PRACTICAL WIRELESS

MARCH 1967

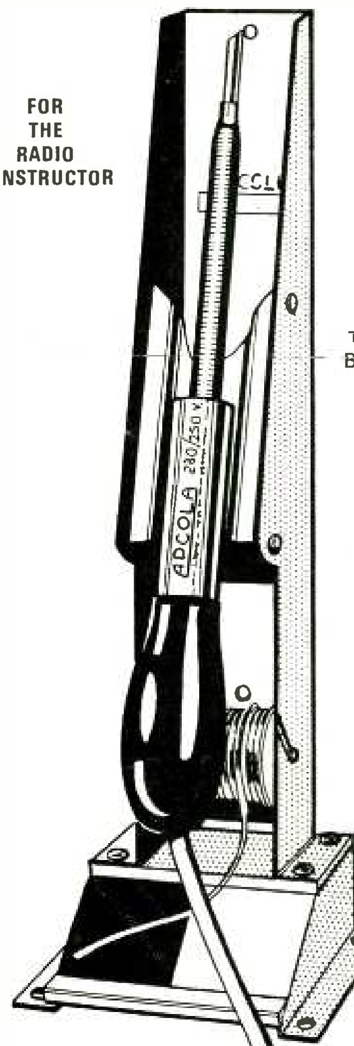
2/6

ADCOLA

PRODUCTS LIMITED
(Regd Trade Mark)

SOLDERING EQUIPMENT

FOR
THE
RADIO
CONSTRUCTOR



ILLUSTRATED
$\frac{3}{16}$" DETACHABLE
BIT INSTRUMENT
(List No. 64)
IN
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SHIELD
WITH
ACCESSORIES
(List No. 700)

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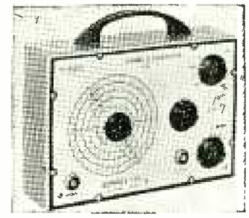

WIDE RANGE TRANSISTORISED SIGNAL GENERATOR MODEL 27

★ Range 150Kc/s-350Mc/s
★ Direct Calibration
★ Mod. or Unmod. output
★ Accuracy better than 2%
£10.16.9.

ALSO AVAILABLE

Audio Generator 63	..	£17.1.9
Inductance Bridge 66	..	£18.6.9
Power Supply Unit 61	..	£6.14.6

WIDE RANGE TRANSISTORISED C.R. BRIDGE—Model 62

6 Ranges: 1Ω to 100M
1pF to 100μF

★ **Visual null indicator**
★ **Power factor check**
★ **Electrolytic leakage test**
★ **Battery operated**
£9. 6. 9.

All prices include battery, post and packing

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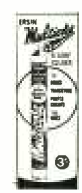
NOMBREX LTD INSTRUMENTS DIVISION
Estuary House, Camperdown Ter., Exmouth, Devon

For quick, easy faultless soldering

ERSIN Multicore 5 CORE SOLDER

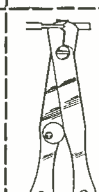
Easy to use and economical. Containing 5 cores of non-corrosive flux, instantly cleaning heavily oxidised surfaces. No extra flux required. Ersin Multicore Savbit Alloy reduces wear of copper soldering iron bits.

SIZE 5 HANDY SOLDER DISPENSER
Contains 12 ft. of coil 18 s.w.g. Ersin Multicore Savbit Alloy. Quick and easy to use.
2/6 each



NEW SIZE 15
21 ft coil of 60/40 Alloy, 22 s.w.g. in a dispenser. Ideal for small components, transistors, diodes, etc.
3/- each

SIZE 12
Ideal for home constructors. Contains 102 ft. of 18 s.w.g. Ersin Multicore Savbit Alloy on a plastic reel. 15/- each (Also available in other sizes)



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Standard Play			Long Play		
3in.	150ft.	2/3	3in.	225ft.	2/9
4in.	300ft.	4/6	4in.	450ft.	5/6
5in.	600ft.	7/6	5in.	900ft.	10/6
5¾in.	900ft.	10/6	5¾in.	1,200ft.	13/-
7in.	1,200ft.	12/6	7in.	1,800ft.	18/6
Double Play			**Triple Play**		
3in.	300ft.	4/-	4in.	900ft.	13/-
4in.	600ft.	8/-	5in.	1,800ft.	25/-
5in.	1,200ft.	15/-	5¾in.	2,400ft.	34/-
5¾in.	1,800ft.	19/6	7in.	3,600ft.	44/-
7in.	2,400ft.	27/-	**Quadruple Play**		
			3in.	600ft.	8/6

Postage 1/- *reel.*
Post Free less 5% on three reels.

