. sections. Repeat the process until the sound is very near the vision so far as the position of the oscillator is concerned.

At this point the oscillator should be swung back to maximum vision position and then turned towards the position of sound until the vision signal is reduced to about half its previous volume. This is the optimum position for the vision signal on single sideband transmitters.

The oscillator should now be left and the sound I.F.s trimmed for maximum volume. The R.F. and mixer tuners should finally be adjusted for maximum compromise between vision and sound.

Final adjustments are best made on Test Card " C " to ensure maximum quality of signal on the vision channel.

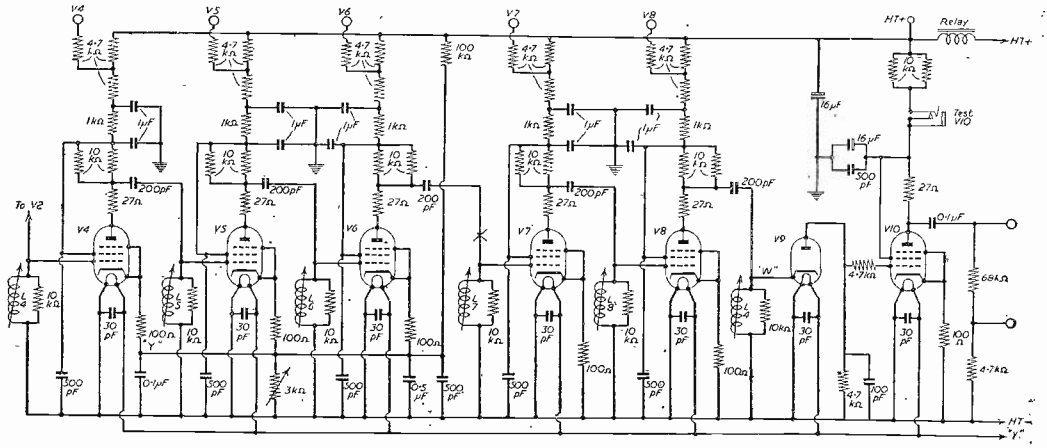


Fig. 2.—I.F. and video stages unmodified. *See text.

The Fringe Model

If the unit is modified as given in the preceding paragraphs a moderately powerful vision and sound receiver can be built. By sacrificing the dual purpose of the receiver it is possible to construct a rather powerful fringe model.

To do this the whole of the unit is devoted to the vision receiver and a separate unit can be modified for sound.

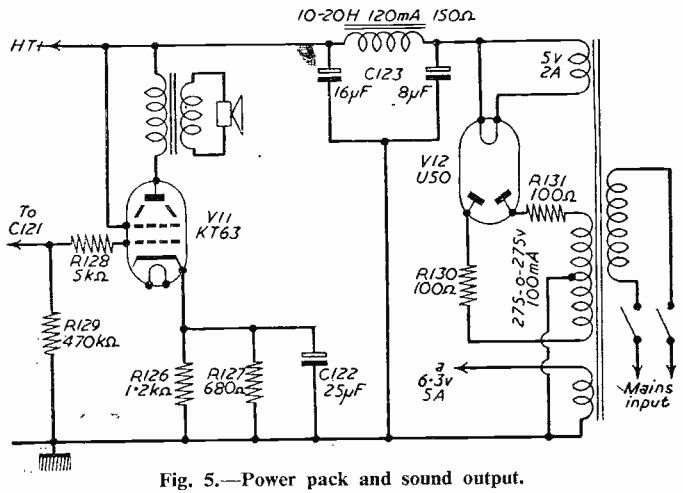


Fig. 5.—Power pack and sound output.

For Band I the R.F. section is rather on the weak side, so far as fringe working is concerned, and an extra R.F. stage can be added to increase the gain, using the circuit given in page 553 of the May, 1954, issue of PRACTICAL TELEVISION. This will provide an improvement of about 10db.

Unfortunately there is very little room on the existing chassis for the extra valve and it would, perhaps, be better to use a separate pre-amplifier as given in the October, 1954 issue of PRACTICAL TELEVISION.

A rather better, simpler, though more expensive method is to use one of the Cyldon five-channel tuners which are now available on the market. The sub-chassis of the R.F. section can be completely removed and the new unit put in its place.

The tuner uses two valves, an EF80 H.F. pentode and an ECC81 double triode as oscillator and mixer.

It is equipped with a rotary switch which enables any one of five channels to be obtained.

A few simple modifications are necessary to connect it into the ZC8931 using the connecting strip on the tuner and the connecting strip on the ZC8931 chassis previously occupied by the R.F. section.

Terminal number 1 from the front of the chassis should go to terminal C on the tuner. The wire from terminal C in the tuner is connected directly to the anode of the mixer and this wire should be broken and a 10 pF condenser inserted. A coil tuned to 12 Mc/s can be inserted in the anode of this section of the valve, or more simply a 10 k resistor can be used.

Terminals 2 and 3 can be ignored as these connect the test points. Terminal 4 goes to "E" on the tuner. Terminal 5 goes to "A" on the tuner, but note that terminal "A" which is connected to pin 9 of V2 in the tuner should instead be connected to pin 4. Pin 9 should then be connected to terminal "C" and terminal "C" should be strapped to terminal "D."

Pin 6 on the unit should be connected to terminal "D" on the tuner. Terminal "F" on the tuner should be strapped to terminal "D."

The coaxial input from the aerial socket should be taken to :—Inner terminal "G," outer terminal "H."

Fig. 6 gives a diagram of the tuner.

The Video Stage

The only other modifications are to the video stage. The existing V10 circuit should be modified so that it is the same as V7 in Fig. 3 and due note should be taken on the method of connecting the detector and the value of the cathode bias resistor according to whether grid of cathode modulation of the C.R.T. is intended.

Note that the positive of the crystal shown in Fig. 3 represents the cathode of the diode valve, and the negative represents the anode.

A 16 μF condenser is connected to the screened grid of the valve V10 and this should remain in position.

Power Supply

The power supply can follow exactly the same lines as for the previous modification excepting for the KT63 output stage.

It is advisable to use earphones or loudspeaker at the video output to tune in the signal as given in the previous section. The Cyldon unit is trimmed to

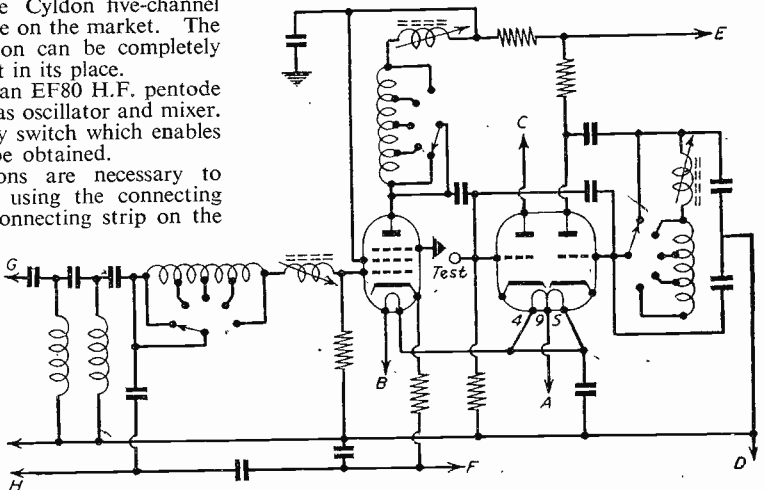


Fig. 6.—The Cyldon 5-channel unit.

MODIFYING THE ZC8931 (APR 4790)

give maximum volume of signal and then the oscillator adjusted to reduce this volume by half in the case of the single side-band transmissions.

Final adjustments may be made on Test Card " C."

The Sound Version

A second ZC8931 can be used for the sound channel and, in this case, it is not necessary to fit a tuner unit as the gain of the receiver is quite sufficient for the sound channel.

The coils of the R.F. section should be modified as shown in the coil data, and the only other modifications required are at the output stage. The circuit should be interrupted at point " W " (Fig. 2) and the detector circuit modified as given in Fig. 4.

V10 should also be modified as in Fig. 4.

Power Supply

The power supply described previously can be used complete with sound output stage. Except under extreme conditions there will be plenty of power to spare, and it will be found possible to omit one I.F. stage bridging the grid circuit of V5 to the grid of V6 simply by extending the lead on the cap of V5. V5 can then be withdrawn.

Reducing the I.F. stages by one, effects a saving of 0.6A in the heater supply and under these conditions a power unit such as is available for the R1155 communication receivers can be used directly.

Conclusion

No separate list of components required for the various modifications has been given as it is thought that most constructors will have the necessary odd resistors and condensers in the spares box. Consultation of the diagrams will show which items need purchasing.

Note that it is important to use the correct grade of crystal for the vision detector which has to handle a wide bandwidth.

It is understood that there are several modifications which have been made to the original design, and if a particular unit does not conform exactly to the diagrams given, it will be found that, in the main, the variations are concerned with the specific use of the unit for radar purposes. The main fundamental circuits are almost identical, and the unit can be successfully modified by adhering to the instructions.

COIL DATA

	L1 Aerial	L2 RF1	L3 Osc.
Channel 1.....	13	13	Add 0-30 pF trimmer across coil
Channel 2.....	11½	11½	
Channel 3:.....	10	10	
Channel 4.....	9	9	
Channel 5.....	8	8	

E.M.I. Wired TV System

(Synopsis of an Address to the Television Society)

THE E.M.I. Wired Television System was the subject of a paper read to the Television Society at one of their meetings, by E. J. Gargini, M.S.R.E., of E.M.I., Ltd.

Besides dealing in full with the E.M.I. system, the paper discussed the relative merits and de-merits of wired broadcasting as against radiated broadcasting.

Objections

First, the paper outlined the main objections to wired broadcasting: the high initial cost of the network itself; the considerable time taken to develop a service in a large town and the attendant aesthetic problems; the necessary limitation of the service to areas of relatively high population density; the difficulty of making significant changes to the combination of channel circuits and bandwidths once the system is installed, and the need for correction of the frequency characteristics of the cable circuits.

None of these obstacles is insuperable, and the author pointed out that against them must be weighed the disadvantages of radiated broadcasting. These are: the susceptibility of radiated broadcasting to all kinds of interference; the averagely low signal input to the receiver, requiring high amplification circuits; the limitation in the number of possible services due to the fact that in general any one channel can provide only one service; the restriction of high quality reception to areas local to the transmitter; the high cost of transmitting equipment and, lastly, the complexity and diversity of receiver design.

Even the simplest form of wired broadcasting system—the single coaxial system—appears to surmount all these disadvantages. It permits the use of low sensitivity terminal units operating with a signal input at least equal to that of local station radio reception, and so with a suitable cable the possibility of extraneous interference is virtually ruled out. For sound reception a large number of channels is readily accommodated using the simplest form of superhet as a terminal unit and, similarly, monochrome vision terminal units can be simple superhet arrangements for which the heterodyning oscillation is supplied via the relay network. All amplification can, therefore, be at intermediate frequencies.

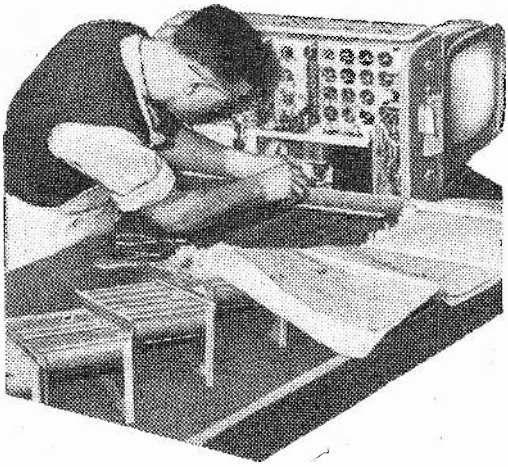
High Cost

This simple single coaxial system involves rather high maintenance costs in respect of terminal equipment. By increasing the complexity of the relay station equipment, vision terminal equipment can be reduced simply to a cathode-ray tube. Although this is attractive in certain circumstances the best solution is found in a compromise involving the use of a number of wired circuits, which, whilst considerably simplifying terminal equipment, does not unduly increase the intricacy of the relay station equipment. For example, sound terminal equipment may be reduced merely to a loudspeaker with channel selector switch and, similarly, vision circuits employing only low-gain intermediate amplifiers can be used. The scanning circuits of subscribers' terminal units can also be greatly simplified by taking advantage of the immunity to noise of closed circuits.

The paper pointed out the adaptability of the E.M.I. Wired Television System to " slot meter " programmes as operated in the U.S.A.

The first part of the paper concluded with a general discussion of the advantages of the wired system to the subscriber in terms of cost and convenience, and of the general problems of coverage and overloading in broadcasting channels, all of which the author feels would be solved by the general adoption of the wired broadcasting technique.

PAGES FROM A TELEVISION ENGINEER'S NOTEBOOK



25.—STAGGERED VIDEO AMPLIFIERS

WHILE the stagger-tuned R.F. and I.F. amplifier is a commonplace part of television circuitry, the use of a staggered form of video amplifier, or even of a two-stage video amplifier, is not often encountered. The term stagger-tuned is perhaps not accurate when applied to video amplification instead of R.F. and I.F. stages, but the idea of spreading the response of a pair of valves to the extremes of the wanted passband to give a wide frequency characteristic is very similar, use being made of the usual effects of anode loads of various values and anode compensating chokes to produce the desired response from each of the stages.

Before actually dealing with the staggered circuit, a few notes on high-voltage output video stages might be found of value.

High-voltage Amplifiers

In order to obtain a high-voltage output from a video amplifier using a single stage of amplification between the detector and the tube, together with a bandwidth of some 3 Mc/s, valves having high anode currents and mutual conductance (G_m), and low input and output capacities, have been developed. Since the anode load must be small, the anode current must be high in order to obtain the high output voltages required, and the type of valve which most nearly meets the above requirements is a beam power-pentode. Several popular designs of recent months (including the Super-visor) have used the N78 as the video amplifier, and with an anode impedance of 40 KΩ and a g_m of 10.5 mA per volt, this valve is eminently suited to the job. A better valve from the point of view of capacities is the Brimar 6CH6 which is a specially made video amplifier; here the anode impedance is 50 KΩ with a g_m of 11 mA per volt. The input capacity is higher than the N78 (14 pF against 11 pF), but the output capacity is lower (5 pF against 10.5 pF). With 250 volts anode and screen supplies, the anode currents are of the order of 35 to 40 mA for either valve.

With these valves, higher output voltages can be obtained for a given bandwidth (provided the proper compensation is applied) than is possible from the low-level type of valve, such as the EF50 or EF91. The simple expression for gain given in the article on video amplifiers previously (October, 1953)—

$$\text{Gain} = g_m.R$$

where R is the anode load of an uncompensated amplifier, may be incorrect when applied to high-level valve stages, and a better approximation can be obtained if the gain as computed from the above is multiplied by a factor G where

$$G = \frac{Ra}{Ra + R}.$$

The 6CH6 valve with its g_m of 11 mA/volt and Ra of 50 KΩ, when used with an anode load R of 3.3 KΩ, then gives a g_m.R value of 36.3, a G factor of 0.94, and an overall voltage gain of 34.

Staggered Amplifiers

When a sharp pulse is analysed, the high-frequency components are found to be smaller in amplitude than the low-frequency components; therefore, whereas it is customary to specify the high-frequency cut-off point of a video amplifier at, say, 3 Mc/s, the signal components which have frequencies close to this figure have amplitudes which are very small

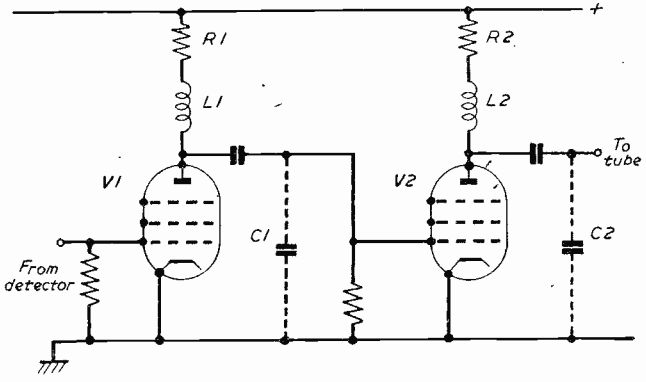


Fig. 1 — A two-stage staggered video amplifier with design formulæ

$$f_1 = \frac{1}{2\pi R_1 C_1} \qquad f_2 = \frac{1}{2\pi R_2 C_2}$$

$$L_1 = \frac{1}{2(2\pi f_1)^2 C_1} \qquad L_2 = \frac{1}{2(2\pi f_2)^2 C_2}$$

compared with the full pulse amplitude. Equal power is not necessary, therefore, throughout the spectrum ; for while the small (H.F.) components require equal amplification with the large (L.F.) components of a pulse they do not require such large anode-current swings.

Consider Fig. 1 where a two-stage video amplifier of the type now to be discussed is shown. The coupling between the stages is quite conventional

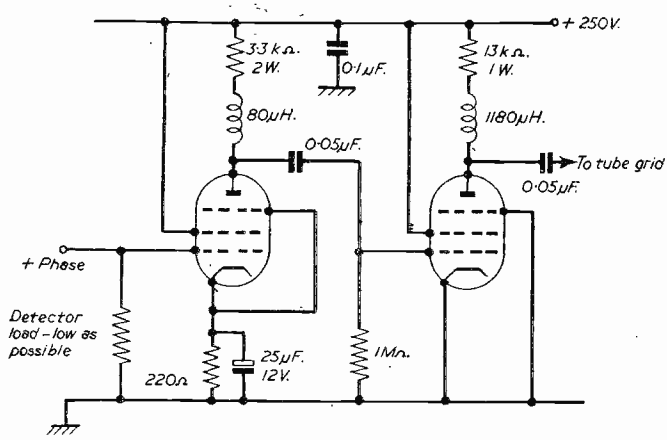


Fig. 2. — Design for a two-stage staggered video amplifier. There should be no possibility of coupling between the two coils.

and usual values of about 0.05μF for the capacity and 1 MΩ for the grid return are suggested. It is in the " tuning " of the individual amplifiers that the advantage comes home.

Both stages have anode loads, R1 and R2 respectively, with compensating inductances L1 and L2 associated with the resistances. The stray and valve capacities of each stage are shown dotted at C1 and C2 respectively, and these are assumed to include all input and output capacities, plus stray and wiring capacities. If the two stages are designed to peak (flatly) at two different frequencies within the video range, the bandwidth of the complete amplifier can be made very wide, and the gain can be kept high. In general, the first stage emphasises the high-frequency end of the video band, while the second stage emphasises the low-frequency end, the anode loads being respectively low and high in the usual design manner. The advantage of the system is the fact that a very high anode load can be used for R2 with the corresponding increase in voltage output for a given anode current. The danger of overload on V2 can only be real if the high-frequency components are large when received from V1, but in the television waveform this difficulty does not become apparent.

It is fairly simple to show mathematically that if the size of R2 is multiplied by a factor K2 and the size of R1 is multiplied by a factor K1 (where K1 = 1/K2), the two-stage amplifier will have the same gain at low-frequencies and at the upper cut-off frequency as an amplifier designed conventionally, that is, with R1 = R2. The compensating inductance values are unaffected by the staggering, being calculated as usual from a knowledge of the anode load and the shunt capacity. Normally K1 = ½ and K2 = 2, and on this basis the following design is worked out.

For equal bandwidths this sort of amplifier will give up to 20 per cent. more gain than the conventional system.

Design Notes

The relevant design formulae are given in Fig. 1 and the calculation of the various component values is not difficult. Taking V1 and V2 to be EF91's (or equivalents) the normal values for C1 and C2 may be taken as 15 pF (careful wiring). Then, working to an upper-frequency limit of f1 = 3.25 Mc/s, we get for R1 the value 3.3 KΩ, and correspondingly for L1 the value 80 μH. Using the multiplying factor K2 we have for R2 the value 13 KΩ (four times 3.3 KΩ), whence the lower peaking frequency f2 works out to be 0.825 Mc/s. From this, L2 can be calculated to be 1,180 μH.

This latter value is rather large to keep capacity down, but with wave-winding and very careful wiring its effect on C2 will not upset the assumed value of 15 pF. In any case, the value of L2 only changes slowly, for changes in C2 and the circuit is not critical. This is not true for the first stage and here the value is more critical.

No bias or screen feeds are shown in the figure as they do not affect the arguments on design. In practice, however, it is suggested that the detector input be positive in phase (derived from the cathode of the detector) and that V1 be biased back by some 220 ohms and high bypass condenser. The input to V2 is then negative-going and this stage can be operated without bias as shown so that D.C. restoration occurs after the capacity coupling. The tube feed can be direct-coupled if necessary, but if it is condenser fed as shown, D.C. restoration will be required at its input (the grid as the signal will be positive-going) in the usual way. The screens may be returned directly to the H.T. line, taken to be about 250 volts.

Television Trade Test Transmissions

THE BBC announces that the additional hour of television test transmissions introduced for a trial period of four months on September 1st, 1954, will be continued until April 30th, 1955. These test transmissions, which may be interrupted without notice, are intended to assist the radio industry and trade to test and adjust television receivers.