Quantity and Trade enquiries invited.

NOTE. *Large tape stocks at all branches.*

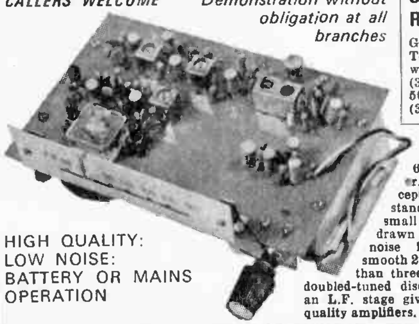
BARGAIN PARCELS

Including variable condensers, i.f. coils, loudspeaker plugs/sockets, knobs, pots, condensers, resistors, nuts, bolts, cabinet fittings, switches, transformer choke, rectifier, transistors at a small fraction of list value. Due to heavy demand we are now packing them in several sizes—TRY ONE.

3 lbs. (post 3/-)	9/-
7 lbs. (post 5/-)	17/6
14 lbs. (post 6/-)	29/-

Transistorised FM Tuner

CALLERS WELCOME *Demonstration without obligation at all branches*



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LOW NOISE:
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This beautifully compact 6 transistor machine (size 6 x 4 x 2½in.) will give quieter, more interference free reception. Months of use from a standard 9 volt battery or its small power requirements can be drawn from any amplifier. Low noise frequency changer with smooth 2 gang tuning feeding no less than three I.F. stages coupled to a doubled-tuned discriminator terminating in an L.F. stage giving ample output for all quality amplifiers.

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ORDER NOW £8-10

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Mullard Matched Output Kits OC81D and 2-OC81	9/6
R.F. Kits OC44, OC45 (2) 3 transistors	9/6

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General Purpose miniature detector A.V.C. etc. 6/6 doz. **8d.**

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500 mA (3 for 19/6) **7/6**

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AUTOSLIM	£5.10.0
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Model 3,000	£8.10.0
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A70	£18.10.0
LAB80	£24.19.0
401	£29.19.0

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TU14	59/-
GU7	85/-
UA14	89/-
UA16	99/-
UA25 SUPERSLIM	£5.10.0

CARTRIDGES

G.C.2. Garrard Mono	16/-
EV26 Garrard Stereo Ceramic	24/-
EUPHONIC SUPER Ceramic Stereo Diamond 100mV Output	29/-

AVOID AMPLITUDE DISTORTION WITH YOUR HI-FI AMP.

STABILISED TRANSISTOR POWER SUPPLY

- VARIABLE 0—15V. AT 0—1 AM).
- STABILISED FOR MAINS VAR. 210 - 250V.
- RIPPLE CORRECTED
- SHORT CIRCUIT PROTECTION
- HANDSOME STYLED CABINET

★ PRICE ONLY 6GNS.

10 WATT TRANSISTOR AMP

Consisting above stabilised power pack (can be used separately), with built-in pre-amp and controls driving two x OC26 main amp. in styled cabinet. New concept in value and design. 10 transistors, selection, vol. and tone controls equalisation.

PRICE 12GNS.

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DPA15. Latest black/satin chrome finish multiple input channels selector bass and treble controls. Matches all pick-ups and mikes. Provision tape recording. Normally 10 gns. our price **4 Gns.**

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1S5	4/6	6L18	7/9	30F5	9/-	ECH21	10/-	KT66	19/6	U25	9/6
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2D21	5/6	6P25	12/-	30L15	11/6	ECH42	10/6	KTW61	5/9	U35	12/6
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6BJ6	7/-	7C6	7/6	CBL31	19/6	EF89	6/6	PCF82	6/9	UBL21	10/9
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6C4	3/-	10C1	11/-	DL96	7/3	EL32	5/-	PCL84	9/-	UCH21	10/9
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6C6	4/-	10F1	7/6	DL94	6/6	EL34	11/6	PCL86	9/6	UCH81	7/-
6C9	11/-	10LD11	14/6	DL96	7/3	EL35	8/-	PL33	8/6	UCL82	8/-
6CD6G	17/-	10P13	9/6	EABC80	6/9	EL38	15/-	PL36	11/-	UCL83	10/6
6D6	4/-	10P14	9/6	EAF42	8/-	EL41	9/9	PL38	12/6	UF41	9/-
6F1	6/6	12AT7	4/9	EB41	4/6	EL42	8/9	PL81	7/9	UF42	6/9
6F6G	5/-	12AU7	5/6	EB92	2/9	EL84	6/6	PL82	5/9	UF85	7/6
6F13	4/6	12AX7	6/-	EBC33	7/6	EM80	7/-	PL83	6/-	UF89	6/9
6F14	7/6	12J7GT	9/-	EBC41	9/6	EM81	7/6	PL84	7/-	UL41	10/-
6F15	9/6	12K7GT	5/-	EBC91	6/9	EM84	7/9	PY31	7/6	UL44	14/-
6F23	8/-	12K8GT	9/6	EBF80	7/9	EY51	7/6	PY32	9/6	UL46	10/6
6J5G	4/-	12Q7GT	6/6	EBF89	7/-	EY86	7/6	PY33	7/6	UL84	6/8
6J5GT	6/6	14S7	14/6	EBL21	11/-	EY88	8/6	PY80	5/9	UM80	9/6
6J6	3/3	19AQ5	5/6	ECC40	9/6	EZ40	7/6	PY81	5/9	UY21	8/9
6J7G	5/6	20D1	8/9	ECC81	4/9	EZ41	8/6	PY82	5/6	UY41	7/-
6J7GT	9/6	20F2	9/6	ECC82	5/6	EZ80	5/6	PY83	5/9	UY85	5/6
6K7G	2/8	29L1	16/-	ECC83	6/-	EZ81	6/-	PY88	8/6	VR105	5/-
6K7GT	5/9	20P1	9/6	ECC84	7/-	FC4	8/-	PY800	7/-	VR150	5/-
6K8G	5/9	20P3	9/6	ECC85	5/9	GZ32	9/6	PZ30	9/6	X66	7/9

STEREO PORTABLE CABINETS

Latest black and silver metal finish. Consisting of centre cabinet size 16½in. x 13in. x 8in. deep with lift up lid together with two 10 x 6 speaker cabinets which clip on ends of main cabinet size 4½in. x 13in. x 8in. making overall size of 25½in. x 13in. x 8in. High quality chrome fittings. Will take almost any autochanger or tape dec. Approx. half price at **£3.19.0**

Ditto, but less chrome, takes 7 x 4 speaker **£2.19.9**

MONO PORTABLE CABINETS. B.S.R. tape deck or single record player, new, attractive finish, half price. **19/6**

AUTOCHANGE PORTABLE CABINETS. As used on 18 gns. record player. Due to fortunate purchase we offer complete with motor board and all fittings at only **49/-**

PLEASE NOTE. *A wide range of cabinets to callers at all branches.*

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1% to 5% 100Ω to 5 mΩ.

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MICROPHONE CABLE Highest quality, black, grey, white. 9d. per yard.

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Miniature Ceramic, Silver, Mica etc., 3pF to 5μF. LIST VALUE OVER £4.

25 ELECTROLYTICS
Assorted 2 to 500 mfd 6 to 400 volt. LIST VALUE OVER £5. **9/6**

50 TAG STRIPS **7/6**
Mixed sizes 2 to 15 way.

25 POTENTIOMETERS
Including with switch, long and short spindle, pre-sets, log and lin. unused. 1k-2mΩ. **9/6** LIST VALUE APPROX. £4.

CONNECTING WIRE
P.V.C. Bright Colours. Five 25ft. coils only. **4/-**

CALLERS. *A very wide range of electronic components await you at all branches. Your enquiries welcomed.*

Stockists of Leak, Quad, Chapman, Goodman, Armstrong, Tripletone Linear Rogers, Truvox, Ferrograph, Wharfedale, etc.