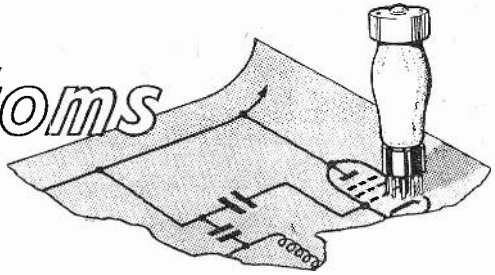
From January 1st, 1955, the morning trade test transmissions are taking place each weekday as follows :

10 a.m. to 10.57 a.m.—Demonstration Film.
11 a.m. to 12 noon—Demonstration Film.
12 noon to 1 p.m.—Test card " C " accompanied by recorded music.

Between 10 a.m. and 10.57 a.m. the high power stations operate at reduced power, the standby transmitters being used.

Test card " C " accompanied by recorded music is also radiated at normal power each weekday from the end of the afternoon programme to the start of Children's Television.

Fault Symptoms



THE CAUSES OF COMMON FAULTS, AND METHODS OF CORRECTION

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

(*Continued from page* 350, *January issue.*)

THE remedy for instability resulting from such causes, which, incidentally, may also be accompanied by intermittent sound and/or vision, or intermittent variations in the gain of the sound and/or vision channel, lies in removing the chassis from the cabinet, removing the valves from the chassis, and thoroughly cleaning the chassis and components with a soft dusting brush aided by a bicycle pump—a vacuum cleaner is not very effective for this operation when the dust has been on the chassis for any length of time.

The valveholder sockets should be cleaned electrically by application of a few drops of carbon tetrachloride, and the oxidisation on the valve pins can be readily removed by using a length of fine emery cloth—taking care not to bend the pins—after which the pins should be rinsed in carbon tet. Attention should also be paid to the valve screening cans, and if they are secured in position by means of a spring, stretching the springs slightly helps in achieving a good contact between the cans and the chassis.

It is extremely important to ensure that the valves are replaced in the holders from which they were taken. This applies even to valves of the same types, for valves working in different circuit sections do not wear at the same rate, and interchanging the same type of valve between the R.F./I.F. section and the timebase section, for instance, might upset the tuned circuit alignment and impair the receiver's performance.

For this reason it is always a good idea to check the alignment of a receiver after replacing a valve in the R.F./I.F. section, and from time to time during the life of the set to counteract any drift in alignment that often results as the valves age.

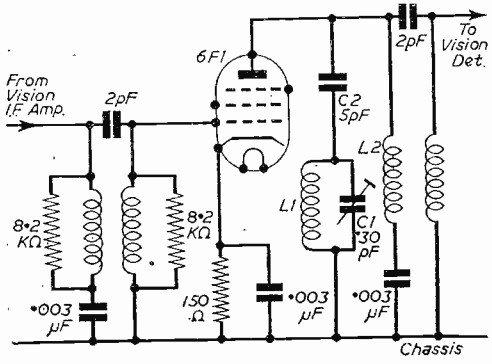


Fig. 85.—The sound rejector circuit used in Ekco T141 series receivers.

Deterioration of capacitors used for decoupling the circuits associated with the R.F./I.F. stages is another factor that often upsets the stability of a circuit. It is worthy to note that, particularly in old receivers, the cumulative effect of deterioration of a number of capacitors is often responsible for instability, as, for instance, opposed to a single capacitor losing its efficiency in some way. A general fall-off in sensitivity can also be attributed to the cumulative effect of slight leakage in a number of R.F./I.F. decoupling capacitors.

In certain receivers, such as the older style Ferguson and Ferranti models, individual stage decoupling is provided by a single capacitor unit containing three or four 500 or 1,000 pF capacitors. Such capacitor units are a little larger than a single 1,000 pF capacitor. Normally they are quite satisfactory in operation, though it has been known for them to be the cause of unstable operation, especially after they have been in use for a number of years.

Sometimes one section of the unit fails, and when this happens it is desirable to replace the complete unit, or, if such a part is not readily available, three or four separate capacitors should be installed in the circuit and the unit capacitor discarded completely.

The unit capacitor possesses the advantage of having a common connection, which can thus be earthed at the associated valve's screening connection, or at a common point on the chassis. When replacing with separate capacitors, therefore, it is essential to return them all to a common point, for the stage in question, and not to random sections of the chassis as is unfortunately common practice. The circuit at Fig. 81 illustrates the arrangement that should be adopted, and this applies equally, of course, when replacing a single capacitor.

Good quality non-inductive capacitors must be used for R.F./I.F. decoupling functions; a quick way to test whether inductance in a capacitor is causing instability is by shunting the suspect with a good quality 50 or 100 pF capacitor.

When investigating a set for instability it is sometimes difficult to establish the actual stage which is causing the trouble. Assistance in this respect is yielded by gently tapping the R.F./I.F. valves in turn, since the ones which are oscillating often have a tendency to appear unduly microphonic.

Another method is by measuring the valve current by means of a voltmeter connected across the cathode resistor; a valve which is oscillating will indicate an abnormal cathode voltage reading, and, as a further check, a marked alteration in cathode voltage will be observed if the control grid of the same valve is connected to chassis through an 0.1 µF capacitor (see Fig. 81).

As a conclusion to this subject, it should be mentioned that conditions for instability are frequently produced, particularly if a slight mis-match is present in the aerial system, by the aerial feeder coiled up behind the set with the mains lead. It is, therefore, always worth while to keep these two leads as far as possible away from each other.

Sound Interference on Vision

Essentially, this system results from one—or more—of four possible causes : these are (a) misalignment of the vision tuned circuits, including the sound rejector circuits ; (b) overloading of the frequency-changer stage, giving rise to cross modulation ; (c) feedback in the H.T. circuits ; and (d) valve microphony.

The intermittent nature of the alternate dark and light bars, representing the effect, which appear across a picture in sympathy with the sound modulation—sometimes evidenced only during the louder sound passages—readily distinguish the symptom from that of hum in a receiver.

When the trouble is severe it generally succeeds in destroying the line synchronising, though this occurs mainly when the symptom is the result of misalignment.

The Cause of the Symptom from the R.F. Aspect

From the viewpoint of the R.F./I.F. stages, sound interference on vision occurs when some of the sound signal manages to gain admittance to the vision R.F. or (in the case of a superhet receiver) I.F. stages. This out of place signal, together with the picture signal, arrives at the vision detector, undergoes demodulation, and, as well as the picture signal, the audio content of the sound signal also modulates the picture-tube beam.

Since the first two or three stages of a television receiver are wide-band and designed to accept both the vision and the sound signals, the means of rejecting the sound signal must, therefore, be included in the vision R.F. or I.F. stages. The pass-band response of the vision stages must of necessity be sufficiently wide to prevent attenuation of the picture signal, while, at the same time, the vision response demands a sharp cut-off at its low-frequency side, at least, to avoid it spilling over into the sound carrier part of the spectrum (see Fig. 82).

Although modern band-pass vision tuned circuits provide a reasonably sharp cut-off at both sides of the vision response curve, additional sound rejector circuits are invariably necessary to provide added attenuation at the sound frequency in the vision channel (see Fig. 83).

This reasoning applies whether the set is of the superhet or T.R.F. mode, of course ; in a superhet receiver, for instance, the rejector circuits are included in the vision I.F. amplifier stages. It is interesting to note, however, that where the oscillator frequency in a superhet receiver is higher than the signal frequency (the I.F. plus the signal frequency) the sound I.F. is always higher than the vision I.F. This characteristic does tend to assist with the sound rejection problem, particularly in single sideband receivers.

Even though sound rejector circuits take on several different forms depending on their precise design, they can generally be spotted without difficulty by the experimenter, both in the theoretical circuit, and in the set itself. Looking in at the circuit of the G.E.C. BT1091 series receivers—Fig. 84—it takes little time to pick out the sound rejector comprising L, C1 and C2 connected in the cathode circuit of the final vision I.F. amplifier valve.

This circuit is adjusted by means of C2 for minimum vision output when a signal equal in frequency to the sound I.F. (10 Mc/s) is injected into the vision I.F. channel. At resonance the impedance of the circuit is solely resistive. This results in heavy negative feedback, thus reducing the gain of the stage at the sound frequency. Away from this frequency the feedback reduces owing to the fall-off in tuned circuit impedance and the stage resumes its normal gain.

It is worthy of mention that at frequencies far removed from the sound carrier the circuit is liable

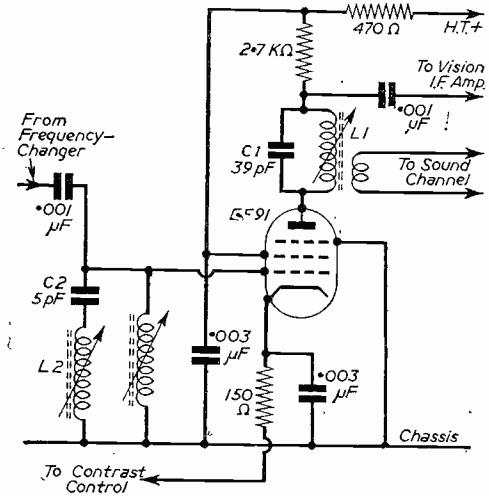


Fig. 86.—Showing the sound rejector, and adjacent channel sound rejector circuits used in the Bush TV22 series receivers.

to oscillate. This should be borne in mind by experimenters for it tends to complicate the adjustment of the circuit—in fact, it may even be mistaken for a fault elsewhere in the vision channel.

Sound Rejection in the Ekco T141 Series Receivers (Fig. 85)

In this receiver a series- and parallel-tuned rejector combination is included in the final vision I.F. amplifier stage. C1 and L1 form the parallel arrangement and are chosen to resonate at a frequency corresponding to the lower edge of the vision pass-band. At this frequency the circuit as a whole subjects negligible shunt impedance across the coupling coil L2, and so the vision response curve, at this point, anyway, is unaffected.

The parallel circuit becomes inductive as the frequency is reduced towards the sound carrier, and in association with C2 resonates to form a series circuit of low impedance across the coupling coil L2. A sharp cut-off is, therefore, achieved at the low-frequency side of the vision signal and extends, in the form of a deep trough, to the frequency of the sound carrier, thereby providing the desired sound rejection.

Sound Rejection in the Bush TV22 Series Receivers (Fig. 86)

Tied up with the problem of sound rejection is the circuitry employed to facilitate sound pick-up from the stages common to both sound and vision. In the Bush TV22 series receivers the sound rejector, including a sound pick-up coil, is installed in the anode circuit of the first I.F. amplifier valve—this being common to both sound and vision. Here the rejector circuit, comprising C1 and L1, when tuned for minimum vision output at the sound frequency, produces a trough in the overall response curve, as illustrated at Fig. 87 (b). Although C1 L1 is tuned, for maximum sound rejection, slightly away from the sound carrier frequency, as Fig. 87 (b) shows, a useful sound signal is, nevertheless, developed across C1 L1, and this is conveyed to the sound circuits via the small coupling coil.

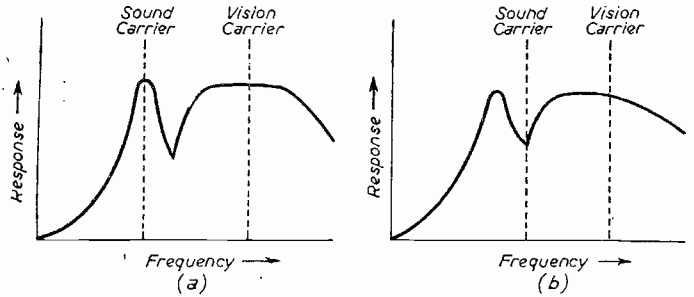


Fig. 87 (a).—The vision response curve when L1 C1 (Fig. 86) is tuned to the sound carrier, and (b) when L1 C1 is tuned for maximum sound rejection.

It must be made clear that if L1 C1 were tuned for maximum sound output, instead of for maximum sound rejection, the trough in the overall response curve would fall away from the sound frequency, and optimum sound rejection would not be achieved.

The curve at Fig. 87 (a) reveals this point, and clearly illustrates why one should not be tempted to tune any sound pick-up circuit for maximum sound output—this is practised in some cases where sound volume appears to be lacking ! First and foremost, the sound pick-up circuit is a sound rejector ; the fact that it is used to convey the sound signal to the sound channel is really a secondary factor.

It should be noted, of course, that (b) corresponds to the response curve to the coupling to the vision channel only. The coupling to the sound channel, being much sharper, responds solely to the sound carrier. Therefore, it does not follow that when tuning to the trough on the overall response curve one is doing this in the sound channel. As far as this is concerned, the circuit is being slightly detuned. The sound will, of course, be attenuated owing to this, but the extra sound rejection derived far outweighs this loss, which is easily made up in proceeding stages.

Adjacent Channel Sound Rejection

Now that all five channels in Band 1 are occupied, only a 1.5 Mc/s interval exists between the vision carrier frequency of a station in one channel and the frequency of the sound carrier of a station in the adjacent higher frequency channel. As an example, the vision carrier frequency of a station operating in Channel 4 (61.75 Mc/s) is removed by only 1.5 Mc/s from the frequency of the sound carrier of a station operating in Channel 5 (63.25 Mc/s).

To eliminate the possibility of adjacent sound channel interference, it now becomes necessary, therefore, for receivers to embody a rejector circuit tuned to the frequency of the adjacent channel sound signal. This ensures that the receiver response is severely attenuated, and possesses a sharp cut-off, at the high frequency side of the vision carrier frequency.

In the Bush circuit (Fig. 86), this is achieved by means of a series tuned circuit comprising C2 and L2. At the frequency corresponding to the adjacent sound channel, the impedance of the series tuned circuit falls to a low figure, and consequently presents a virtual short-circuit to the coupling it shunts, whereas away from its tuned frequency its impedance rises to a high figure and affects very little the coupling.

Apart from giving rise to the symptom of sound interference on vision, adjacent channel sound interference is always accompanied by patterning. This pattern takes the form of thin, evenly spaced dark lines appearing on a picture slightly inclined from the vertical. Since the pattern is the result of a beat note between the two frequencies concerned, the spacing between the lines is, of course, consistent with the spacing between the 1.5 Mc/s bandwidth bars in Test Card " C."

Rejector Circuit Adjustment

In order to prevent the response curve of the sound rejector circuits from distorting the vision response curve, it is necessary for them to possess a relatively high " Q " value. Such a characteristic provides a sharp response at the sound frequency and thus avoids the side of the rejector response from unduly attenuating the low-frequency side of the vision response corresponding to the vision frequency bandwidth.

High " Q " circuits are invariably characterised by the heavy gauge wire used for the inductive element, and also by the low-loss air-dielectric trimmer employed for tuning. Often the coils are self-supporting, and are thus quickly spotted. The sound rejector circuits in the G.E.C. BT2147 series receivers are typical in this respect ; two Philips type air-dielectric trimmers constitute the capacitive elements of the circuits, which are accessible for adjustment on the top of the sub-chassis, whilst the coils, formed of heavy gauge wire, are installed underneath the sub-chassis, in line with the trimmers.

It is worth bearing in mind that some superhet type receivers embody a coil of similar construction for the local oscillator. Care must, therefore, be taken to ensure that the correct coil is adjusted if no service data is at hand. Tracing the coil wiring should, of course, quickly establish the function of each coil. Another and probably quicker method is by bringing the hand very close to each coil in turn, whilst the set is working ; when the hand approaches the oscillator coil, both sound and vision will fade as the oscillator is detuned owing to hand capacitance effects.

The high "Q" nature of most rejector circuits makes their adjustment very critical, and to perform a first-class adjustment an accurate signal generator and some means of measuring the video output are essential. In this latter respect a voltmeter can be used to measure the change in voltage across the video valve anode load resistor, or arranged to measure the rectified vision signal appearing across the vision detector load resistor—preferably a valve-voltmeter, or a voltmeter of high sensitivity should be used for this purpose.

With the signal generator tuned accurately to the frequency of the sound channel in the case of a T.R.F. receiver, or to the sound I.F. in the case of a superhet receiver, a signal should be injected into the signal grid of the first valve in the vision section. The R.F. output voltage of the signal generator should be gradually increased until an appreciable deflection is observed on the video meter, and then the aim should be to achieve minimum deflection on the video meter by making careful adjustment to the sound rejector circuits in turn.

It is extremely important to ensure that the signal generator is "spot on" for this adjustment. If one happens to feel dubious regarding the accuracy of the generator calibration, it is quite easy to make certain that it is tuned to the sound frequency, or to the sound I.F., by loosely coupling the generator output (a low value capacitor can be used for this purpose) to the receiver aerial terminals. The aerial should be left plugged into the set, and the receiver switched on and operated in the normal way.

After allowing sufficient time for the generator to warm up and become stable, it should then be tuned slowly over the sound frequency to which the receiver is tuned; a beat note will be heard from the set loudspeaker when the frequency of the generator approaches the frequency of the sound transmission—the two frequencies correspond when the generator is adjusted to the "dead-beat" point. The same procedure can, of course, be adopted to set the generator accurately to the receiver sound I.F.

If no instruments are available it is sometimes worth while to attempt a less scientific way of setting the rejector circuits. This can be done by tuning the rejectors for minimum sound interference displayed on the screen of the receiver after the BBC vision transmitter has been switched off, but whilst the "sound only" news bulletin is being read—this always takes place at the conclusion of the evening programme sequence.

Check the Local Oscillator Tuning

A mistuned local oscillator in a superhet receiver tends to shift the relative position of the sound carrier, on the overall I.F. response curve, out of range of the trough produced by the rejector circuits. Apart from slightly detuning the sound channel and impairing picture quality, a misadjustment of this nature is also bound to aggravate the symptom of sound interference on vision.

Therefore, before attempting adjustment of the rejector circuits in a superhet receiver, it is always desirable to check the local oscillator tuning first. It is surprising how the frequency of local oscillators drifts after receivers have been in use for a number of months. The more modern 5 channel specimen appears particularly prone to this trouble, and it is well worth while to reset the oscillator tuning from time to time, for the frequency drift and consequent fall-off in picture quality, is so gradual that one might easily put it down to normal valve and component wear. Ferranti type 14T3 and 17T3 series receivers should be checked for oscillator drift, at least once every three months. Excessive drift may, of course, indicate that a small tuning or coupling capacitor, associated with the oscillator circuit, is in need of replacement.

It is also worth bearing in mind that correct adjustment of the oscillator in some receivers does not necessarily correspond to maximum sound volume. Often it is first desirable to tune the oscillator for maximum sound volume, and then detune very slightly for minimum sound disturbance on the picture.

Overloading of the Frequency-changer Stage

If a sound and vision signal of excessive amplitude is applied to the frequency-changer valve, or to the last stage which is common to both sound and vision, the sound signal tends to modulate the vision signal, and the vision signal tends to modulate the sound signal. Such an effect is known as cross modulation, and is evidenced by severe sound interference on vision, and vision interference on sound (this latter symptom is evidenced by a rough 50 c.p.s. note superimposed on the sound signal).

Once the mixed-up signals get into their appropriate channels nothing at all can be done to separate them. The solution to this problem, therefore, lies in reducing the strength of the signal applied to the receiver from the aerial. If, however, the receiver embodies a sensitivity control reducing the setting of this should first be tried. Should it not prove possible to attenuate the signal sufficiently by this means, or if it is necessary to reduce the contrast setting by more than two-thirds to achieve a picture of desirable contrast ratio when the sensitivity control is positioned for maximum attenuation, then an external attenuator should be installed in the feeder from the aerial to the set.

(*To be continued.*)

TELEVISION PRINCIPLES AND PRACTICE

(*2nd Edition*)

By F. J. CAMM

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SOME DETAILS OF THE USE OF THIS 12IN. ELECTROSTATIC C.R.T.

By "Serviceman"

MANY amateurs, like myself, start their experiments in TV with the small 6in. C.R.T., the VCR97. This C.R.T. is extremely useful and has given pleasure to very many home constructors who have thereby learned a great deal about the art of television.

When the first stages have been mastered the constructor then searches for wider fields and looks for circuits for a larger tube.

From time to time there comes on the market 12in. cathode-ray tubes from ex-Government supplies which are electrostatic, i.e., they use the same deflection principles as the VCR97 and 517 and do not require focusing magnets nor deflecting coils. They are an attractive proposition as they can be bought for less than £5 and use the same tube holder as the VCR97.

The writer decided to alter his receiver from a VCR97 to one of these larger tubes. The original televisor was the "Argus" (the forerunner of the £16 "Simplex"), and it was decided to use as much as possible of the existing timebase circuit.

Some very useful data was published in PRACTICAL TELEVISION on the use of this kind of tube ("Using 12in. Electrostatic Tubes," by J. H. Willis, November, 1952, issue), and it was decided to use these circuits by Mr. Willis as a basis for experiments.

There are some major difficulties in converting to larger electrostatic tubes; much greater power is wanted in the timebase circuits because of the greater width and height, and much larger voltages are wanted in the timebase.

It was decided to build the amplifier part of the timebase amplifier and the C.R.T. network on a separate chassis as the "Argus" chassis was too small for the big tube.