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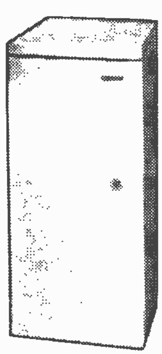

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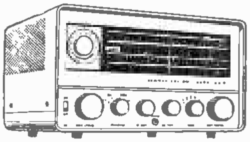
LAFAYETTE HA-63 COMMUNICATION RECEIVER

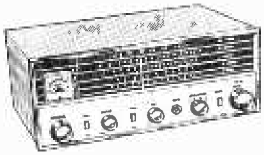


Outstanding value. High-class 4 band receiver covering 550kc/s—31 Mc/s. Seven valves plus rectifier, RF stage, illuminated "S" meter, 1.5μV sensitivity. Electrical bandspread on 80/40/20/15 and 10 metre bands. Slide rule dial, aerial trimmer. B.F.O., ANL, Output for phones or speaker. 115/220/240V. A.C. Brand new, guaranteed, with manual. **24 Gns.** Carr. 10/-

LAFAYETTE KT-340 COMMUNICATION RECEIVER SEMI-KIT

Build this wonderful receiver and save pounds. Supplied semi completed, main components ready mounted. R.F. section already wired and aligned. Full and precise instructions supplied. Specification:—8 valves + rectifier, 4 bands covering 550kc/s.-30 Mc/s. Incorporates 1 R.F. and 2 I.F. stages, 'Q' multiplier, B.F.O., A.N.L., 'S' meter, bandspread aerial trimmer etc. Operation 115/230V. A.C. Price **25 Gns.** Carr. 10/-.

HAM-1, 4 BAND COMMUNICATION RECEIVER



4 wavebands covering 535 kc/s. to 30 Mc/s. 5 valve superhet circuit. Incorporates S meter B.F.O., BANDSPREAD TUNING, BUILT-IN 4in. SPEAKER, FERRITE AERIAL AND EXTERNAL TELESCOPIC AERIAL. Operation 220/240 v. A.C. Supplied brand new with handbook. **£16.16.0.** Carr. 10/-.

GARRARD RECORD PLAYERS

SRP12 Player mono **£4.4.0;** 1000 changer mono or stereo **5 gns.;** 2000 changer mono or stereo **£6.6.0;** A50 Changer mono or stereo **£7.10.0;** 3000 Changer stereo **£7.7.0;** AT6 Mk II **£8.19.6;** SP25 Player mono or stereo **£9.19.6;** AT60 Changer mono or stereo **£9.19.6;** A70 less cartridge **£19.19.0;** LAB 80 Stereo **£25.0.0;** 401 Transcription **26 gns.** Brand new and guaranteed. All plus post and packing 5/-.

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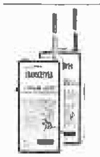
All items available as advertised.

SINCLAIR TRANSISTOR AMPLIFIERS

Z12 Amplifier 89/6; Z12 Power Pack 79/6; Stereo 25 Pre-Amplifier **£9.19.6;** Micro FM Radio Kits **£5.19.6;** Micro 6 Radio Kit 59/6; Micro Amp. Kit 28/6 Post Paid.

2-WAY RADIOS



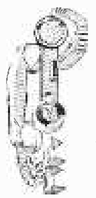
Super quality. Brand new and guaranteed.

3 transistor	£6.15.0 pr.
4 transistor	£7.19.6 pr.
5 transistor	£8.4.0 pr.
6 transistor	£9.19.6 pr.
6 transistor De Luxe	£17.10.0 pr.
10 transistor	£22.10.0 pr.
13 transistor 500MW	£31.10.0 pr.
13 Trans. 1W	£35.0.0 pr.

Post extra.

These cannot be operated in U.K.

TRANSISTORISED TWO-WAY TELEPHONE INTERCOM.



Operative over amazingly long distances. Separate call and press to talk buttons, 2-wire connection. 1000's of applications. Beautifully finished in ebony. Supplied complete with batteries and wall brackets. **£6.10.0 pair.** P. & P. 3/6.

ZQM TRANSISTOR CHECKER

It has the fullest capacity for checking on A, B and Ico, Equally adaptable for checking diodes, etc. Spec.: A: 0-7.0-9967, B: 5-200. Ico: 0-50 microamps, 0-5 mA. Resistance for diode 200Ω—1 MEG. Supplied complete with instructions, battery and leads. **£6.19.6.** P. & P. 2/6.

P.C.R.1. RECEIVERS

Brand New Condition—Fully Tested and Checked before despatch. 3 Waveband with RF Stage—Wonderful value. 860-2080 metres 190-570 metres 5.6-18 Mc/s. with internal speaker **£8.19.6.** Carr. 10/6 with circuit. Plug in external power units. 230V A.C. 35/-, or 12V D.C. 19/6.

MAGNAVOX 363 TAPE DECKS

New 3-speed tape deck, supersedes old Collaro studio deck. 2-track **£10.10.0.** 4-track **£13.10.0.** Carr. Paid.

AMERICAN TAPE

First grade quality American tapes. Brand new. Discounts for quantities.

3in., 225ft. L.P. acetate	4/-
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5in., 600ft. std. plastic	8/6
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5in., 1,200ft. D.P. mylar	15/-
5in., 1,800ft. T.P. mylar	35/-
5¾in., 1,200ft. L.P. acetate	12/6
5¾in., 1,800ft. D.P. mylar	22/6
5¾in., 2,400ft. T.P. mylar	45/-
7in., 1,200ft. std. mylar	12/6
7in., 1,800ft. L.P. acetate	15/-
7in., 1,800ft. L.P. mylar	20/-
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Postage 2/-. Over £3 post paid.

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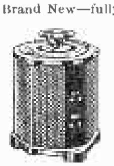
Brand New—fully Shrouded. Input 230v. 50/60 c/s. Output 0-260 Volts.



1 Amp	£4.10.0
2.5 Amp	£5.17.6
5 Amp	£9.0.0
8 Amp	£13.10.0
10 Amp	£17.0.0
12 Amp	£19.10.0
20 Amp	£32.10.0

2.5 Amp Portable—Metal Case with Meter, Fuses, etc. **£9.17.6.**

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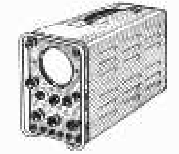
400v. PIV, 3 amp	7/6
1,000v. PIV, 650mA	6/6
800v. PIV, 500mA	5/6
800v. PIV, 5 amp	7/6
400v. PIV, 500mA	3/6
70v. PIV, 1 amp	3/6
150v. PIV, 165mA	1/-
150v. PIV, 25 amp	19/9
700v. PIV, 100 amp	49/6

Discounts for quantities. Post extra

PORTABLE OSCILLOSCOPE CT-52



A compact (9in. x 8in. x 16½in.) general purpose 'scope T/B 10c/s-40 kc/s. Band width 1 Mc/s. Mullard DG 7/5 2¾in. CRT. For operation on 200/250v. A.C. Supplied complete with metal transit case, strap, test leads, and visor hood. Brand new, **£22.10.0.** Carr. 10/-. Supplied complete with instructions.

F.M. WIRELESS MICROPHONE

94-104 Mc/s. Transistorised. Operates from 9v. battery. Complete with additional secret tie clip microphone. List £12.10.0. ONLY **£7.10.0.** P. & P. 2/6. These cannot be operated in U.K.

ERSKINE TYPE 13 DOUBLE BEAM OSCILLOSCOPE

Time base 2 c/s-750 kc/s. Calibrators at 100 kc/s and 1 Mc/s. Separate Y1 and Y2 amplifiers up to 5.5 Mc/s. Operation 110/230 volt A.C. Supplied in perfect working order. **£22.10.0** Carriage 20/-.

TE-20 RF SIGNAL GENERATOR

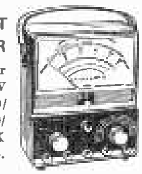
Accurate wide range signal generator covering 120 kc/s-260Mc/s on 6 bands. Directly calibrated. Variable R.F. attenuator. Operation 200/240v. A.C. Brand new with instructions. **£12.10.0.** P. & P. 7/6.

S.A.E. for details.

LAFAYETTE TE-46 RESISTANCE CAPACITY ANALYSER

2 PF—2,000 MFD, 2 ohms—200 Megohms. Also checks impedance, turns ratio insulation 200-250 v. A.C. Brand New **£15.** Carr. 7/6.