At first the writer intended to use the more orthodox type of E.H.T. supply with negative earthed, but there is rather a shortage of high-voltage coupling condensers for the deflector plates, and so the original positive earthed system was employed.

A tour of the junk shops provided the necessary important condensers and tube.

The Frame Amplifier

The method adopted in the conversion was to use the existing frame (and line) oscillators in the "Argus" and to feed the output into a special paraphase amplifier on the lines suggested in the original article.

The "Argus" circuit (like many of its type) uses two SP61 valves in the frame circuit, one of them being the oscillator in a Miller transition circuit, the other being the paraphase amplifier. It was decided to use the amplifier SP61 in the new amplifier stage accompanied by a further SP61. The actual line-up of this arrangement is, therefore, the Miller oscillator

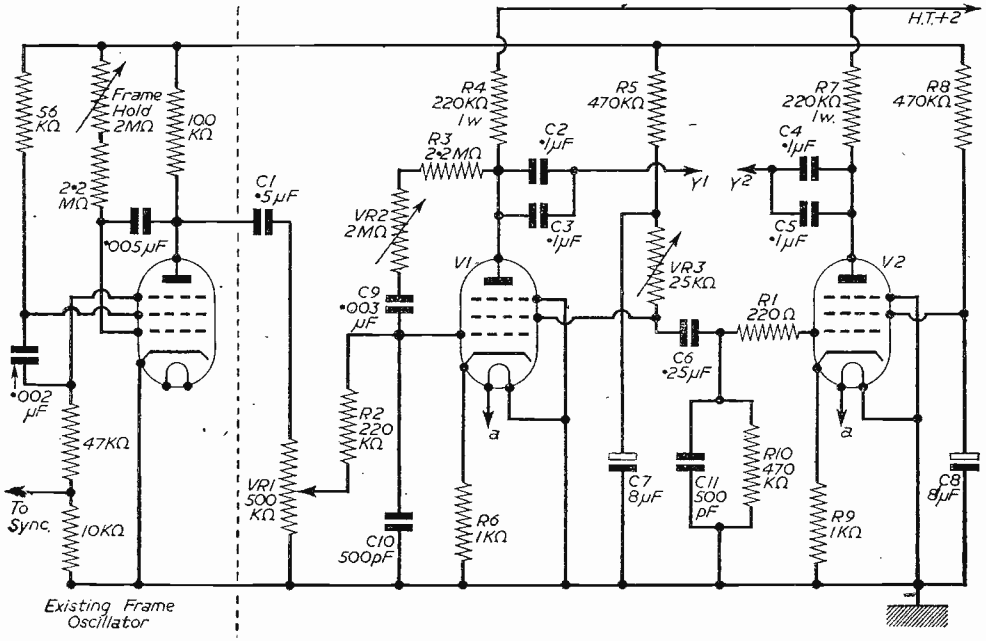

Fig. 1.—Circuit of the frame amplifier.

in the existing timebase feeding into two SP61 valves in the new amplifier.

A similar method was used for the line circuit.

It was found important to retain the time constants (C/R values) of Mr. Willis's circuit and very little alteration was made apart from using components which were to hand. Large value coupling condensers were necessary to avoid cramping at the bottom with expansion at the top of the screen.

The circuit used is given in Fig. 1. The frame oscillator of the "Argus" is shown but the circuit should work to any standard Miller oscillator using the coupling condenser C1 between the two circuits.

VR2 is what was originally the height control of the "Argus"; it now becomes the auxiliary linearity control and VR1 is the new height control.

C2 and C3 were used in parallel because they were to hand, but they can be replaced by an 0.25μF. The working voltage should be 750-volt minimum.

The same arrangements apply to C4 and C5.

The main linearity control is VR3, which varies the amount of negative feed-back from the anode to the grid of V1.

C10 and C11 assist in preventing cross-talk between frame and line circuits, and it was found necessary to earth the metalising of the valves and to use screened grid caps and leads for all of the valves.

C7 and C8 are 8μF, 450-volt working and are in the same can, i.e., an 8+8μF condenser was used.

It will be noted that the screens are fed from the same H.T. supply as the original timebase, and this simplifies the circuit, enabling 450-volt condensers to be used. A lead can be connected from the normal timebase H.T. rail to the new chassis. If fed from the same supply as the anodes then much more expensive and higher rated condensers would have to be used.

Apart from the points mentioned above very little alteration has been made to the original circuit. It has been nicely balanced and good linearity is possible.

Line Timebase Amplifier

This is shown in Fig. 2, and it was found that the values given in the original circuit were quite suitable for use with the SP61 valves, though 6SH7 valves were specified.

It was found that there was some degree of fold-over at the left-hand side but this was corrected by using 500pF for the flyback condenser (C*) in the "Argus" circuit.

Another point is that some further control over linearity was obtained by the use of the VR6 potentiometer which can be a pre-set component.

C15 and C16 were 0.1 μF as against the 0.01 μF used in the original circuit and were used as they were available.

It was found that the linearity control was to some extent affected by the width control but it was possible to arrive at a suitable combination which gave a horizontal scan which was remarkably free from distortion.

As in the case of the frame circuit the valve caps and leads were screened to prevent interaction between line and frame circuits.

Where line pulses get into the frame circuit the frame is liable to be triggered at incorrect moments with the result that the picture appears to jitter up and down.

Main Power Supply

The extra voltage required for the timebase was obtained by using a mains transformer with full-wave rectifier (5U4G), the rectified output being connected in series with the existing timebase H.T. supply. (Fig. 3.)

Transformer outputs should be 250-0-250 at 60 mA

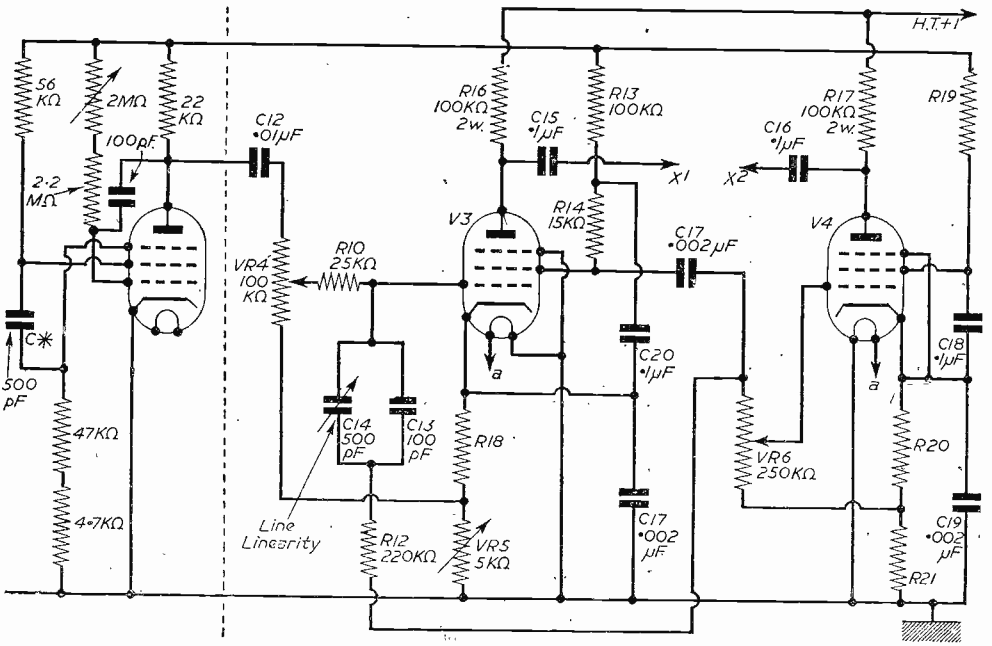

Fig. 2.—Circuit of the line amplifier.

and 6.3 volts at 2.3 amp, 5 volt 2 amp. The 5-volt winding supplies the rectifier valve and the 6.3-volt winding the four SP61 valves.

It is very important to note that the negatives of C21, C22 and C23 do not go to chassis. The can must be isolated from the chassis, the negative of the condensers being connected to the *positive* of C24, the negative of C24 being connected to chassis.

C31, 22 and 23 are 450-volt working so as to accommodate surge voltages while C24 is 500-volt working.

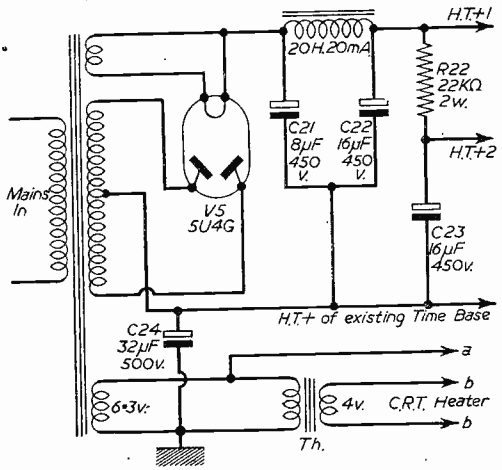

Fig. 3.—Circuit of the Power Supply.

A decoupling resistor is connected in the supply to the frame anodes to prevent interaction between line and frame.

The supply for the C.R.T. heater is obtained from a transformer which has a 6.3-volt input and a 4-volt output. The actual transformer used was obtained from the U.E.I. Corporation and was specially manufactured by them for an E.H.T. doubler. It has two secondary windings one insulated at 2.5 kV. and the other at 5 kV. The 2.5 kV. was not used as only a 5 kV. winding is required for the present purpose.

It is possible to construct a suitable transformer and the following data is supplied :

The transformer is built up on stampings having an area of about 0.5 square inches for the centre limb, the window area being about 1¼in. by ¾in. (Fig. 4.)

The 6.3-volt primary is wound with 65 turns of 22 s.w.g. enamelled copper wire. The winding is covered with six complete turns of oiled silk and then the 4-volt winding is wound on. Care must be taken to ensure that the 4-volt windings start well in from the edge of the former to avoid the possibility of sparking between the winding and the core.

This winding is covered with six turns of oiled silk and the whole assembly can be immersed in molten beeswax.

The C.R.T. Network

The C.R.T. network was the old one rebuilt to cater for the higher E.H.T. voltage. Positive earthing of the E.H.T. was employed, and this enabled the coupling condensers to the timebase to be kept to a reasonable value.

The main difficulty with the circuit was in buying the high voltage condensers and these (ex-Government types) were on the bulky side.

The shift controls were removed from the original "Argus" chassis and were used again. The focus control was used again but the brilliance control was too low in value to operate correctly in the circuit and so a new one valued 500 K was employed.

As positive earthing was employed it was necessary to have a high voltage condenser to couple the vision circuit to the grid of the C.R.T. and as this isolates the D.C. component D.C. restoration had to be arranged as in the "Argus." A VR78 or VR91 can be used for this purpose.

All the wiring was insulated first with small diameter plastic sleeving and the whole enclosed in larger diameter sleeving to ensure good insulation in the E.H.T. circuits.

It was found that care had to be taken with the soldering as if the wire got hot it would peel through the sleeving.

Another important point was that the soldered joints had to be made carefully so that there were no sharp points. Sharp points cause corona discharges and they can usually be detected by the sharp smell of ozone which they generate.

The high voltages used made it necessary to fit all the variable controls on a paxolin panel, well-

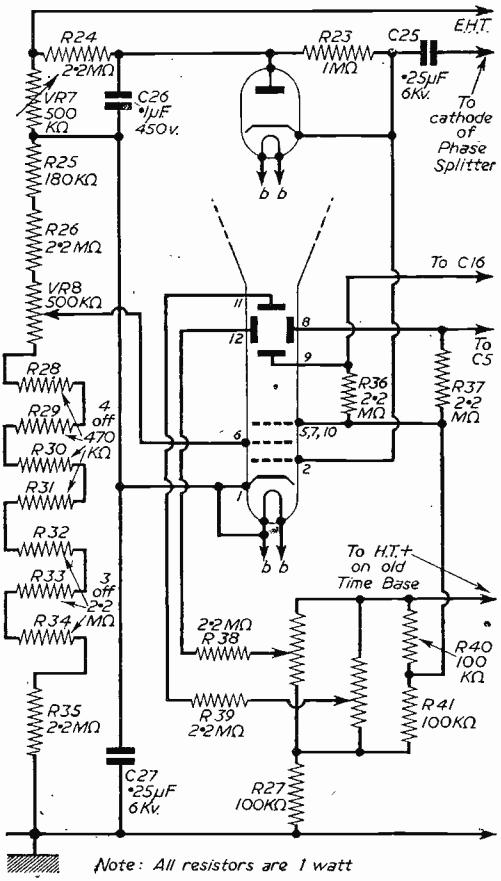

Fig. 5.—The C.R.T. network.

insulated from the chassis, and in the case of the brilliance and focus controls knobs were fitted, the grub screws being well sunk and the hole being filled with beeswax.

Note that the 470 K resistors in the bleeder network can be replaced with one 2-megohm if desired; they were used simply because they were available.

All the resistances in the bleeder network were mounted on a paxolin panel and kept well clear of the chassis.

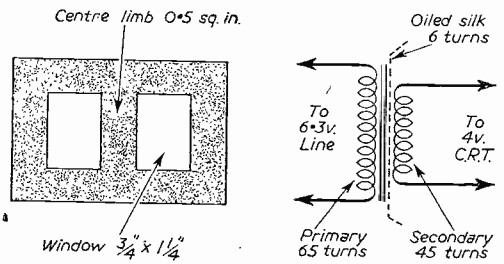

Fig. 4.—Details of the Heater Transformer.

E.H.T. Supply

E.H.T. was obtained from the original E.H.T. transformer in a standard voltage doubler circuit.

The circuit is shown in Fig. 6.

V7 was the E.H.T. rectifier used in the "Argus" and it was supplemented with a metal rectifier the K3/40. The scheme is quite orthodox in every way and proved quite successful.

The E.H.T. transformer had one side of the E.H.T. winding connected to the core; this wire was removed from the core and taken to the junction of C28 and C29. In order to relieve the strain on the E.H.T. winding and to prevent a breakdown, the transformer was mounted on insulating blocks so that the core was not in contact with the chassis at any point.

It may be thought that this method was too fussy, but as E.H.T. transformers have an uncanny knack of breaking down, the precaution of isolation was taken. The heater of the rectifier, although at earth potential, offers a smaller target area to the E.H.T. winding and no trouble has been experienced with this set-up.

Construction Hints

The timebase amplifier, auxiliary power supply and E.H.T. supply with the C.R.T. network was mounted on a separate chassis with the various controls at the rear.

For mounting in a cabinet the contrast and volume controls were removed from the "Argus" chassis and extended by screened cables to the new chassis. By this method the C.R.T. could be fitted with the contrast and volume controls mounted below the screen, similar to the method used in the "Simplex" televisor.

The tube was mounted in a similar manner by binding the periphery of the screen with rubber salvaged from an old bicycle inner tube, and clamping it to the chassis by a metal strip.

The colour of the screen is a light green very similar to the colour given by the VCR97 and is quite restful to the eyes. Subdued lighting is best to obtain the optimum results as the screen is obviously not so brilliant as a black-and-white tube.

Although a VCR511A was used in this circuit i should be possible to employ other types of tubes which become available from time to time. Suitable types are the NC20 and the VCR131.

Vision Receiver

Due to the larger screen size it is possible to get a picture with finer details and the vision receiver can be profitably re-aligned.

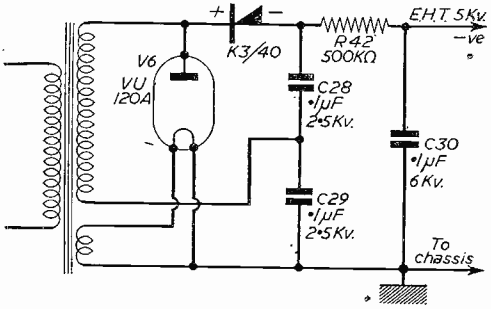

Fig. 6.—The E.H.T. supply.

In the writer's case a pre-amp was added to give extra power which was used to widen the bandwidth of the televisor and so give better quality.

It cannot be claimed that the 3 Mc/s bars were resolved but the 2,5 bars were clear, and the picture was of very pleasing quality.

School Television Broadcasting

THE School Broadcasting Council for the United Kingdom have been giving further consideration to the question of the extension into television of the existing service which the BBC conducts in sound radio. The Council have, at the suggestion of the former Minister of Education, made a further study of the distinctive contribution which television might be expected to make to the work of the schools and have issued the report of their enquiry which emphasises that it is only by means of the practical test of an experimental service that conclusive evidence can be obtained. This more limited interim enquiry, however, has helped to prepare the way by making clearer what kind of help television may offer.

The Report suggests that a School Television Service, maintaining the high qualities of School Broadcasting in sound, could be of value to schools, not only in Current Affairs, but in other subjects.

The School Broadcasting Council for the United Kingdom have ascertained that local education authorities in England, Scotland and Wales are prepared to equip enough schools to receive the programmes when the service starts to justify the mounting of such a service on an experimental basis. The Council have reached the conclusion that it would be best for an experimental service to start for secondary schools with two or three transmissions a week on a continuing basis, with the prospect of a gradual extension, rather than for there to be an intensive experiment concentrated into a few months and then coming to an end. They have accordingly asked the BBC to provide this experimental service as soon as they are ready.

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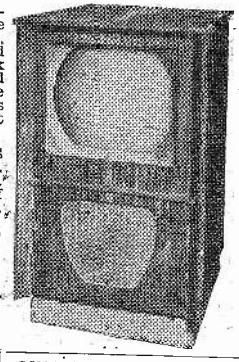

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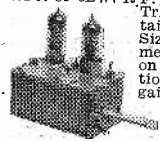

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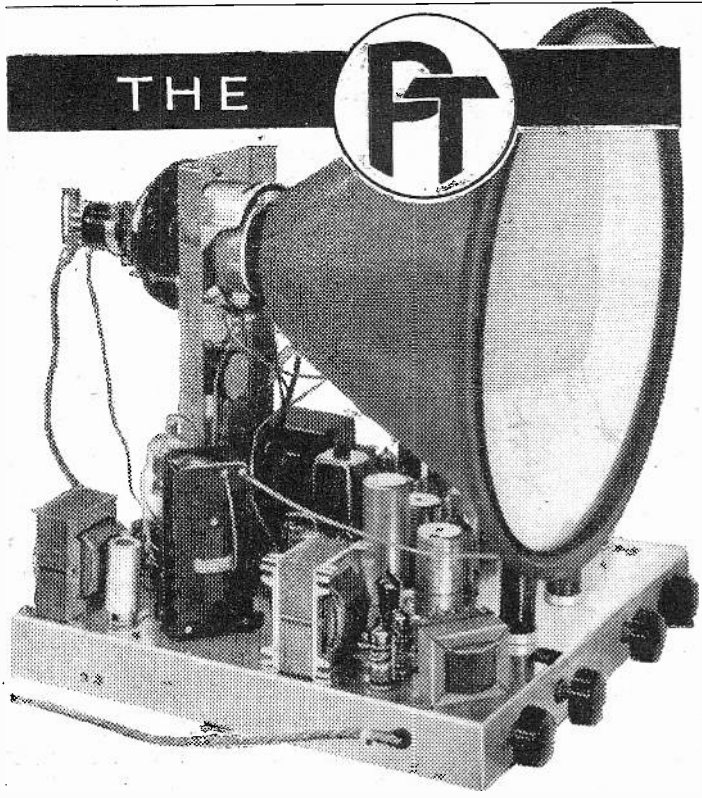

SUPER-VISOR

SOME NOTES ON THE ADJUSTMENT OF THE TIMEBASES AND LINING-UP THE TUNING CIRCUITS

WHEN this receiver was first produced, many readers built it from the published instructions. Subsequently a blue-print was produced and in this the anode load of the first triode of V8 (R37) was increased to 100 KΩ. This has apparently caused some confusion amongst those readers who have compared the two circuits, but the value of 100 KΩ is correct, the former value proving rather too low to deliver a satisfactory sync pulse. Various queries have been raised from time to time concerning this particular receiver and as they may prove of general interest they will be dealt with here. First, the function of some of the valves appears to offer some difficulty, especially those following the video stage and preceding the frame output stage. The double-diode V7 performs the dual function of interference limiter and rectifier for the D.C. voltage which is used for the Automatic Picture Control bias. Next, the double-triode, V8, performs the dual function of D.C. restorer and sync separator. The D.C. restorer is necessary in this circuit as condenser C29 is interposed between the video stage and the picture tube, and consequently the D.C. component is lost. There are three outputs from V8, two of one polarity and one of another. One of these controls the frame timebase, and the remaining two (of opposite polarity) feed the flywheel controlling double diode for the line timebase.

On the frame side there are two valves before the multivibrator and these perform the functions of pulse shaper and clipper. The frame timebase seems, from correspondence which we received, to offer most difficulty and be most prone to a variable performance due to component tolerances. We have carried out some experiments with this stage and it appears that there is a possibility that should a number of tolerances be in one direction, and as a result not cancelling out, the frame hold will be rather weak. It will be appreciated that normal tolerances of components, even at 10 per cent., may, with a given number of components be all on the high side—within the 10 per cent., of course. Alternatively half may be high and half low, and it is when a number of items all have the tolerance on one side or the other that slight differences in performance may be noticed. If, therefore, your Super-Visor suffers from a weak frame hold, evidenced either by failure to hold throughout the evening, or failure to lock at all, giving split pictures or even two pictures one above the other, some attempt should be made to obtain a stronger pulse. It is not necessary to replace all the components in these stages. The critical points are the voltages on

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Multivibrator oscillators on both timebases.
Single chassis construction.

the first anode of V8 and the first anode of V14, and both of these points are fed from potential dividers across the H.T. supply. Provided that R37 is about 100 K this section should work quite satisfactorily and attention should then be paid to V13 and V14. One scheme which has been advocated and proved successful is to connect a variable resistor, say about 50 K, across R61. Two lengths of flex should be attached to the variable and it may be left with quite long leads as these will not affect the results. Set the variable to maximum and switch on. Now slowly reduce the value and see whether this affects the lock. The effect of this additional component is to vary the total value of R33, and this, in turn, affects the voltage at the diode anode. If it is found that there is a point where this additional item provides a sound lock the set should be switched off, the total value of resistance across R61 measured, and the variable and R61 replaced by a fixed resistor of the measured value. Another point where it may be possible to obtain an improvement is at C55, the condenser which couples the first anode of the multivibrator oscillator to the second grid. This is given as .01 μF, but it may be found that it may be increased to .02 with advantage. Finally, some variation in R67 may prove effective, but it should be pointed out that all the changes so far mentioned are only to take care of variation in tolerances, and where one modification may prove effective on one model, an alternative may be required on another. Similarly, whilst only one such modification may be required on one model, perhaps two or more may be needed on another.

Lining Up

Closely linked with the problem of solid timebase working is the accurate lining up of the tuning circuits. The timebases are triggered by the received sync pulses, and it is useless to modify the circuitry to try to strengthen these pulses if they are not being passed on by the video stage. Therefore, it is essential to ensure that the circuits are all properly tuned so that not only is a maximum picture content passed to the tube, but the sync pulses are also at maximum. In the lining-up notes it was stated that the sound I.F. transformer L13 is accurately lined up by the makers, and that it is only necessary to trim L3 to maximum sound to obtain a picture, finally, trimming the remaining circuits for best results.

If signal generator can be obtained, the circuits may be lined up much more accurately, whilst, of course, if an oscilloscope and wobbulator are obtained the lining-up process is made perfect. For those who are able to obtain and use these instruments the following are the peaking points of the various coils, and the lining-up procedure. Short-circuit C15 and C35. Connect a milliammeter in series with R25, or a voltmeter between the chassis and anode of V6, or across R27/8/9. Connect the signal generator through a suitable matching device (according to the instrument manufacturer's directions), to the grid of V5 and inject a frequency of 12.5 Mc/s. Peak L8B (bottom trimmer) to this frequency and reset generator to 9.8 Mc/s, adjusting L8A (top) for *minimum* response. There should be very little interaction between these two coils, but first one and then the other should be adjusted and rechecked for maximum and minimum response. Transfer the generator to the grid of V3 and then adjust both top and bottom trimmers of L4 and L6 to provide a more or less equal reading from 10.5 to 13 Mc/s. This is a little tricky, and it would probably prove best to peak all four coils to about 12 Mc/s and then offset the top of one and the bottom of the other and proceed in this way from one to the other to provide a constant reading from 10.5 to 13 Mc/s. It will probably prove impossible to obtain this exactly, but there should be the minimum of variation as the generator is tuned through this range. Now transfer the generator to the grid of V10 and make sure that L13 A and B are accurately set for maximum output on the sound side at 9.8 Mc/s. The loudspeaker may be used for this, keeping the output from the generator very low so that slight changes may be made more audible. Now transfer the generator to the aerial socket and adjust it to the frequency of your local sound transmitter. Adjust L3 bottom trimmer until the sound is heard from the loudspeaker and reduce the generator output to the very minimum. Adjust the trimmer in L12 and L3 bottom until maximum sound is heard, and then readjust the generator to the vision frequency. A good output should be registered on the vision indicator and nothing should be heard on the sound side. Now adjust the trimmers on L1, L2 and top of L3 for maximum output on vision, and reset the generator to the sound frequency. If there should be any indication on the vision indicator, carefully adjust the top trimmer on L8. The receiver should now be accurately trimmed for maximum picture and sound definition, and the short-circuit should be removed from C15 and C35, the aerial connected and contrast and brilliance turned up, when a good picture should be obtained with a good sound sync pulse.

Iraq to Buy Pye TV Studio

THE complete television studio and equipment which Pye took to Baghdad for the recent Trades Fair is to be purchased by the Iraq government, and will be moved from its present site at the Fair and re-erected on an official site belonging to the Iraq broadcasting authorities.

Visitors from countries bordering Iraq and the Middle East predict that the effect of television in Baghdad will certainly be felt well beyond Iraq. There is no doubt that as a result British prestige and that of her electronics industry in particular will be greatly enhanced throughout the Middle East.

The television studio, which was erected and put on the air only four weeks after the arrival of Pye technicians from England, is equipped with all the facilities of a modern television station, including the very latest telecine equipment.

To begin with the Iraq government will probably use the television station for educational purposes. In the Middle East women do not appear in public and so are unable to share the same educational opportunities afforded to those who can go to cinemas and other public places. The Baghdad authorities hope that television in halls and other places where women congregate with their children will help to fill the gap in their knowledge of the world around them.

During the Fair Pye broadcast regular programmes which were received on sets in many parts of Baghdad, including the King's palace. At the outset, however, TV receivers had to be removed from shop windows in the main street because of traffic congestion caused by enthusiastic crowds.

No date has yet been announced for the commencement of television transmissions from Baghdad.

R.F. Units 24, 25, 26 and 27

SOME DETAILS OF THEIR USE FOR TELEVISION RECEPTION

By B. L. Morley

TO the older televisor constructor it sometimes comes as a shock to discover that newcomers to the hobby do not know of the extremely useful convertor units listed as the RF24, 25, 26 and 27. They are still available in quantity in the ex-Govt. market at very reasonable prices, and it is thought that some details of their characteristics and use in TV work would not be out of place.

Each of the units is a self-contained convertor for superhet working providing an I.F. of between 7 and 8 Mc/s. Each one contains three valves arranged as R.F. amplifier, mixer and oscillator and they were originally designed as plug-in units for an I.F. strip called the R1355.

The units are very powerful, especially the later types and can form a very powerful fringe area receiver when used in conjunction with the R1355. They will give a gain which is vastly superior to any commercially produced televisor.

It is not necessary to employ them in conjunction with the R1355 as they can be used (for example) as a television sound receiver feeding into a normal broadcast receiver ; all that is necessary is a simple coil modification (in some cases) and a separate power supply.

The RF24

This is the earlier of the units and covers a frequency range of 20 to 30 Mc/s in five pre-set switched ranges. It is not tunable in the normal sense but the five switched positions can be pre-set to any desired frequency.

They are very useful for checking purposes as one switch position can be tuned to the sound programme and the other to the vision programme. Similarly, where the receiving point is midway between two transmitters one channel can be tuned to sound and vision on the first two switch positions, while the second channel sound and vision can be tuned on the third and fourth switch positions. It is thus easy to compare one channel with the other.

The circuit for this unit is given in Fig. 1. The input is fed to the first R.F. stage through the tuned coil which has switched pre-set condensers for covering the various frequencies. The first R.F. valve is a VR65 (alias CV118 civilian equivalent SP61) and the amplified output is fed into the mixer valve by another switched tuner which is similar to the previous one.

The mixer valve is another VR65 and injection from the oscillator takes place in the cathode circuit. The I.F., which is between 7 and 8 Mc/s (in the 40-meter band) is taken from the anode, an inductance tuned to this frequency forming the anode load.

Another VR65 is used as the oscillator in a series-fed Hartley circuit, the oscillator frequency being taken from the anode via a coupling coil to feed directly into the cathode of the mixer. Oscillator frequency is controlled by switch tuning in a manner similar to that for the other tuned circuits.

Converting the RF24

The RF24 can be used for feeding directly into an R1355 unit or can be fed into any I.F. amplifier at a frequency of between 7 and 8 Mc/s. When used with the R1355 it is usual to provide power for the valves from the I.F. section via the six-pin Jones plug fitted at the back of the R.F. unit. No modification is then required.

If it is desired to use it in conjunction with, say, a normal domestic receiver, then a separate power supply must be used and a suitable circuit is given later in the article.

For the television bands the coils should be modified as given in the table and then by simply adjusting the air trimmer associated with that coil section it is possible to tune in the desired signal.

Alignment of the RF24

Supposing, for example, the unit is to be used with the normal domestic receiver, then the unit should be coupled to the receiver by means of a length of coaxial cable. At the receiver end a Pye socket should be fitted but the outer should be insulated from the receiver chassis by an 0.0005 μF condenser as shown in Fig. 2. This method should be used for all the units when used with the domestic receiver.

A three-pin plug and socket mounted at the rear of the unit can be used to transfer power from the power unit to the R.F. unit.

The domestic receiver should be tuned to a silent point somewhere between 7 and 8 Mc/s.

The unit should now be switched on and the aerial connected. (It is advisable to use a TV type of aerial for optimum results).

The switch should be set to the range over which it is desired to tune the coils and the oscillator trimmer associated with that position should be carefully rotated until a signal is heard. The sound should appear as normal sound, but the vision channel will sound like a very rough mains hum. The signal should be tuned in as loudly as possible on all three trimmers associated with the particular switch point in the three sections.

If no sound can be heard set all trimmers in each section at maximum capacity and try again ; if still no success set them at half way and try again. If still nothing is heard then check the operation of the R.F. stages by tapping a short circuit across the aerial and across the grid of the R.F. section. A distinct click should be heard in each case.

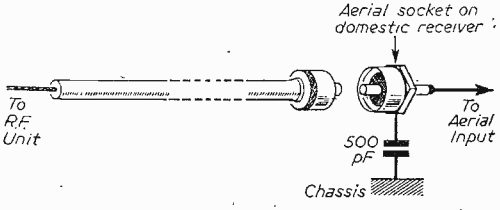


Fig. 2.—Adding an R.F. unit to a domestic receiver

Where the signal is weak some patience may be required to enable the signal to be tuned in.

The RF25 is a very similar unit. It has a range from 30-50 Mc/s.

Like the RF24, it has switched sections for pre-tuned circuits and can be used in a similar manner. The circuit arrangement is very similar to that of the "24," but the oscillator section is a little different. In this case the screened-grid and control-grid form the triode section of a Hartley oscillator, the amplified signal being taken from the anode of the oscillator valve and fed directly into the cathode circuit of the mixer via a small coupling coil.

Output is between 7 and 8 megacycles.

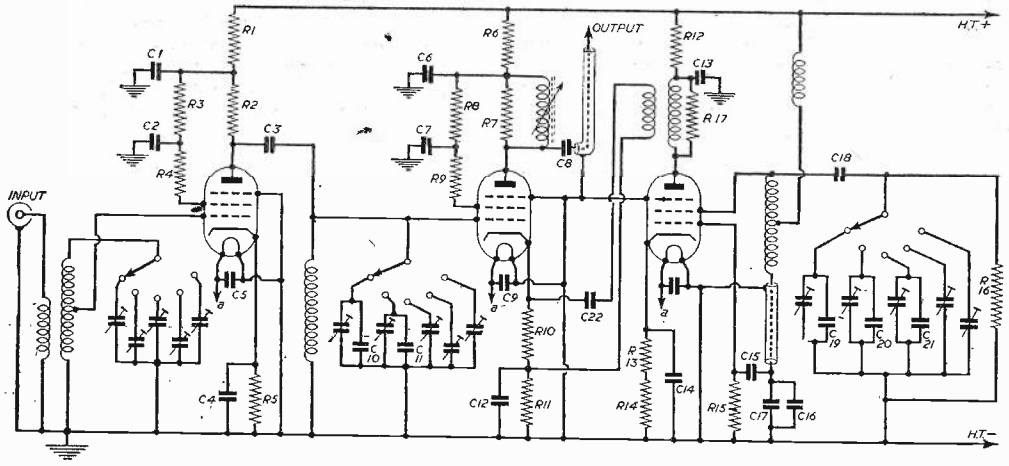


Fig. 3.—Circuit of the RF25 unit.

Modifying the RF25

For the lower channel (Channel 1) it will be found that the sound signal can be tuned in directly with the switch in position 4 by adjusting the trimmers, and the vision signal can be tuned directly with the switch in position 5.

It may be possible to get Holme Moss sound on switch position 5 by careful trimming.

For the other channels it is only necessary to modify the coils as given in the table.

Alignment of the RF25

The alignment procedure applicable to the RF24 should be followed and no difficulty should be experienced.

The RF26

This unit is a great advance on the previous two units, being a more modern and powerful version. The tuning range covered is 50 to 65 megacycles and, unlike the previous units, the tuning is continuous by means of a variable condenser. Fig. 4 gives the circuit.

The unit is fitted with a tuning dial with slow-motion drive and has even been given a small panel light.

EF54 valves are used as R.F. and mixer valves and an EC52 as an oscillator. This latter valve is an extremely good oscillator and will perform up to and even beyond 200 Mc/s.

Overall gain is very high and losses are kept low by suitable layout and the use of a silver-plated chassis.

In appearance it is a handsome unit and remarkably good value for money.

In the writer's opinion this is the most useful of the four units as it can be made to cover the whole of Band 1 television frequencies without modification. As received the unit will tune in directly to channel 3, Kirk O'Shotts, or channel 4, Sutton Coldfield. Channel 5 is obtained simply by inserting brass cores

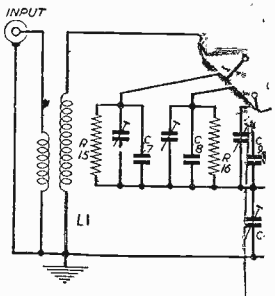
RF24 Coil Turns

("C" is parallel capacity in pF)

Channel	L1	(C)	L2	(C)	L3	(C)	L3 tap
1	4	30p	3	30p	3	30p	1¼
2	3½	15p	2½	25p	3	15p	1
3	3	20p	2½	20p	2½	35p	¾
4	2½	30p	2½	15p	2½	15p	¾
5	2½	15p	2½	5p	2½	—	¾

NOTE ALL TRIMMERS ARE 0-30 pF. IN SOME UNITS C42, C43 AND C MAY BE FIXED CONDENSERS

C1 = 300pF	C9 = 5 pF	C17 = 15 pF
C2 = .001 μF	C10 = 35 pF	C33 = 300 pF
C3 = 100 pF	C11 = 20 pF	C34 = 300 pF
C4 = 10 pF	C12 = 10 pF	C36 = .001 μF
C5 = 50 pF	C13 = 45 pF	C37 = 300 pF
C6 = 50 pF	C14 = 30 pF	C39 = 300 pF
C7 = 15 pF	C15 = 25 pF	C45 = 300 pF
C8 = 10 pF	C16 = 20 pF	
R1 = 2.2 kΩ	R11 = 1 kΩ	R21 = 2.2 k
R2 = 10 kΩ	R12 = 2.5 k	R22 = 3.6 k
R3 = 22Ω	R13 = 10 kΩ	R23 = 10 k
R4 = 10Ω	R14 = 220Ω	R24 = 10 k
R5 = 33Ω	R15 = 2.7 kΩ	R25 = 47Ω
R6 = 100Ω	R16 = 3.9 k	R26 = 3.3 k
R7 = 100 k	R17 = 4.7 k	R27 = 47Ω
R8 = 10 k	R18 = 6 kΩ	R28 = 2.2 k
R9 = 100Ω	R19 = 7 kΩ	R29 = 2.2 k
R10 = 47Ω	R20 = 1.5 k	



in the three tuning coils and readjusting the trimmers.

Channel 2 sound (Holme Moss) can be obtained right at the top end of the dial without any cores in the coils, and it is possible by careful trimming to pull in channel 2 vision as well.

For channel 1 (and often for channel 2) it is necessary to insert iron-dust cores in the three tuning coils and to re-trim.

Alignment of the RF26

When used on channel 3 or 4 the only alignment necessary is in the setting of the oscillator for single sideband reception when the unit is used for receiving the vision channel; for the sound channel no alignment is required.

For the vision channel the trimmers associated

C1 =300 pF	C9 =300 pF	C17 =15 pF
C2 =300 pF	C10 = 15 pF	C18 =300 pF
C3 =100 pF	C11 = 10 pF	C19 =25 pF
C4 =300 pF	C12 =300 pF	C20 =15 pF
C5 =300 pF	C13 =300 pF	C21 =5 pF
C6 =300 pF	C14 =300 pF	C22 =11.5 pF
C7 =300 pF	C15 = 50 pF	
C8 = 10 pF	C16 = 25 pF	
R1 =2.2 k Ω	R7 =10 k Ω	R13 =100 Ω
R2 =2.5 k Ω	R8 =100 k Ω	R14 =100 Ω
R3 =10 k Ω	R9 =33 Ω	R15 =22 k Ω
R4 =33 Ω	R10 =33 Ω	R16 =1 M Ω
R5 =330 Ω	R11 =1 k Ω	R16 =3.3 k Ω
R6 =2.2 k Ω	R12 =2.2 k	

with the ganged condensers should be adjusted to receive maximum volume and if necessary they can be supplemented by adjustment of the trimmers underneath the chassis.

When maximum volume of signal (or rather contrast, as we should say, when speaking of vision) has been received, then the oscillator trimmer underneath the chassis is adjusted towards the sound channel until the vision signal is reduced by half. This is the optimum position for quality of the picture.

For Wenvoe and other channel 5 stations brass cores should be inserted and set level with the tops of the coil forms. The trimmers mentioned above are then adjusted after the station has been tuned in on the dial. The oscillator should be adjusted as as previously when receiving the vision signal.

In the case of London and Holme Moss (and other stations on channels 1 and 2) iron-dust cores should be inserted level with the tops of the coil forms and alignment should proceed as given for channel 5.

RF25.—Remove turns from each coil as follows:

Channel	Turns removed
1	—
2	½
3	1
4	1½
5	2

The RF27

This unit is almost exactly the same as the RF26 except for a few different values in components and the fact that the coils do not have so many turns. As bought the unit covers from 65-80 Mc/s.

The valve line-up is identical to that of the previous unit and performance is identical.

It is possible to tune in the Wenvoe transmitter on channel 5 simply by retrimming the unit. For channels 3 and 4 it is necessary to insert iron-dust cores in each of the tuning coils and then to re-trim.

For channels 1 and 2 an additional turn is required to each tuning coil and iron-dust cores must be used.

Alignment of the RF27

The alignment procedure given for the RF26 should be followed, bearing in mind the difference in the coil design. The unit is extremely simple to align.

Power Supply

Where a separate power supply is required, it is suggested that this is built on a separate chassis as a self-contained unit. Any standard type of A.C. Power Pack may be used, or one suitable for A.C./D.C. supplies

Where the unit is used for feeding into another receiver which is A.C./D.C., or the A.C./D.C. power supply is fed into the R.F. unit, then the coaxial link should be isolated from the chassis at each end by means of a 500 pF condenser.

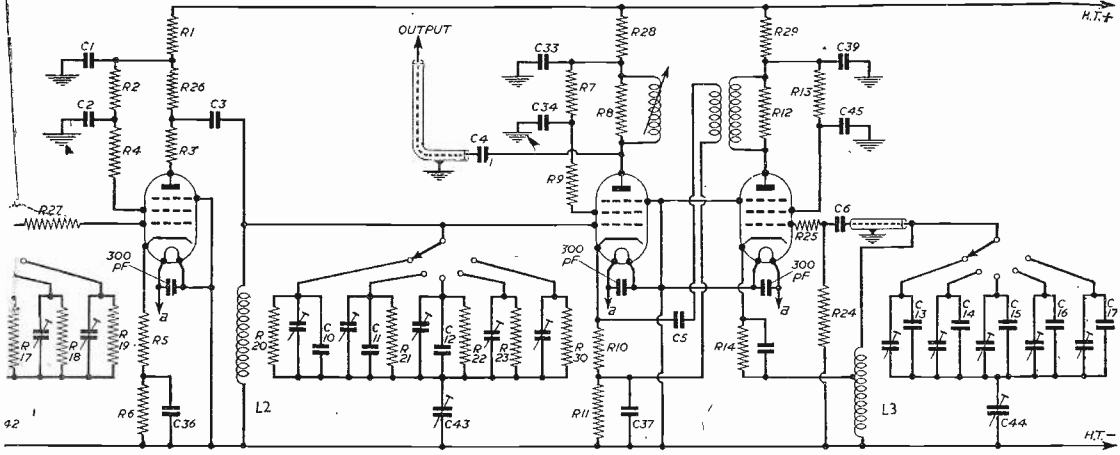


Fig. 1.—Circuit of the R.F. 24 unit.

No. 6.—G.E.C. MODELS BT2147, BT5144 AND BT4541

By L. Lawry-Johns

THE BT2147 is a small 9in. table model in a bakelite cabinet. It should not be confused with an earlier 9in. table model which was of the "long" variety, that is the tube was mounted beside the loudspeaker not above it. Also this earlier model was for A.C. mains operation only. The BT2147 is a T.R.F. receiver with a small R.F. sub-chassis which is easily removable. This chassis carries all the vision and sound valves up to the video amplifier (277) and the double diode triode (DH77).

Valve Troubles

As this receiver is of the universal type the valve heaters are, of course, in series as shown in Fig. 1. It will be seen that the U31 efficiency diode is the first valve of the chain followed by the KT36 line output and then the B36 line and frame oscillator.

It often happens that the B36 develops a heater to cathode short, and it will easily be seen that the full mains voltage will be expended across the dropping resistor(s), Thermistor, U31, and the KT36. Should the fuses be found to have blown the B36 and the U31 should be tested, on a valve tester (not cold) for heater-to-cathode shorts.

The reason for testing the U31 is that, even though the fuses have failed, the preceding surge of high current will probably have damaged this valve in addition to the defective B36 which caused the original trouble.

If the fuses have not blown the dropping resistor on the left side of the main chassis will most likely be found to be overheating. This may well be the case when the receiver is used on a higher voltage tapping, say, 250 volts.

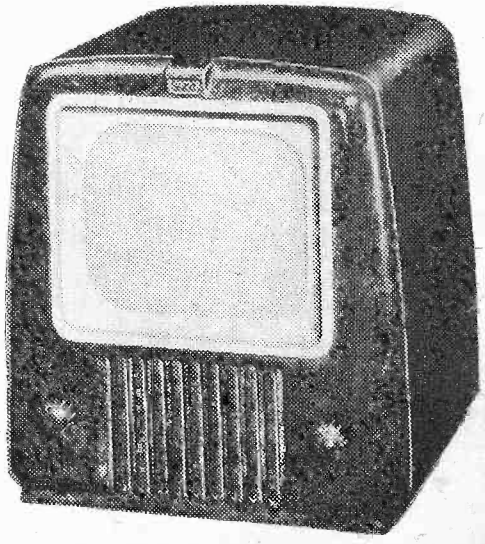
In this event the B36 should still be suspect and the U31 also carefully tested. Should the set have run for any time in this condition, i.e., with a defective B36, the 25μF 50-volt electrolytic condenser between the cathode of the U31 and the H.T. positive line may be found to be leaky owing to A.C. having been applied to it. This happens when the U31 becomes defective as explained above. To save time and possible additional expense the following points should be checked when this fault occurs. The Thermistor, which is mounted behind the main dropper resistor, should be examined. It may be cracked due to excessive heat.

The U31, KT36 and B36 valves should be tested for heater to cathode shorts and the condenser mentioned above checked if the U31 proves defective. The fuses should be rated at 1.5 amp.

Sound Section

The N37 sound output valve is a likely source of trouble which often appears in the form of a loud hum on the sound. This is due to an internal short occurring in the valve, and results in the decoupling resistor (1.1 k, see Fig. 2) becoming overheated. Should this fault occur the set should be immediately switched off, the bottom inspection panel removed and the resistor examined to verify that it has been passing excessive current. It will be found wired across the output transformer.

The decoupling electrolytic and the .02μF tone compensating condenser could also cause this fault, but it is the writer's experience that the N37 is more generally to blame. If an N37 is not to hand a Z77



Model BT2147, with moulded cabinet.

may be tried in this position to prove the point (this, of course, results in a deterioration of quality). The difference in heater voltage will not cause undue rise across the other heaters.

The DH77 is often responsible for a complete loss of sound. It is that valve which is mounted nearest that the height control, a 1 MΩ slider in the grid circuit of the N37 frame output valve, is defective due to the spring leaf slider not making proper contact with the carbon. This control is susceptible to hand-capacity effects and this fact should be remembered in any tests which are made.

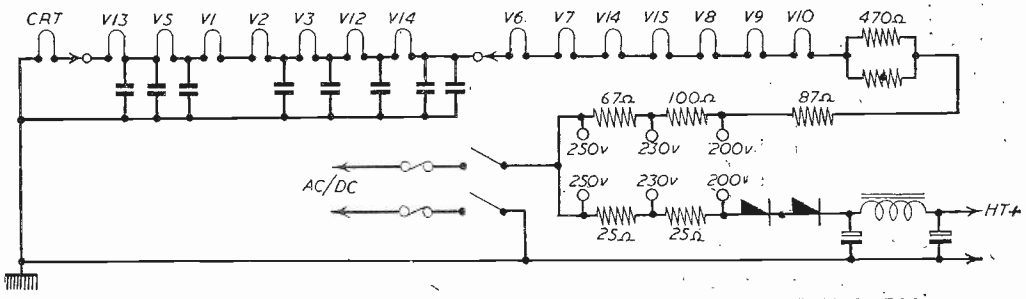


Fig. 1. — Heater arrangements for the receiver. V20 is a U31, V9 a KT36 and V8 the B36.

to the multi-plug connection, of course, on the sub-chassis. Crystal diodes may be found fitted as detectors (vision) and limiters, and these should receive priority attention in the event of valve replacement not producing the required effect.

The multi-plug connection should receive careful examination in the event of various troubles. After this plug has been removed a few times it is quite possible for one or more leads to become disconnected and cause possible confusion.

Picture Defects

Should the raster fail to fill the mask in a horizontal direction and the measured H.T. voltage be found below 200, the metal rectifier will almost certainly be at fault. If the voltage is well up, it may well point to a low emission KT36 line output valve. An unsteady raster accompanied by thin black lines across it points to a dry joint or other poor connection in the frame timebase. It will normally be found

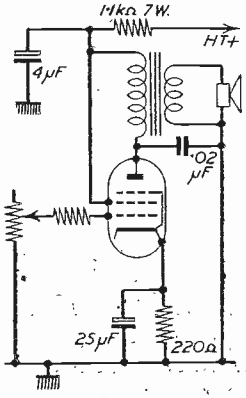


Fig. 2. — Sound Output Stage.

Sound on Vision

This is a fault which is common to this model and seems to recur regularly, probably due to vibration. The procedure is to adjust on a transmission which contains reasonably loud passages of deeply modulated sound.

The trimmer marked T2 in Fig. 4 is the main sound rejector and its position is extremely critical. The hand or trimming tool may introduce unwanted effects and some patience is required. A piece of sleeving is often fitted to extend the top of the trimmer

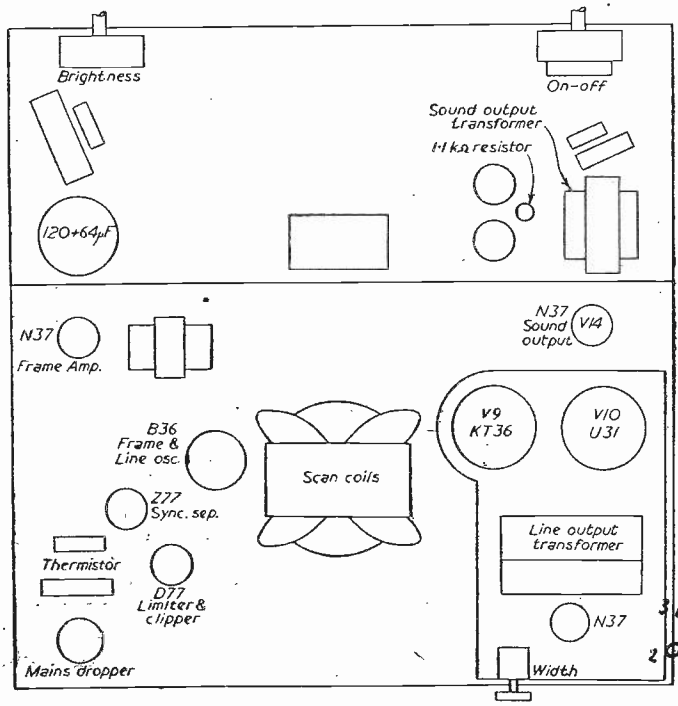


Fig. 5. — Top view of the main chassis.

L63 = 6J5 or 6C5 L63 as pin No. of B36, 6.3V .3AMP

and, if it is not, it is a worthwhile idea to add this small but handy accessory. T2 should be screwed down almost to the bottom of its travel and then unscrewed until the best position is found—the set will oscillate if it is unscrewed too far. If in its best position some

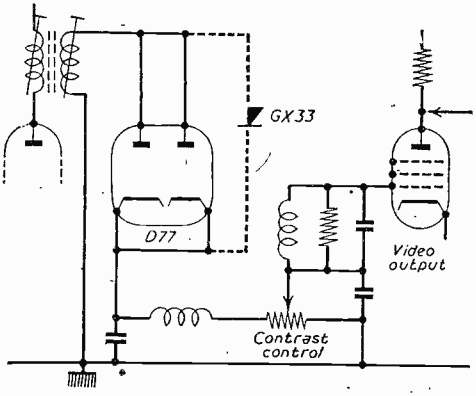
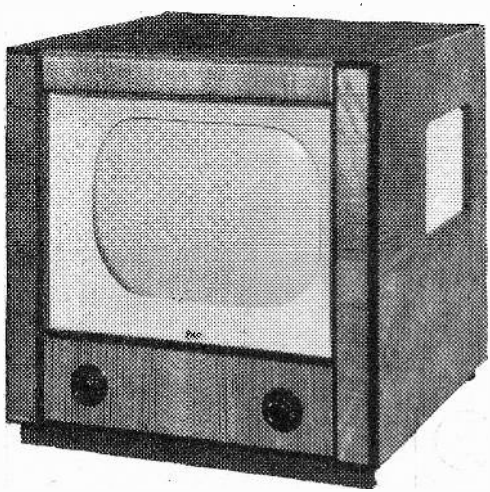


Fig. 3.—The Video detector.

slight traces of sound on vision remain, the T1 trimmer which is actually in the sound circuit, may be adjusted to achieve final rejection. When the required result has been obtained the trimmers should be carefully sealed with wax.

Hum Bars

These, when appearing on a modulated raster usually denote a heater-to-cathode leak in a Z77 in the sub-chassis. The exact location depends upon whether the sound is affected or not.



Model BT5144, which has a wooden cabinet

If no signals are present on the tube and only the dark and light hum bars are visible the D77 vision detector should be suspected if this valve is fitted. Note that the bars in this case would be very pronounced.

Special Notes

The flying lead which is clip-connected on the left side of the sub-chassis is the video output lead. The short black spade connecting lead on the right side is the true earth connection to the aerial plug. This is *not* a chassis connection.

If in some situations ringing is noticed it may sometimes be removed by adjustment to L1 and L2.

Many variations of the basic circuit may be found depending upon whether the model is an early or late version.

The BT5144 is the 12in. table version in a wooden cabinet, the tube being a G.E.C. 6704A. Negative feedback is added to the sound output stage and in this case the bottom of the volume control is taken to a potential divider consisting of a .05μF condenser, a 3.9 KΩ and 470Ω resistor. The lead from the volume control is taken to the top of the 470Ω resistor instead of the chassis.

The BT4541 is the console version with a 12in. tube and tinted screen. Again the feedback is different. The .05μF condenser is shunted by a .25μF making a total of .3μF. A larger speaker is also used.

To obtain easier sound rejection when sound on

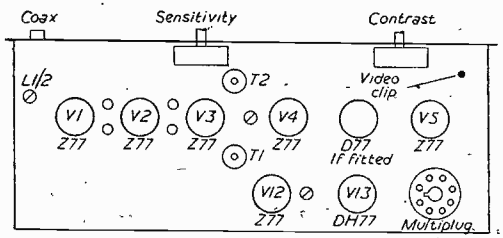


Fig. 4.—Top view of sub-chassis. T2 is the sound rejector, T1 is the sound tuner to be adjusted with T2 to obtain adequate sound rejection on vision.

vision is troublesome, it is best to slip the picture so as to obtain the edge of the picture in the centre of the screen. Any ripple will be more easily noticed. Only a slight movement of the horizontal hold is required.

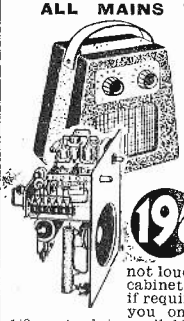
Modifying the Amplifier Type 178

With reference to the details published in the last issue the following amendments should be noted in connection with Figs. 2 and 6. In Fig. 2, the complete circuit, the colours of the two H.T. leads, red and yellow, were transposed. In addition, a decoupling resistor and condenser should be inserted in the blue lead, the resistor being XR40 and the condenser XC30.

The connections to the coil LA in Fig. 6 should be modified so that the lead from the " top " of the coil goes to pin 4 direct (not to R101), and the end of R101 shown at present joined to the coil should be taken direct to earth. In other words, the coil is taken direct to pin 4, and resistor R101 goes from pin 4 to earth.

A NEW HANDBOOK
" PRACTICAL TELEVISION CIRCUITS "
288 pages, 156 illustrations
15/- net or 15/6 by post from:
GEO. NEWNES, LTD.,
Tower House, Southampton Street, Strand, W.C.2.

ALL MAINS THREE



A handy midget A.C./D.C. 3-valve mains receiver giving powerful reception over long and medium waves. All component parts incl. valves, coils, resistors, etc., but not loudspeaker and cabinet (available if required) will cost you only 19/6 plus 1/6 post—data available separately 2/-, post free.

"CHIMELITE"

It is a hall light as well as a double chime and you can make it in a couple of evenings for the total cost of only 19/6, including instructions. Post, etc. 2/-. Data available separately price 2/-.

CHASSIS ASSEMBLY

3 colour, 3 waveband scale covering standard Long, Medium and Short wavebands, scale pan, chassis punched for standard 5 valve superhet, pulley driving head, springs, etc., to suit. Scale size 14½in. x 3½in. Chassis size, 15in. x 5in. x 2in. deep. Price 15/-. plus 1/6 post.

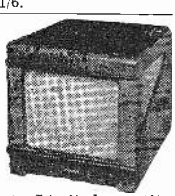
TABLE RADIO CABINET

Very fine cabinet, size approx. 16 x 16 x 7—walnut veneered and satin finished. 39/6, carriage and packing 3/6. This cabinet is the correct one for the chassis above.

BE PREPARED

for a cold winter by making our low cost **Electric Blanket.** 27 yards of special heater wire and blueprint, 20/-. Blueprint only 1/6. Alternatively make a Bed Warmer; Constructional Data, 1/6.

CABINET 19/6



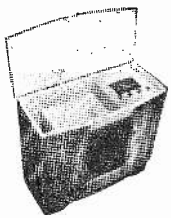
You can make an excellent bass reflex cabinet with this well-made veneered and polished walnut cabinet. Limited quantity offered at 19/6. Carriage, etc., 3/6.

DEFINITELY THE LAST

Unit for breaking down offered at little over the price of the six Aladdin coil formers it contains. Briefly, this contains 150 various parts, not including nuts, screws, washers, and other items of hardware. For full description see the December issue. Price only 7/6, plus 2/6 post.

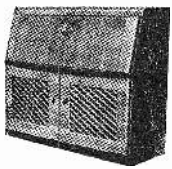
SELECTIONS FROM OUR RANGE OF CABINETS

THE EMPRESS CONSOLE



This cabinet is undoubtedly a beautiful piece of furniture. It is elegantly veneered externally in figured walnut, internally in white sycamore. The radio section is raised to convenient level but is not drilled or cut. The lower deck acts as the motor board, again is uncut, it measures 16 x 14 and has a clearance of 5in. from the lid. There is a compartment for the storage of recordings. Overall dimensions of this essentially modern cabinet are 3ft. wide, 2ft. 6in. high, and 1ft. 4½in. deep. Price £15.15.0, carriage, etc., 12/6.

THE BUREAU



This is a really beautiful cabinet elegantly veneered in walnut and finely polished. The control board, revealed when the front is dropped down is ample for the larger than average radio chassis or amplifier and alongside there is a space for a tape recorder or auto record changer mechanism. Both the radio board and the control board are left uncut to suit your own equipment. Size approximately 30in. high, 12in. wide, and 16in. deep. Price £16.16.0. Carriage 12/6.

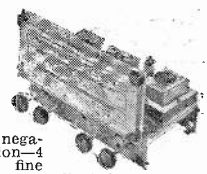
THE CONTEMPORARY

Also in the modern trend is this very stylish contemporary console. Veneered in oak with contrasting mouldings this has the "G" plan look and is ideal for use with this furniture or with other contemporary fittings or furnishings. The radio and motor board is again uncut and its size 30in. x 15½in. provides ample room for all equipment. Price £8.15.0. Carriage, etc., 12/6.

THE REGINA

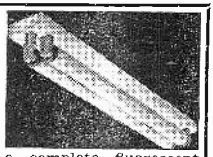
Highly polished, nicely figured, two-tone walnut finish, developed for the home constructor and supplied with component parts for a shelf that can be fitted in at any desired height. Suitable for most constructor sets, "Viewmaster," "Supervisor," "Magnevisor," "Teleking," etc., etc. Size 18½in. wide, 18½in. deep, 34in. high. Cut for 12in. tube, but not drilled. Price £7.17.6, or £3.12.6 deposit.

THE CLEVELAND ORGANTONE



5 valve 3 waveband superhet covering Long, Medium, and Short waves. Osram miniature valves—low loss iron coils—permeability tuned I.F.S.—full A.V.C.—variable negative feed-back—gram. position—4 watts output—particularly fine tone. Chassis size 7 x 7 x 7 approx. Tested in difficult areas where exceptional results have been obtained. Price £11.10.0, or £3.16.0 deposit. Carriage, etc., 7/6.

THE TWIN 20



This is a complete fluorescent lighting fitting, it has built-in ballast and starters—stove enamelled white and ready to work. It is an ideal unit for the kitchen, over the workbench, and in similar location. It uses two 20-watt lamps. Price, complete less tubes, 29/6, or with two tubes, 39/6, post and insurance 2/6. Extra 20-watt tubes, 7/6 each.

CAR STARTER/CHARGER KIT

All parts to build 6 and 12-volt charger which can be connected to a "flat" battery and will enable the car to be started instantly. Kit comprising the following:

Mains Transformer	...	19/6
6-amp. Rectifier	...	22/6
Regulator Stud Switch	...	3/6
Resistance Wire	...	2/-
Resistance Former	...	2/6
Mains On/Off Switch	...	1/-
0-5 amp. Moving Coil Meter	...	9/6
Constructional Data	...	1/6

or if bought all together price is 59/6, plus 2/- post and packing.

GLASS SCALES 4/- A DOZ.

An exceptional bargain this month is our assorted parcel of glass scales. A most useful collection for all who make up experimental or other radios. We offer twelve glass scales mostly in two or three colours for 4/- plus 9d. post and packing. Limited quantity only.

NOW A.C./D.C.

We can now offer a kit of parts suitable for making a multimeter to measure A.C. volts as well as D.C. volts, milliamps and ohms. Price for kit containing all the essential items including moving-coil meter, metal rectifier, resistors, range selector, calibrated scale, etc., etc., is 19/6, plus 1/- post and packing.

The D.C. only version is 15/- plus 9d. post and packing.

INSTANT HEAT CONVECTOR

The heater with the lowest possible thermal capacity, 4ft. long; made from heavy gauge sheet steel (galvanised). 1 kw., suitable A.C. or D.C. Price only £2 or with thermostat, £3.15.0. Note: The thermostat mounts separately and will control up to three heaters.

ANOTHER CLEVELAND CHASSIS THE "TREMENDO"

The first Cleveland chassis was good, but this one is really superb. It has a 7-valve circuit with 6-watts output, fitted with independent bass and treble controls. It is really an efficient R.F. circuit coupled to a high-fidelity amplifier. The chassis size is 12 x 7 x 7 with the 10½ x 4½ multicoloured scale, and it is built to the same exacting specification as the Organtone. Price £14.10.0, carriage and packing 7/6. H.P. terms if required.

ELECTRONIC PRECISION EQUIPMENT, LTD.

Post orders should be addressed to Dept. 7, RUISLIP.

Personal shoppers, however, can call at:

42-46, Windmill Hill, Ruislip, Middx.	152-3, Fleet Street, E.C.4.	29, Stroud Green Road, Finsbury Park, N.4.	249, High Road, Kilburn.
Phone: RUISLIP 5780	Phone: CENtral 2833	Phone: ARCHWAY 1049	(Now Open)
Half day, Wednesday.	Half day, Saturday.	Half day, Thursday.	

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Thousands of enthusiasts are building the "Simplex" Televisor, now being featured in "Practical Television." WHY NOT YOU? **CONSTRUCTOR'S ENVELOPE** containing full constructional details and Blue Print, additional notes and suggestions, and Query Service form, sent for ONLY **5/-**. All components available ex stock as follows :

ALUMINIUM CHASSIS. — 18 s.w.g. DRILLED, for VCR97 version with screens and tube holder bracket, **22/6.**

TRANSFORMER.—350-0-350 v. 150 m.a. 6.3 v. 5 a., 5 v. 3 a. tapped at 4 v., ONLY **32/6.** (Postage 2/-.)

CHOKE.—10 h. 120 ma., **10/6.** (Post 1/-.)

RECTIFIERS.—RM3 5/- ea., K3/40 6/- ea.

VALVES.—EF50 6/6, SP61 4/-, 6SN7 9/-, 6J5 5/6, EB34 3/6, EA50 3/6.

VALVEHOLDERS.—B9G/(EF50) **10d.**, I.O. and M.O. **6d.**, Diode (EA50) **6d.**, VCR97 **2/6.**

VCR97 TUBE.—Tested full screen, **42/6.**

CONDENSERS.—Electrolytics 25 mfd. 25 v. 1/10, 16 x 8 mfd., 450 v. 5/6, 32 x 32 mfd. 450 v. 6/-. Mica, silver mica, and tubulars, 350 v. **6d.** each.

POTENTIOMETERS.—All values, preset 1/9 each, long spindle 3/-, with switch, 4/6.

RESISTORS.—½ watt **4d.**, ¼ watt **5d.**, 1 watt **6d.**, 1.5 k. 5 watt, **1/6.**

COIL FORMERS.—½in. **8d.**, ¾in. **10d.**

SPEAKER.—6½in. ROLA P.M. less trans. 19/6 (postage 2/-).

O/P. TRANSFORMER. 5/-

All Components Brand New and Unused. Full Price List available on request.

VALVES

1G6	6/6	7A7	8/6	5Z4	10/-
1E7	6/6	7C5	8/6	5U4	10/-
1LH4	8/-	7F7	8/6	6AC7	6/6
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6AK7	9/6	12SR7	7/6	EF36	6/6
6B4	7/6	28D7	7/6	EF39	6/6
6B8	7/6	32	7/6	EF50	6/6
6C8	8/-	36	7/6	,, Red	
6G6	6/6	50Y6	8/6	Sylvania	8/6
6H6	5/-	58	8/6	EF91	12/6
6K6	9/-	1622	11/-	EY51	15/-
6L7	7/6	1626	4/-	EK32	6/6
6N7	7/6	1299A	7/6	EL32	7/6
6R6	8/6	VR150/30	8/6	SP61	4/-
6U5	8/6	VR137	5/9	MU14	10/6
6V6	8/6	KT44	8/6	RL37	6/-
6V6GT	7/6	KT2	5/-	VS70	7/6
6SA7	8/6	VP23	6/6	954	6/-
6SG7	7/6	HL23DD	6/6	955	6/-
6SH7	7/6	TP25	8/-	9003	6/-
6SJ7	8/6	1S5	8/-	9004	6/-
6SK7	7/6	1T4	8/-	931A	50/-
6SL7	9/-	1R5	8/-		
6SS7	7/6				

R.F. UNITS TYPE 26 and 27. For use with the R.1355 or any receiver with a 6.3 v. supply. These are the variable tuning units which use 2 valves EF54 and 1 of EC52. Type 26 covers 65-50 Mc/s (5-6 metres), and Type 27 covers 85-65 Mc/s (3.5-5.0 metres). Complete with valves, and BRAND NEW IN MAKER'S CARTONS. ONLY 35/- each.

TRANSFORMERS.—Manufactured to our specifications and fully guaranteed Normal Primaries. 425-0-425 v. 200 ma. 6.3 v. 4 a. 6.3 v. 4 a., 5 v. 3 a., **ONLY 50/-** ; 350 v.-0-350 v. 160 ma., 6.3 v. 5 a. 6.3 v. 3 a., 5 v. 3 a., **ONLY 42/6** ; 250 v.-0-250 v. 100 ma., 6.3 v. 6 a., 5 v. 3 a., **ONLY 32/6.** 350v.-0-350 v., 150 ma. 6.3 v. 5 a., 5 v. 3 a. **ONLY 32/6.** 250-0-250 v. 60 ma., 6.3 v. 3 a., 5 v. 2 a. **ONLY 21/-.** The above are fully shrouded, upright mounting. 5.5 kV. E.H.T. with 2 windings of 2 v. 1 a., **ONLY 72/6** ; 7 kV. E.H.T. with 4 v. 1 a., **ONLY 82/6.** PLEASE ADD 2/- POSTAGE FOR EACH TRANSFORMER.

E.H.T. TRANSFORMER FOR VCR97 TUBE.—2,500 v. 5 ma., 2-0-2 v. 1.1 a. 2-0-2 v. 2 a. **37/6** (postage 2/-).

PYE 45 mc/s I.F. STRIPS.—The strip that is ready made for the London Vision Channel. Complete with 6 valves EF50 and 1 of EA50. BRAND NEW. **ONLY 70/-.**

CHASSIS OF INDICATOR 233.—Contains VCR97 C.R.T. holder, 11 valve holders, resistors, condensers, etc., etc. BRAND NEW. **ONLY 10/-** (carriage, etc., 5/-).

Open until 1 p.m. Saturdays, we are 2 mins. from High Holborn (Chancery Lane Station), 5 mins. by bus from King's Cross.

Cash with order, please, and print name and address clearly. Include postage as specified and on Component Orders under £2.

U.E.I. CORPN. THE RADIO CORNER, 138, GRAY'S INN ROAD, LONDON, W.C.1. (Phone TERminus 7937.)

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EXPERIMENTAL KITS in Radio, T.V. etc.

LEARN THE PRACTICAL WAY

Specially prepared sets of television parts (which you receive upon enrolment) with which we teach you, in your own home, the working of circuits and bring you easily to the point when you can construct and service a television set. Whether you are a student for an examination; starting a new hobby; intent upon a career in industry; or running your own business — this Practical Course is intended for YOU — and may be yours at very moderate cost.

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IC.55

TELENEWS

Rector Attacks Television

IN a parish magazine, a Lincolnshire Rector attacks television as being the chief cause of diminishing congregations in his church and describes TV programmes as "dreary rubbish."

In an open appeal to his parishioners, he says: "Again and again I have warned you that the aim of life is to live and not to watch other people pretend to live."

TV Station In Every City

MR. ROY THOMSON, who owns newspapers in this country and Canada, told the Canadian Club of Glasgow recently that TV stations were being built in all Canadian cities with a population of over 50,000 and that he considered it necessary for all reasonably-sized cities to have a station to use for local affairs and events.

Television Licences

THE following statement shows the approximate number of television licences issued during the year ended November, 1954. The grand total of sound and television licences was 13,794,195.

Region	*Number*
London Postal ...	1,048,354
Home Counties ...	425,999
Midland	756,905
North Eastern... ...	568,770
North Western ...	574,733
South Western ...	191,443
Wales and Border Counties	211,764
Total England and Wales	3,777,968
Scotland	203,230
Northern Ireland ...	18,426
Grand total ...	3,999,624

Roman Catholic Adviser

FATHER AGNELLUS ANDREW, who has acted as adviser to the BBC on Roman Catholic broadcasts since 1945, with his base at Manchester, has been appointed full-time assistant to the Head of Religious Broadcasting.

This appointment, we understand, does not presage an increase in Roman Catholic broadcasts.

"The Significance of TV"

ACCORDING to Sir George Barnes, BBC Director of Television Broadcasting, at least one home in every four possesses a television set. Lecturing at Leeds University on "The Significance of Television," Sir George said that the BBC television service had been brought within the reach of nine homes out of ten in the past five years, and that during last year alone over one million TV licences were taken out.

More on H.P.

SALES figures indicate that six out of ten television receivers are bought on the hire purchase scheme.

Americans See "Aladdin"

A RECENT American TV newsreel featured a traditional English pantomime to show to United States audiences a type of family show that is non-existent over there.

Excerpts from "Aladdin" at the Chelsea Palace were filmed for the newsreel with Violet Pretty as Principal Boy.

From Films to TV

IT is learned that Associated-Rediffusion, Ltd., the commercial television company formed by Broadcast Relay Services and Associated Newspapers, are negotiating the purchase of Wembley Film Studios which are controlled at present by Twentieth Century-Fox.

World Colour Television

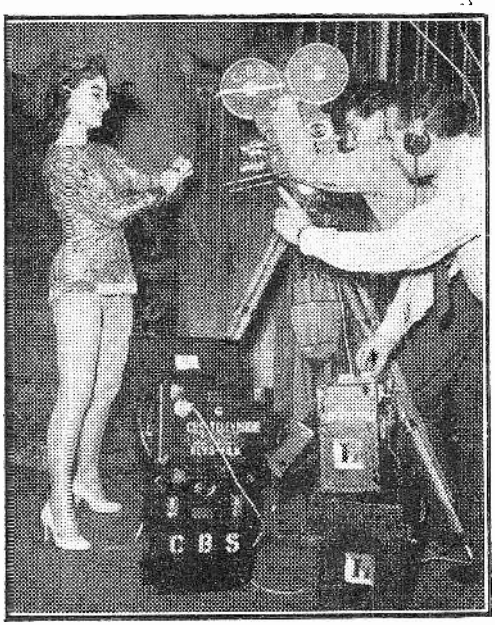
IN a paper on "Insulation of submarine telephone cables," which was read recently to the Royal Society of Arts in London, Mr. J. N. Dean said that there was a strong possibility within the next 10 years of world-wide colour TV being transmitted by cables under the sea.

Mr. Dean is chairman and managing director of Submarine Cables, Ltd.

Mr. George Campey

MR. GEORGE CAMPEY has succeeded Mr. Huw Wheldon as Television Publicity Officer for the BBC.

He was the *Evening Standard's* radio correspondent for five years



Violet Pretty, Principal Boy in "Aladdin" at the Palace Theatre, Chelsea, rubs her magic ring while cameramen John Tiffin and Frank Binney shoot the film sequence to be transmitted to American audiences.

and will now work directly under Mr. John Hytch, Chief Publicity Officer, Home.

Schools' Own Service

THE School Broadcasting Council for the United Kingdom and the BBC has stated that a television service for schools will begin probably in the autumn of 1957 or the early months of 1958. Local education authorities in England, Scotland and Wales have agreed to equip their schools when the programmes are due to begin.

The Conversion Problem

THE managing director of a London TV company estimates that it would take three years, working five and a half days a week, to convert all the sets sold by his company to the commercial wavelengths.

As it takes a good hour to fit a converter to a receiver, it is only possible to get through a small number of sets in a day.

Marooned On Aerial

NO transmission was possible from the Rowridge station recently when three BBC riggers climbed the mast and found themselves unable to descend after a fierce gale had begun to blow.

The riggers had gone up the 200-feet mast to rectify a fault that had developed. The winds were so strong, however, that they could not even carry out the necessary repairs and had to remain aloft during the time that Children's Hour was due to be transmitted. They were down in time for the evening's programme and were unharmed in spite of the cold and wet weather.

A licensee in South-west London has had a Nera Ceiling Projection receiver installed. This leaves floor space clear, and remote-control of the picture from behind the bar prevents the set's misuse by customers.

Always TV First

A SOUTHAMPTON insurance collector has reported that many of his customers are surrendering their insurance policies in order to put down a deposit on a television receiver.

Licence Rush in Leamington

VIEWERS in Leamington, Warwickshire, heard shortly before Christmas that the TV detector van would soon be touring the district to hunt out some of the "pirates" who were looking in without licences in the Spa.

Within a month licence figures had risen seven times but the van did not come. Said Mr. J. Kirkwood, head postmaster: "There is more evasion in the more heavily populated areas and the van has concentrated on these."

Tele-Luxembourg

AT the time of going to press, it is expected that Radio Luxembourg will commence a new television service some time in January to be known as Tele-Luxembourg.

The service will cover large areas of Northern France but there is little possibility of it being introduced in this country for quite some time because of technical and legal difficulties.

New Rules for Manufacturers

NEW regulations concerning the manufacture of sets are to be drawn up by the British Standards Institution to ensure that the correct heat-resisting materials are used in latest models employing high voltages.

This is to be done in the interests of the safety of all who handle television receivers.

Treasure Hunt

ONE night in May, 1866, the U.S. clipper ship *General Grant* sank in the waters off the Auckland Islands, south of New Zealand. In her hold lay £2 million worth of Australian gold.

To this day, all efforts to salvage it have failed. Now another attempt is to be made—using underwater television.

TV in Aircraft Industry

THE de Havilland Aircraft Company have installed a television system in an aircraft for detecting the presence of flame in a new engine which they are trying out in the bomb bay of a test aircraft.

The TV camera, which is prefocused and controlled by the navigator in the pilot's cabin, watches the test engine in complete darkness through a heat-resistant glass window and, as long as the small monitor on the pilot's dashboard is blank, he knows that everything is working satisfactorily.

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

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

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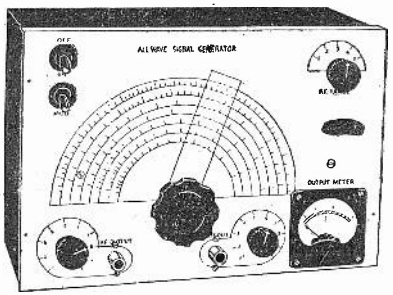


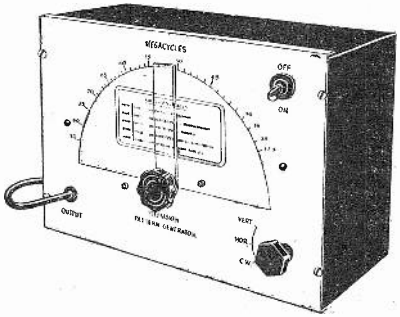
COMPLETELY BUILT SIGNAL GENERATOR

Coverage 120 Kc/s-320 Kc/s, 300 Kc/s-900 Kc/s, 900 Kc/s-2.75 Mc/s, 2.75 Mc/s-8.5 Mc/s, 8.5 Mc/s-25 Mc/s, 17 Mc/s-50 Mc/s, 25.5 Mc/s-75 Mc/s. Metal case 10 x 6¾ x 4¾in. Size of scale 6¾ x 3¼in., 2 valves and rectifier. A.C. mains 230-250 v. Internal modulation of 400 c.p.s. to a depth of 30 per cent., modulated or unmodulated, R.F. output continuously variable 100 milli volts. C.W. and mod. switch, variable A.F. output and moving coil output meter. Black crackle finished case and white panel. Accuracy plus or minus 2%. **£4/19/6**, or **34/-** deposit and 3 monthly payments **25/-**. P. & P. 4/- extra.

EXPORT ENQUIRIES INVITED

(N.B. Post and packing charges stated apply to British Isles only.)

Both generators guaranteed for 12 months



PATTERN GENERATOR

40-70 Mc/s direct calibration, checks frame and line time base, frequency and linearity, vision channel alignment, sound-channel and sound rejection circuits and vision channel band width. Silver plated coils, black crackle finished case 10 x 6¾ x 4¾in. and white front panel. A.C. mains 200/250 volts. This instrument will align any T.V. receiver, accuracy plus or minus 1%. Cash price **£3/19/6** or **29/-** deposit and 3 monthly payments of **£1**. P. & P. 4/- extra.

Used Mazda C.R.M. 123 Cathode heater short aluminized. Complete with rubber mask Elac P.M. focus unit, scan coils, low line, low frame and frame o.p. trans., **£5.10.0.** P. & P. 7/6.

Used Mazda 12in. C.R. Tube 121, 121A heater cathode short. **£3.7.6.** P. & P. 7/6. Guaranteed 3 months.

Used Mazda 9in. C.R. Tube, heater cathode short. C.R.M. 92 & 92A. Guaranteed 3 months. **37/6.** P. & P. 7/6.

9in. T.V. Cabinet in polished walnut, complete with chassis, **20/-** post paid.

USED 9in. TUBE with ion burn, **17/6,** post paid.

USED Mullard 12in. with ion burn, **50/-.** P. & P. 7/6.

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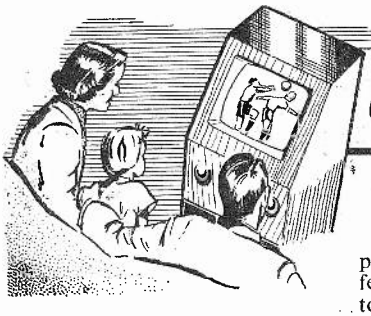


UNDERNEATH THE DIPOLE

TELEVISION PICK-UPS AND REFLECTIONS

By Iconos

WEMBLEY TV STAGES

SPONSORED television is beginning to make itself felt in many ways: financially, in the personnel market and in bricks-and-mortar. The purchases (and rumours of purchases!) of film studios for conversion to TV stages continue, supplemented by reports of theatres and music halls being leased or bought for similar purposes. The most ambitious and practical move so far amongst the sponsored TV concessionaires seem to have been made by Associated-Rediffusion, Ltd., who have purchased from 20th Century Fox the compact and well-appointed Wembley Studios. This plant comprises one large stage, 116ft. x 86ft., and a tiny 45ft. x 25ft. stage, together with all the usual associated workshops, offices, dressing rooms, review theatres and cutting rooms. The power plant comprises three motor-generator sets capable of delivering 600 kW of direct current to the stages. But this is not all. The roof is missing from a third stage, 65ft. x 40ft., which burned out some years ago. This is to be rebuilt immediately and the large No. 1 stage is to be divided into two smaller stages by the construction of a sound-proofed wall across its centre. This will give rediffusion a properly fitted stage area of over 13,000 sq. ft. compared with the 12,000 sq. ft. recently acquired by the BBC at Riverside Studios, Hammersmith, and the 30,000 sq. ft. available at Lime Grove. Further extensions at Wembley are possible, because the site includes building land acquired from the Wembley Exhibition grounds. In the meantime, reconstructional work will go ahead with the object of being ready for the installation of electronic and film equipment by July, 1955. The appointment of Roland Gillett to the post of Controller of Programmes is an excellent one. Mr. Gillett has been producing top-line American TV features for some years, but prior to that was associated with several important British film productions, notably *49th Parallel*, which he jointly produced with Michael Powell and which won an "Oscar."

THE GRANVILLE

ONE of the principal requirements of a studio for TV is that it should be in a central location, handy for theatres and West-end. Wembley Studios are not exactly central, but are conveniently located for the fast electric train services from Wembley Park to town. It is not at all comparable with the hour or more's journey to the big film studios at Pinewood, Shepperton or Elstree, which seem to be way out in the "outback." Where else near town can the TV sponsors find ready-made studios? Following the example of the BBC, who purchased the Shepherds Bush Empire (1,680 seats) from the Stoll Theatres to make it into a TV theatre, the old-established Granville Music Hall, Walham Green (725 seats) has been bought for the same purpose. This theatre must have been one of the smallest designed by Frank Matcham, the eminent theatrical architect who built most of the Moss and Stoll houses, including the London Coliseum. The Granville was opened in 1898 and the first bill included Dan Leno, Charles Bignell, Cora Stuart, James Fawn and—believe it or not!—Bransby Williams, the only member of that illustrious company still alive. Bransby presented characters from Dickens' "Old Curiosity Shop" in the first music hall programme there. It would be most appropriate if he took part in its re-opening as a TV studio. During its 56 years the Granville has changed hands many times and in addition to variety has played repertory, Grand Guignol, touring drama, Shakespearian, Shaw and Ibsen seasons, finally ending in revues in which scanty costumes were at their scantiest. It is pleasant to record that this little theatre, the smallness of which was its greatest handicap, is to be retained in show business. Frank Matcham's auditoriums are too good, too saturated with theatrical lore, to be turned into furniture stores! I notice that the Empire, Kingston-on-Thames (1,522 seats) is to be sold by auction at the end of January. The auctioneer's advertisement cheerfully states "ideally suitable for development as shops with offices." Let us hope that the friendly atmosphere of that cheery music hall is also maintained in the interests of TV.

LONDON COLISEUM

HOW delightful was the unexpected late-night visit to the stage of the London Coliseum, cleared of scenery and props after the night's performance of "Can-Can." Apart from the charming introduction of some of the oldest members of the staff, it was pleasant to meet the genial—but on this occasion, shy—manager, Sam Harbour, and the two youngest members of the cast of the musical play. The London Coliseum has always had something of a link with TV, for the late Sir Oswald Stoll was the first West-end manager to realise the advertising possibilities of allowing excerpts of his shows to be televised. That was a very long time ago, in 1937 or 1938, when there were very few TV licences—less than 100,000. I believe that the show was "White Horse Inn." Sir Oswald expressed satisfaction with the results—he was one of the earliest viewers.

ANGRY TELEPHONE CALLS

DURING recent weeks the BBC has been subjected to more than the normal quota of telephone calls from irate viewers. Twice, within a few days, leading comedians have been faded out at the climaxes of their acts. Fred Emney was subjected to this indignity as he was about to engage in a comedy mock fight

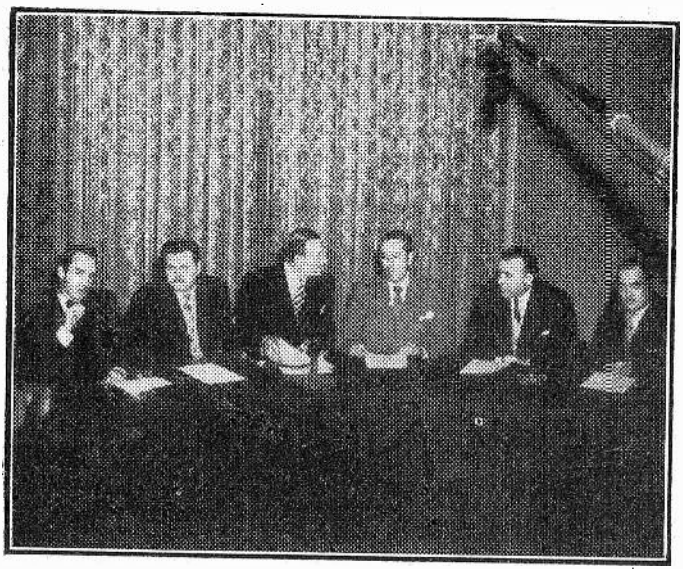
with Tommy Farr, when the "time chopper" came down and the viewer was switched over to a piano recital. Then followed hundreds of angry 'phone calls to Lime Grove Studios. A few days later, Max Wall, the droll musical comedian, was settling down to his excruciatingly funny piano recital routine when—woof!—down came the guillotine, and he was replaced by an ex-miner author giving a talk. The fade-outs may have been essential from the time schedule point of view—but in each case, two or three minutes over-run would have finished the acts properly and also done more justice to the pianist and author who followed the fatuous fade outs. I have one question for Sir George Barnes on the question of fade outs on TV. Is there on record any occasion when a so-called "cultural" item has ever been faded out? Or have I (and all my friends) been unlucky in our experiences of being cut off only from light and comedy items?

The third occasion was during the presentation of Orwell's "1984," about which almost everything possible, both *for and against*, has already been said. The "Big Brother" gag was a timely gift to the comedians for the pantomimes and has been flogged to death. I will merely repeat a suggestion I made in this column about four years ago: let the title of every TV play carry with it a letter "U," "A," "H" or "X" which will indicate the category of the subject matter, in the same manner as do films. It is a punishable offence for film titles to be advertised publicly without indication of the type of certificate granted by the British Board of Film Censors. If radio titles carried similar seals in all programme announcements in the press or elsewhere, viewers would be reminded in advance when *not* to switch on, if they don't like "H" or "X" subjects. Think of the time, electric current, and telephone calls that would be saved!

BBC AND B.F.P.A.

IT is also pleasing to record that another pious hope expressed in this column quite recently has come true. I refer to a get-together between BBC engineers and technicians of the film studios, as represented on committees of the British Film Producers' Association.

A measure of agreement has been found in the procedure, standards and handling of sprocketted magnetic film for sound recording. The BBC already owns many optical and magnetic sound channels at its TV studios at Alexandra Palace, Lime Grove, Manchester and Riverside Studios. The B.F.P.A. have decided against the use of 17.5 mm. sprocketted magnetic film and will standardise on the full 35 mm. magnetic film travelling at 90ft. per minute. This enables a great deal of editing, splicing, projecting and recording apparatus to be readily adapted from optical sound to magnetic sound. The BBC engineers preferred a speed of 93.75ft. per minute, equivalent to 25 frames per second, for obvious reasons.



McCann-Erickson Advertising, Ltd., one of the world's largest advertising agencies—it operates in 16 countries with a staff of over 2,000—have established an Operations Board to produce television commercial films in this country. Members of the Board are seen at the first conference (left to right): John Irwin, Derrick Wynne, Barry Barron, John Reed, Eric Robinson and Jimmy Grafton. Although the experts are under contract, they are still free to work for the BBC.

VARIETY UP TO DATE

THERE are many people ready to maintain that BBC standards in variety presentation are not high. I don't altogether agree with this point of view. There are occasions when really first class performers just don't get over on TV due to inexperience of the mechanics of a television studio. Nevertheless, my faith in the BBC has been somewhat shaken by the steady deterioration of Richard Afton's "Quite Contrary," which somewhat aimlessly presents a number of musical and comedy turns of very middling character. I thought that George Fierstone was quite a virtuoso of the drum and the liveliest performer of the show; but his band lagged behind him rather tunelessly and the other performers did likewise.

What is it that gives an artiste the something which indicates mastery over the blood-thirsty mechanics of the TV studio? So far as variety artistes and musical performers are concerned, I think it is the way they look at the TV camera, and their readiness to switch that look to which ever camera is alive. A friendly expression, eyes focused on the appropriate TV camera lens, a confident manner and you're there! The "eyes" have it! Max Miller, Tommy Trinder and Arthur Askey are comedians who know how to look at a TV camera. BBC producers don't always take advantage of this by sufficient use of the close-up.

AN EXCELLENT PARTY

"A Party For Christmas," televised during the Christmas period, was an excellent choice for the season. Acting honours went to Charles Victor; production was by Eric Fawcett.

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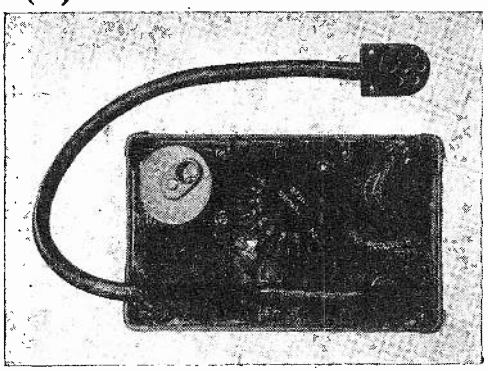

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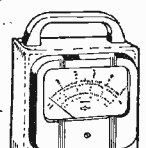

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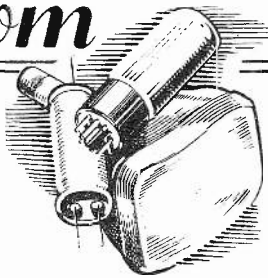

MULLARD EQUIVALENTS OF U.S. THYRATRONS

THYRATRONS of all kinds are becoming increasingly important in industrial electronics for relay operation, and for motor and process control. The Communications and Industrial Valve Department of Mullard, Ltd., now have available a range of nine standard types which can be used to replace a large number of United States thyratrons used in industrial control equipment. These thyratrons facilitate the servicing of certain electronic U.S. equipment imported into the U.K. after the war. They are also of interest to manufacturers of equipment intended for export to countries in which U.S. thyratrons are already in use.

The Mullard range comprises two low-current thyratrons EN32 and EN91/2D21 for relay control; three high-current mercury vapour types XG1-2500/MT57, XG5-500/MT17 and XGQ2-6400/MT105 for motor and process control; two high-current rare-gas types, XR1-3200/5544 and XR1-6400/5545 for the same purpose; and two cold-cathode relay tubes Z300T/1267 and Z900T/5823.

It should be pointed out that the type numbers of U.S. thyratrons are not standardised like those of receiving-type valves. Each manufacturer has his own numbering system and for this reason electrically identical thyratrons are marketed under a variety of type numbers. A single Mullard thyratron can, therefore, replace a variety of apparently different U.S. types. The Mullard XG5-500/MT17 is a direct replacement of 11 U.S. thyratrons.

A table showing American thyratrons and their Mullard equivalents is given below.

AMERICAN THYRATRONS	MULLARD DIRECT EQUIVALENTS	Cathode	Gaseous filling	Max. mean current (a)	Max. peak current (a)	Max. anode forward voltage (kV)	Max. anode inverse voltage (kV)
2050*	EN32	Thermionic	Xenon	0.3	2.0	0.65	1.3
2D21	EN91	Thermionic	Rare-gas	0.1	0.5	0.65	1.3
GL87 WL57 WL631 1257 5559 CE309 EE17 FG17 NL715 TT17	XG1-2500	Thermionic	Mercury-vapour	2.5	15	1.0	1.0**
WL17 272 0517 4261 5557 38217	XG5-500	Thermionic	Mercury vapour	0.5	2.0	2.5	5.0
FG105 WL105	XGQ2-6400	Thermionic	Mercury-vapour	6.4	40	2.5	2.5
5544	XR1-3200	Thermionic	Rare-gas	3.2	40	1.5	1.5
C16* C6J* 5545	XR1-6400	Thermionic	Rare-gas	6.4	80	1.5	1.5
OA4G* 1267	Z300T	Cold	Rare-gas	0.025	0.1	0.26	0.24

* The Mullard valve is a near equivalent of this American type.
** 1.5 kV for condensed mercury temperature up to 75 deg. C.

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Etronic Radio and TV Service

Mr. Pearson, who was service manager for the Etronic company, is fully equipped for servicing of the company's sets.—R. Pearson, 156, South Ealing Road, W.5.

ARCOLECTRIC SIGNAL LAMP

ARCOLECTRIC are now producing a new mains voltage signal lampholder. It has been designed for use with standard 15 watt B.C. pigmy lamps, for all mains voltages up to 250, but is supplied without lamp.

The catalogue number is S.L.100, it is individually boxed and the list price is 21s.—Arcolectric (Switches) Ltd., Central Avenue, West Molesey, Surrey.

Fundamentals of Thermistor Practice

WHAT THEY ARE, AND THEIR USE

By E. G. Bulley

THE current technique adopted by most manufacturers of television receivers is to use the A.C./D.C. arrangement formerly so popular in radio receivers. As most readers know, in this scheme the expense of a transformer is avoided (and incidentally the stray field is also removed) and the heaters are joined in a chain across the mains supply. The picture-tube heater is also included in this chain. To avoid damage due to surges the chain also includes a Thermistor and this component is apparently not so well known as it should be. The following notes are, therefore, offered for those to whom this item presents something of a mystery.

Thermistor is a name given to a resistive element which is sealed into a glass envelope and having what is termed a negative temperature coefficient and a more or less linear characteristic. That is to say, a Thermistor will pass a current which is proportional to the voltage difference that exists across it, assuming, of course, that the Thermistor is operating at a constant temperature. In the States such tubes are known as Varistors; this is mentioned in case the reader may at some time or other read about them.

The action of the Thermistor is best classified as belonging to the electronic field, the resistive element being in the form of a bead usually made from uranium dioxide or nickel-manganese oxide. Nevertheless, other metallic oxides have been and are used. All these, however, belong to the semi-conductor class.

This bead is fused to very thin support wires, these are in turn spot welded to the lead-wires that are sealed into a glass stem. The resistive element or bead is heated when a current is passed through the lead wires. One must, however, bear in mind that such elements are not in electrical contact, but only what may be termed thermal. Therefore, one will appreciate that the Thermistor is purely a thermal resistor.

The resistance is more or less a function of the power dissipated in the element, and such tubes can be obtained either as directly or indirectly heated types.

Thermistors are to-day used in many research and development laboratories and are found in various types of bridge circuits, the basic one being the Wheatstone. When used in such circuits they form one arm of the bridge network. They are, therefore, useful in electronic and radio measurement circuits, especially in the microwave region. Thermistors can be used for the measurement of small R.F. currents and are now finding their way, as mentioned above, into universal receivers in place of the barretter.

TV Society's Exhibition

THE above exhibition was held in the gymnasium of University College, Gower Street, London, from Thursday, January 6th, to Saturday, January 8th.

The following companies had exhibits :

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Dubilier Condenser Co., Ltd.
Derby & Co., Ltd.
Edison Swan Electric Co., Ltd.
Electrical Engineering Dept. University College.
Ferranti, Ltd.
Ferguson Radio Corporation, Ltd.
Fielden, Ltd.
Fortiphone, Ltd.
General Electric Co., Ltd.
Hallam, Sleigh & Cheston, Ltd.
H. K. Lewis, Ltd.
Leland Instruments, Ltd.
Livingston Laboratories, Ltd.
Marconi, Ltd.
Mullard, Ltd.
Murphy Radio, Ltd.
Mole-Richardson (England), Ltd.
Post Office Research.
Phillips Electrical, Ltd.
Standard Telephones & Cables, Ltd.
Telegraph Condenser Co., Ltd.
20th Century Electronics, Ltd.
Whiteley, Ltd. (Stentorian).
Wayne Kerr Laboratories, Ltd.

All the exhibits were concerned with the research side of television and some of the more interesting exhibits are indicated below :

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FAULTY LINE OUTPUT VALVE

About two years ago I built the "Practical Television" receiver. It has worked well until recently, when the line output valve developed an heater-to-cathode short. When I replaced the valve with a new one, sparking occurred inside the valve. This stops if the picture is reduced to half the normal width, but any increase in width causes the sparking to return. Also, after the set has been on about half an hour with the reduced picture a hissing sound comes from the timebase. I have replaced all the condensers and resistors in the line output circuit, but this has no effect.—A. Ogden (Keighley).

These symptoms may indicate that the replacement line output valve is in some way defective—in the first place, therefore, you should check on the efficiency of the valve. If the valve appears normal, a flashover in the line output transformer may be inducing the valve flashover. This may also account for the "hissing" noise, which you mention seems to be emitting from the line timebase.

MURPHY V200

Can you tell me what is wrong with my set (Murphy V200)? This set has been in and out of the dealers and the last time it came back it was O.K., but not a strong picture. Last Sunday when I switched on it came on as usual, then it slowly faded out but sound was O.K. I got hold of the contrast control to turn it up and in doing so I found that if you give a small outward pull the contrast comes back with a white glare, which you can turn down at the sensitivity control and you get a picture as good as when the set was new, if not better. There is one thing, also, which may lead to a clue. Once or twice when a light has been switched on in the house the contrast has come on with a glare, which has to be turned down again to get a picture; also when the picture is good there is heard a click in the set, which may come from the loudspeaker, then the picture turns weaker.—J. Moneur (Gateshead).

The effects you describe are symptomatic of a faulty electrical connection in the vicinity of the contrast control circuit. You should remove the chassis from the cabinet, and carefully investigate this section of your receiver. You will almost certainly discover a dry-joint or poor connection on a component or tag mechanically connected to the contrast control assembly.

ADDING A FIVE-CHANNEL TUNER

Please could you forward to me details of how to connect the Cyldon Teletuner to a TV set? I inquired at the firm where I purchased it, but they could not furnish me with details.—G. W. Lees (Nr. Selby).

Your problem is not so simple as may first appear. For instance, the Cyldon five-channel TV tuner represents the first two stages of a normal television set, embracing the R.F. amplifier and frequency changer. It is designed to have an I.F. output of either 9.5—14 Mc/s or 15.5—22 Mc/s. This means, then, that first of all it will be necessary to modify your receiver to correspond to one or other of the above intermediate frequencies. Having done this (assuming, of course, that yours is a superhet receiver) the tuner should be wired into the receiver in place of the original R.F.—frequency changer section. This should not present much of a problem from the H.T. point of view, though from the L.T. aspect it may be found that the valves used in the tuner possess a heater rating different from the valves in your receiver. If this is the case, a heater transformer may solve the problem with little difficulty. You should wire the signal section of the tuner into your receiver to correspond to your particular receiver circuitry and the circuit of the tuner.

AERIAL CONNECTIONS

I am using a Bush TV which has coaxial input. I have a Pye D18T which has twin feeder input. There are times when I want to use the Pye. It is not convenient to put in another aerial either outdoors or indoors. Can you advise me on this, please?—E. Smith (N.19).

Since you are close to a transmitter it is quite in order to use a coaxial input to your Pye. We have found that even in fringe areas the employment of an unbalanced to balanced transformer is hardly ever warranted.

COSSOR MODEL 921

My set is a 12in. Cossor five channel, Model 921, and the trouble I am experiencing is the picture has reduced to approximately a 3in. band across the centre of the tube.

When it first went down to this, it remained like this for about 15 minutes, then someone switched a light on and the picture went back to full and remained so, except for a few flickers at the bottom, for about seven minutes, then it flickered again and reverted to a narrow band again, with a darkish line about ¼in. wide at top and a bright line about the same at the bottom.

I am getting the full line scan, but unable to get the full vertical scan. Up to the moment I have tried a new 6SN7, have had the 7C5 checked and this has proved O.K. I have changed the position of the two 7C5s, also changed 6AM6 with one in the vision strip, all these changes still giving exactly the same picture.

I have checked on the height control, this seems to work O.K. The picture goes much narrower as this is rotated one way and only slightly wider than the 3in. band when rotated the reverse way.

Up to the moment I have not tried anything further and would appreciate any advice you can give me. —W. J. Tew (Leamington Spa).

Several cases of the symptom described on the same model receiver as yours have been proved to be the result of an intermittent fault in the frame blocking oscillator transformer. In the first place, therefore, we would advise that you check on this part, and also bear in mind that a similar effect could be caused by a defect in the frame output transformer, or in any other of many components associated with the frame timebase.

MURPHY V150/L

I possess a Murphy type V150/L table model television and require some help. Evidently the sound is running into the vision and I cannot locate the oscillator coil to readjust it. On a loud passage of music (or sound) and as it increases, a waver crosses the picture. The set is about four years old. Although I am fairly well acquainted with radio I am only on the "fringe" of television. Incidentally, at the base and underneath the end of the tube there are two coils in cans with a valve in between them, neither seem to affect the picture or sound.—F. Lee (St. Margarets).

In the far right-hand corner of your chassis, when viewing from the rear of the cabinet, you will observe a 10F1 valve. In front and slightly to the right of this valve (towards the rear of the chassis) you will notice a core adjustment. This is the adjustment for the local oscillator, which should be set for maximum sound consistent with minimum sound interference on vision.

BUSH TUG34

I shall be very grateful if you can help me with the following. I have just had C.R. on my Bush TUG34 receiver replaced after less than two years' very careful use, the old tube was the Mullard MW36-22, the new one being the MW36-24. I notice that the ion-trap magnet is secured with arrow about ⅜in. to one side of the line on neck of tube. Is this correct, judging from an article in your June issue it would appear not to be and I am rather worried ? Another thing is that the frame hold will only lock the picture at one end of its travel, whereas before it locked half way. What could be the cause of this ? I hesitate to call in the firm who fitted the new tube as since the set was returned I have found so many faults which appear to me to be due to gross carelessness. The picture quality is fair, but not as good as before and this only after a good deal of readjustment by myself. I wonder if you could give me more details of the slot TV aerial for channel two Holme Moss ? What is its gain in decibels ?—J. B. Shepherd (Liverpool).

It is most important to ensure that the ion-trap magnet is adjusted—as described in the article to which you refer—for *maximum* picture brightness. This correct position may not necessarily be the same as that when the arrow on the magnet accurately coincides with the line on the neck of the tube. The line and the arrow are aids for facilitating a rough adjustment only.

Generally speaking, the gain of a slot aerial over a normal "H"-type is in the region of 2 to 3 dB.

EKCO T.S.1114

I am having trouble with my Ekco Television Model T.S.1114. The top half of the picture will not come down quite enough, and after about half an hour the picture creeps up about ½in. at the bottom. I have changed V.7 6K25 and V.8 SP61. Frame linearity control is at the end of its travel. H.T. volts are O.K. (Taken with large Avometer.)

Could you please tell me in which part of the frame T.B. the trouble may be ?—A. G. L. Taylor (Sutton Coldfield).

The symptom described is usually due to valve trouble, but if you are certain as to the goodness of the timebase valves, you should suspect an alteration in the value of an associated resistor as the temperature of the receiver rises.

Check the following resistors for value when cold and when hot : the 330 ohm resistor in the cathode of the frame amplifier (SP61) ; the 47 ohm resistor in the anode of the frame amplifier ; the 330 K. resistor connected to the frame linearity control ; the anode and cathode resistors of the 6K25 valve.

K.B. EV40/L

I shall be most grateful for any information you can give me on the following faults :

1. Faint sound.

2. No vision.

I have no test equipment.—L. E. Belton (Winchester).

If the symptoms described suddenly occurred you should investigate for a fault in the three stages which are common to both sound and vision. Viewing the chassis from the rear of the cabinet, you will observe a triangle of three 8D3 valves in the far right-hand corner. In the first place you should have these valves tested for emission, and replace them if necessary. If the valves appear to be up to standard, an open-circuit screen-feed resistor or a capacitor associated with the valves may be responsible.

"VIEW MASTER"—12in. MODEL

I have a "View Master" 12in. Table Model, 18 months old, built on the layout of the sixth edition, but less additional E.H.T. boost circuit and less auto mains transformer. The voltage at choke input is 250, and at output 248. G2 at V1, 2, 3 and 5 are 200, 200, 215 and 245, pos. end C32 165, G2 V8, 250. G2, V10, 215, across C42, 28, across C51, 48, V12, A and G2, 240, bias V5, —2 volts. The A.C. input is 240 volts. C.R.T. K, 170, G. 120. I regret I do not know where to test for boost point for V10, which should be 323 volts, also A1 on C.R.T. The tube is a Ferranti T12/44. Can you please advise where to check for the lost voltage ?—Abel Holdcroft (Stoke-on-Trent).

The boosted H.T. voltage is measured from the junction of MR2 and C42 to chassis, and this should measure around 323 volts. It can also be measured directly across C42, in which case the boost volts should be around 38 volts. From your figures it would appear that your H.T. is low since for an A.C. input of 240 volts the D.C. supply should be at least 275 volts.

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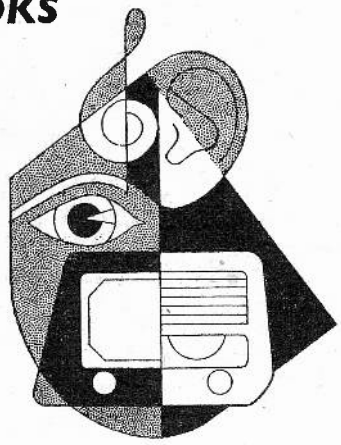

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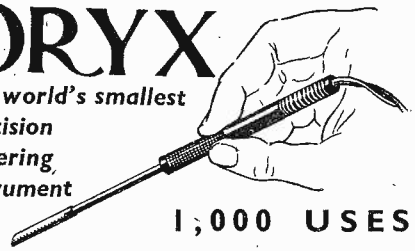

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CORRESPONDENCE

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

HINT FOR BETTER VIEWING

SIR,—Other readers of your journal may be interested in a small tip I used recently to improve my picture.

During the Arsenal-Spartak match at Highbury in November, play was difficult to follow at first because of considerable ground mist and slight fog. The commentator told viewers of the conditions and apologised for any poor pictures being received. In these circumstances, turn down the brightness control a long way until all that is visible on the tube are the faint figures of the players; all whiteness, including the mist, is so faint that it cannot be seen, only the dark figures of the players themselves. Then turn up the contrast control to emphasise these dark figures and they will stand out remarkably well. The picture received in this way is not so clear as normal, but it will enable the viewer to follow the game easily without having those taking part literally "lost in the fog."—J. WOOLGAR (Lee Green).

NOVELTY CAMERA WORK

SIR,—I must congratulate the producer and those associated with the television programme "Sportsview." When switching from one studio to another, we are not given the usual "fade-in" and "fade-out." Each new shot is welded into the next one as if being "peeled off." Never are our screens blank for a second. Cannot other producers use this trick? I should certainly like to know how it is done. —R. D. COX (Hull).

SERVICING H.M.V. 3807

SIR,—Here are some details which may help or interest other readers:

The Set.—H.M.V. No. 3807, 10in., which is almost the same as Marconi chassis 1807, etc.

The Trouble.—Inserted a new B36 valve and both horizontal and vertical holds went to the farthest extent of their travel. Another new B36 was just the same.

Horizontal Hold.—I cured this, bringing it central again by reducing the resistor R33 from 390 KΩ to 360 KΩ. (Note: Some models have 330 KΩ.)

Vertical Hold.—I tried increasing the 10 KΩ on one end of the slider resistance to 22 KΩ, then decreased it to 3.3 KΩ with no difference in the performance. I then fitted 22 KΩ and 10 KΩ in series and still no difference, but I left these connected and reduced R55 from 3 MΩ to 2.2 MΩ, and this sent the control central and it worked perfectly.—W. TAYLER (Hull).

R3118

SIR,—In answer to Mr. B. L. Morley's request for information on units R3118, I have purchased one and am glad to supply you with this description:

R3118B, Serial No. 124, Ref. No. 100B/1868. (AM)

Front panel is identical with description in PRACTICAL TELEVISION

V1 has been removed, together with valveholder and grid and anode components.

Valves 2 to 11 are as in your circuit in PRACTICAL TELEVISION.

V12 in my unit is VR65.

V13 in my unit is VR65.

The chassis is drilled for V14 VR92, but it's quite obvious that V14 and its components have never been fitted.

There is no V15, and V16 is the rectifier.

Comparing the unit with chassis layout Fig. 8, can L11 is missing, and does not appear to have ever been fitted.

I have not yet carried out any mods. on the unit, but am looking forward to so doing later. I am a novice, and have built an "Argus" TV, and am getting very good results. I am wondering what I shall be able to do about the missing can L11. —L. TOWLER (Leeds, 12).

ZC8931

SIR,—In common with Mr. Twist, I, too, was rather puzzled by the ZC8931 modifications. My model is the same as that described in his letter, and I bought it as a 1½ meter superhet.

I have in my possession some "gen" on the conversion of the set to Sutton Coldfield vision channel, and if Mr. Twist cares to get in touch with me I will let him have a copy with pleasure.

Regarding the power supply plug, the connections are as follows:

Inside of plug with cover off: A, HT-ve; C, 250 v. H.T.+ve; B, 6.3 v E; D, 6.3 v.

The conversion uses another set for sound reception, but I think that is unnecessary as the sound and vision may be passed through one common I.F. stage, then separated, using two more I.F.'s on vision and one on sound, leaving the sixth for conversion to sound output. The existing detector and output to serve for vision. Hoping this may be of some use to other readers.—A. SMITH (Lincoln).

[*See also data on this unit on pp.* 388 *onwards.*—ED.]

"CANNED SOUND"

SIR,—I cannot entirely agree with Mr. B. Cook, of Charlton, whose letter appeared in the January issue.

He states that commercial television will mean the advent of more and more filmed programmes and that "canned" vision will mean "canned" sound which is unsuitable for reproduction through the medium of television. This is not so. It must be remembered that a "live" shot is taken only once, but on film it may be taken a dozen times before perfection is reached and the one "live" shot may be far from perfect. This also applies to sound. No producer will transmit a filmed programme if the sound is not as he wishes it to be and he has all facilities and the time he needs to make it so.—R. J. BEAL (Coulsdon).

QUERIES COUPON

This coupon is available until Feb. 21st, 1955, and must accompany all Queries.

PRACTICAL TELEVISION, FEB., 1955.

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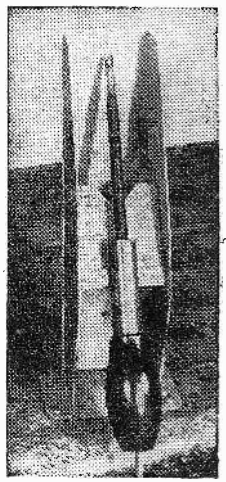

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6V6	8/6	SC215	2/6	VU133	3/-	VR118	5/6
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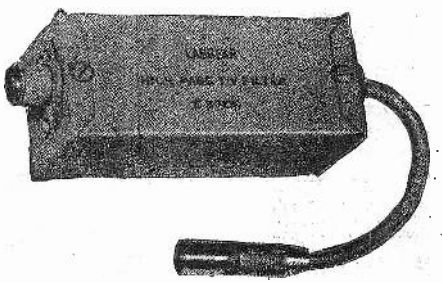

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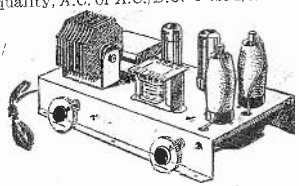
TEST TUBES, 30/-. Most makes and types, all work Perfectly, but have Cathode to Heater shorts or slight burn, ideal for testing or spares. Insured Carriage 15/6.
AMPLIFIERS, 77/6. Push-pull. 4 valve and rec. Full tone range, variable. Output 3-7-15 ohms matching. A.C. or Universal. Post 2/6.
AMPLIFIERS, 57/6. 4 watts. 3 valves. Switched tone range 2-5 ohms output. Good quality, A.C. or A.C./D.C. Post 2/6.
AMPLIFIERS, 7/6. X. W.D. Less valve. Complete with FREE Drawings. Post 1/6.



LADIES ONLY.—Treat the lady and yourself to a heated blanket for the home. **37/6** brings a complete heater kit that a lady can fit by herself unaided—with free drawings.
T.V. 12in. CHASSIS, 97/6. Complete Chassis by famous manufacturer, easily adapted to Channel 3. R.F. E.H.T. Unit included. Drawing FREE. Easily fitted to Table or Console model. Owing to this chassis being in three separate units (Power, Sound and Vision, Timebase) inter-connected, THIS CHASSIS IS LESS VALVES AND TUBE, but see our catalogue for cheap valves. Our £5 Tube fits this Chassis. List of valves by request. Carr. 5/-.
Personal shoppers can see a demonstration model working.
H.T. BATTERY BARGAINS, 1/9.—All dry L.T. 1.5 and H.T. minimum 40 volt tested, **3/9** ; 60 volt + 1.5 L.T. All-Dry, **3/9** ; 67½ volt H.T. Personal Portable type, **3/9** ; 60 volt H.T., **5/9** ; 90 volt + 1½ volt, **5/9**, long round type. Inert cells, G.E.C. 3 volt twins, **1/-** ; 4½ volt L.T. or Bell. P. & P. 1/9 on H.T., 9d. on L.T. and cells. Plugs for Batts., **6d.** each. Send 2½d. stamp for Catalogue.

ALPHA VALVES—GUARANTEED New & Boxed

AC/P1	3/-	E114*	2/-	PM12M	10/-	VU39 (MU 12/14)	8/6	5U4(U52)	3/6	6G6G	8/6	6U7G	9/-	12AT7	9/-
AC/P	6/9	H30	5/-	PM2B	5/6	VU84(U1 2)	8/6	5Y3GT	3/6	6H6	3/6	6V6G	7/6	12AU7	9/-
AC/PEN	7/9	H63	7/9	PM22S	5/6	VU111	3/6	5Z3	3/6	6J5G	5/-	6V6GT	7/6	12AX7	10/-
ATP4	5/6	HL23DD	7/6	PY80	11/-	VU120A	3/-	5Z4G	9/6	6J5GT	5/6	6X4	3/-	12Q8	8/-
DDL4	4/-	HP210	6/9	PY81	11/6	W77	3/6	6A8G	9/6	6J6	5/-	6X5GT	7/9	12H6	5/-
DH73M	10/-	HP211C	7/6	PY82	10/-	W81	10/-	6AC7	3/6	6J7G	3/6	7B7	8/6	12J5	6/-
EA50	2/-	HR210	6/9	PY83	15/-	Z77	6/-	6AG5	7/6	6K6GT	3/6	7C5	3/6	12K7	9/-
EB34	2/-	KBC32	3/6	QP21	7/6	Z63	9/-	6AK5	9/-	6K7G	3/-	7C6	3/6	12K8GT	9/-
EB41	11/-	KF35	3/6	SP220	6/9	1A3	9/-	6AL5	7/-	6K7GT	3/6	7H7	3/-	12Q7GT	9/-
EBC33	7/6	KL35	3/6	SP61	3/9	1A5GT	6/6	6AM5	7/6	6K7M	6/9	7Q7	3/-	12SG7	7/6
EBC41	11/-	KLL32	3/6	TP26	9/-	1A7	11/6	6AM6	7/6	6K8G	3/-	7R7	8/6	12SH7	5/6
EBF80	11/6	KT2	5/-	U10	9/-	1C5GT	8/-	6AQ5	8/6	6K8GT	9/6	7Y4	8/6	12SJ7	8/6
EC52	6/3	KT33C	11/6	U22	8/-	1H5	10/-	6AT6	8/-	6L1	11/6	75	10/-	12SK7	8/6
EC91	9/-	KT61	13/-	U25	14/6	1L4	7/6	6AV6	8/-	6L19	12/6	77	8/-	12SQ7	8/6
ECH35	13/-	KT66	11/6	U26	10/-	1L5	8/9	6B6G	4/-	6L6G	9/-	80	8/6	12SR7	7/6
ECH42	10/6	KT74	8/-	U281	10/6	1N5	10/-	6B8	4/-	6L7M	7/6	807	7/6	20D1	10/6
ECL80	11/6	KTW61	7/9	U403	10/-	1R5	7/6	6B8G	4/-	6L18	11/-	8D2	2/9	20P2	12/6
EF8	6/6	KTW63	7/9	U801	14/6	1S4	7/6	6BA6	3/-	6N7	7/9	9001	5/6	20L1	10/-
EF36	5/-	KTZ41	6/9	U06	10/-	1S5	7/6	6BE6	3/-	6Q7G	3/-	9002	5/6	20P1	15/-
EF39	3/6	LD210	6/9	UAF42	12/-	1T4	7/6	6BR7	9/6	6Q7GT	9/-	9003	5/6	20P4	11/-
EF41	10/-	LP220	6/9	UB41	9/-	1U5	8/-	6BW6	8/6	6R7G	3/-	9004	5/6	25A6G	9/-
EF50Syl	8/-	MH4	5/6	UBC41	11/-	220VSG	6/9	6C4	3/-	6SA7GT	3/-	9006	6/-	25L6GT	8/6
EF50	6/-	MHL4	6/9	UCH42	11/-	2A3	6/9	6C5GT	7/6	6SG7	7/6	954	2/-	25U4GT	
EF54	7/-	MS/PEN	5/-	UF41	11/-	2X2	5/-	6C6	3/6	6SH7	3/-	955	4/9		12/-
EF55	10/-	P61	3/9	VC150/30	9/-	3A4	3/-	6D6	3/6	6SJ7GT	3/-	956	3/6	25Y5	9/-
EF80	11/6	PCF82	11/6	VP23	8/-	3D6	5/-	6F6G	7/6	6SK7	6/3	10C2	10/6	25Y5G	9/-
EK32	8/-	PEN25	8/-	VR105/30	5/6	3Q4	9/-	6F6GT	7/6	6SL7	8/-	10F1	10/-	25Z4G	9/-
EL2	12/6	PEN46	8/6	VR116	4/-	3Q5	10/-	6F8G	7/6	6SN7GT	9/-	10F9	10/6	25Z5	9/-
EL41	11/6	PEN220A		VT52(EL32)	3/-	3S4	8/6	6F8M	8/6	6SQ7	9/-	10LD11	11/-	25Z6GT	8/6
EL42	11/6		4/-	VT75(KT 44)	7/6	3V4	8/-	6F8G	7/-	6SS7	8/-	10P13	11/6	30L1	10/6
EM31	9/-	PL33	9/6	VT501(TT 11)	8/-	4D1	3/-	6F13	12/6	6ST7	7/6	10P14	11/6	35W4	10/-
EY51	13/6	PL81	13/6			42	8/-	6F14	12/6	6U4GT	15/-	12A6	6/9	35Z4GT	8/6
EZ40	10/-	PL82	11/6					6F15	11/6	6U5G	8/6	12AH8	11/6	50L6GT	8/6

LATEST TYPE PRE AMPLIFIER

Well known maker. Chassis size 4½ x 2½ x 1. Co-axial input and output. With valve EF42. London Freq. 14/- each. Post 1/6

SEN-TER-CEL SELENIUM RECTIFIERS

Type RM1 125v. 60 m/a... 3/10 each
Type RM2 125v. 100 m/a... 4/8 each
Type RM3 125v. 120 m/a... 5/- each
Type RM4 250v. 250 m/a... 15/- each

FILAMENT TRANSFORMERS

All 220 to 240 v. Input.

2 volts 2 amps. 4/6
2 volts 3 amps. 7/9
4 volts 1½ amps. 5/-
4 volts 3 amps. 10/-
5 volts 2 amps. 10/-
6.3 volts 1½ amps. 6/-
6.3 volts 2 amp. 5/-
6.3 volts 3 amps. 9/-

THE COMPACT TELEVISION AERIAL BY ANTIFERENCE LTD.

Supplied complete with universal mounting and backplate in neutral brown finish. Overall length 5ft 6ins. Packed in carton 3ft. 4ins. long. Complete with full instructions. Cat. No. CD4. List price 50/-. Our price 14/6 each

★ ★ ★ ★ ★ ★

MAINS TRANSFORMERS

3-way Mounting Type.

MT1. Primary 0-210-230-250 v. Secondary 275-0-275 v. 80 M/A. 6.3 v. 4 amps. 5 v. 2 amps., with taps at 4 v. on Filament Winding. Price ... ... 17/6 each

MT2. Primary 0-210-230-250. Secondary 350-0-350 v. 80 M/A. 6.3 v. 4 amps. 5 v. 2 amps. Both filament windings tapped 4 v. Price ... ... 17/6 each

PENCIL RECTIFIERS

Rectifiers type J10 ... 2/6 each

Type	Price
K3/25	5/6 each
K3/40	7/6 each
K3/45	8/9 each
K3/50	8/9 each
K3/60	9/3 each
K3/100	14/8 each

CO-AXIAL CABLE

75Ω thin type 7/0076, Best quality ... ... 8½d. per yd. Solid 1/092. Best quality 7½d. per yd. Semi Air Spaced 1/036. Best quality ... ... 1/- per yd.

TERMS: Cash with order or C.O.D. Postage and Packing charges extra, as follows: Orders value 10/- add 9d.; 20/- add 1/-; 40/- add 1/6; £5 add 2/- unless otherwise stated. Minimum C.O.D. fee and postage 2/3.

MAIL ORDER ONLY

LOUDSPEAKER UNITS

Rola 5in. Speaker with transformer ... ... 16/- each
Elac 5in. Speaker with transformer ... ... 16/9 each
Plessey 6½in. lightweight unit ... ... 16/6 each
Rola 6½in. standard type... 17/6 each
Lectrona 6½in. with transformer ... ... 18/- each
Truvox 6½in. wafer type ... 20/- each
Plessey 8in. lightweight unit ... ... 17/6 each
R. & A. 8in. Standard type 17/6 each
Plessey 10in. unit ... 19/6 each
Elac 10in. unit ... ... 22/6 each
R. & A. 10in. unit ... 22/6 each
Goodmans 10in. unit with transformer ... ... 26/6 each
Elliptical 4in. x 7in. unit ... 18/6 each
Mains energised 8in. unit 1,000Ω ... ... 21/- each
Mains energised 6½in. unit 600Ω ... ... 17/6 each

PERSPEX IMPLOSION GUARDS

Incorporating escutcheon and filter. 12in. type, 11/6 each. 16in. type, 14/6 each.

POCKET TEST METER

Ex-Govt. volt-meter, two ranges, 0-15 v., 0-250 v. D.C. Complete in case ... ... 17/6 each

NYLON DRIVE CORD

25 yard rich nylon drive cord on wooden reel ... ... 2/9 each

CRYSTAL DIODES

Plastic case, wire ends ... 2 for 2/1

BI CONDENSERS

Waxed cartons with flying leads. 4 mfd., 500 v., 1/6 each; 4 x 4 mfd. 500 v. ... ... 3/4 each.

IRON ELEMENTS

Standard adaptable type, 230 v., 450 w. ... ... 1/8 each
Morphy-Richards replacement type ... ... 3/9 each
H.M.V. replacement type 3/- each
PLIERS with side cutters 4/3 pair

DOUBLE TRIMMERS

250/250 Pf.: 100/100: 100/50: all 3d. each.

YAXLEY SWITCHES

2-pole. 3-way, 1 bank. 1/8 each.
3-pole. 3-way, 3 bank, 1/8 each.

OCTAL PLUG AND SOCKET (SCREENED) ... ... 1/- each

PRE-SET CONTROLS (CARBON) 50 KΩ: ½ MegΩ: 1 MegΩ: 2 MegΩ ... ... 1/9 each

HUNTS CONDENSERS

Type W99, 200 Pf., 350 v. } 7d. each
Type W99, .005 mfd., 150 v. }
Type W48, .1 mfd., 400 v. 1/- each
Type L44 .1 mfd., 500 v. 9d. each

RESISTORS, 2-WATT

2.2 KΩ: 470Ω: 7.5 KΩ: 22Ω: 150Ω: 5.6 KΩ: 390Ω: 150 KΩ: ½ MegΩ: 39Ω: 1.5 Meg: 56 KΩ. All 4d. each.

BAKELITE CASED BI CONDENSERS

.1 Mfd., 1,000 v.: .03 mfd., 4 Kv.: .01 Mfd., 4 Kv.: .03 Mfd., 500 v.: .001 Mfd., 4 Kv. All 1/6 each.

DUBILIER NITROGOL CONDENSER

12 Mfd., 350 v. ... ... 5/6 each

OSMOR COIL PACKS

Type H.G., 48/- each. Type Ldd. 40/- each. Type T.B., 50/- each. Type TRF, 40/- each.

SPRAGUE CONDENSERS

.05 mfd., 500 v.: .01 mfd., 1,000 v.: .1 mfd., 350 v.: .02 mfd., 750 v. All 9/- doz.

TCC VISCONOL CATHODRAY CONDENSER

Type CP57XO, .002 mfd., 18 Kv., 7/6 each. Type CP55QO, .001 mfd., 6 Kv., 5/- each. Type CP55TO, 500 Pf., 10 Kv., 5/- each.

VIBRATORS ETC.

Vibrator Unit for 6 v. operation, 14/6 each. Post 1/6.
6 v. and 12 v. Vibrators, 4-pin UX Types, 6/6 each.

CONNOISSEUR PICK-UP

Standard model: magnetic type. Complete with matching transformer. Listed at £4 10s. 5d. Our price, 29/6.

NUTS AND BOLTS

Box of 4 B.A. nuts, shakeproof washers and bolts. Mixed counters sunk and round heads. Over 100 items ... ... 1/- per box

2 megs AMPLION

2 MegΩ Amplion Vol. Controls. Double Pole Switch, 2/6 each. 1 MegΩ Erie Vol. Controls. Double Pole Switch, 2/6 each.
100 KΩ: ½ MegΩ: ¼ MegΩ: Single Pole Switch, 2/- each.

RECORDING TAPE

1,200 feet tape on Cyldon reel. (Brown plastic type.) 18/6 reel.

INTERNATIONAL OCTAL VALVE HOLDERS

Paxolin, 4d. each. Ambenol, 6d. each. Ceramic, 1/- each.

WHEN ORDERING PLEASE QUOTE "DEPT. P.T."

ALPHA RADIO SUPPLY CO.
5/6 VINCES CHAMBERS, VICTORIA SQUARE, LEEDS 1.