TE-900 20,000Ω/VOLT GIANT MULTIMETER

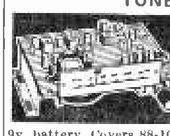


6in. full view meter. 2 colour scale. 0/2.5/10/250/1,000/5,000V A.C. 1/25/12.5/10/50/250/1,000/5,000 V. D.C. 0/50μA/110/100/500 mA/10 amp D.C. 0.2K/200K 20 Meg. Ohm. **£12.19.6** P.P. 5/-.

TE22 SINE SQUARE WAVE AUDIO GENERATORS

Sine: 20 cps to 200 kc/s. on 4 bands. Square: 20 cps to 30 kc/s. Output impedance 5,000 ohms. 200/250v. A.C. operation. Supplied Brand New and Guaranteed with instruction manual and leads. **£15** Carr. 7/6.

TRANSISTORISED F.M. TUNER



6 transistor, high quality, size only 6 x 4 x 2½in. 3 I.F. stages, double tuned discriminator. Ample output to feed most amplifiers. Operates on 9v. battery. Covers 88-108Mc/s. Ready built, ready to use. Fantastic value for money. **£6.19.6.** P. & P. 2/6.

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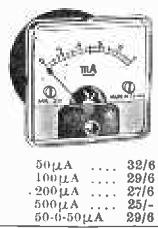


First grade quality, Moving Coil panel meters, available ex-stock. S.A.E. for illustrated leaflet. Discounts for quantity. Available as follows: Type MR. 38P, 1 21/32in. square fronts.

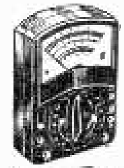
100-0-100μA	27/6	200mA	22/6	100V D.C.	22/6
500-0-500μA	22/6	300mA	22/6	150V D.C.	22/6
1-0-1mA	22/6	500mA	22/6	300V D.C.	22/6
1mA	22/6	750mA	22/6	500V D.C.	22/6
2mA	22/6	1A D.C.	22/6	750V D.C.	22/6
5mA	22/6	2A D.C.	22/6	15V A.C.	22/6
10mA	22/6	5A D.C.	22/6	50V A.C.	22/6
50μA 32/6 · 20mA	22/6	3V D.C.	22/6	150V A.C.	22/6
100μA 29/6 · 50mA	22/6	10V D.C.	22/6	300V A.C.	22/6
200μA 27/6 · 100mA	22/6	20V D.C.	22/6	500V A.C.	22/6
500μA 25/- · 150mA	22/6	50V D.C.	22/6	'S' Meter 1mA	29/6
50-0-50μA 29/6					

POST EXTRA. Larger sizes available—send for lists.

TE-51 NEW 20,000Ω/VOLT MULTIMETER

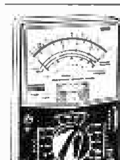
0 / 6 / 60 / 120 / 1,200V. A.C. 0 / 3 / 30 / 60 / 300 / 600/3.000V. D.C. 0 / 60μA / 12 / 300 MA. D.C. 0 / 60K / 6 Meg.Ω 85/-. P. & P. 2/6.

MODEL TE-12



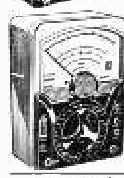
20,000 O.P.V. 0/.06/6/30/120/600/1,200/3,000/6,000v. D.C. 0/6/30/120/600/1,200 v. A.C. 0/60μA/6/60/600 mA. 0/6K/600K/6 Meg./60 Meg.Ω. P.F. —.2 MFD. **£5.19.6.** P. & P. 3/6.

MODEL U50D MULTIMETER



MODEL U50D MULTIMETER with meter protection. 20,000/o.p.v. 0/.1/.5/5/50/250/1000V D.C. 0/2.5/10/50/250/1000 V D.C. 0/.05/.5/5/50/250 mA. 0/5K/50K/500K/5 meg ohm. .0001— .2 mfd —20— + 22 db. **£5.19.6.** P. & P. 3/-.

MODEL 500



MODEL 500. 30,000 opv, 0/.5/1/2.5/10/25 / 100 / 250 / 500 / 1,000 v. D.C. 0 / 2.5 / 10 / 25 / 100 / 250 / 500 / 1,000v. A.C. 0 / 50μA / 5 / 50 / 500mA. 12 amp. D.C. 0 / 60K / 6 Meg. / 60 Meg.Ω. **£8.17.6.** Post paid.

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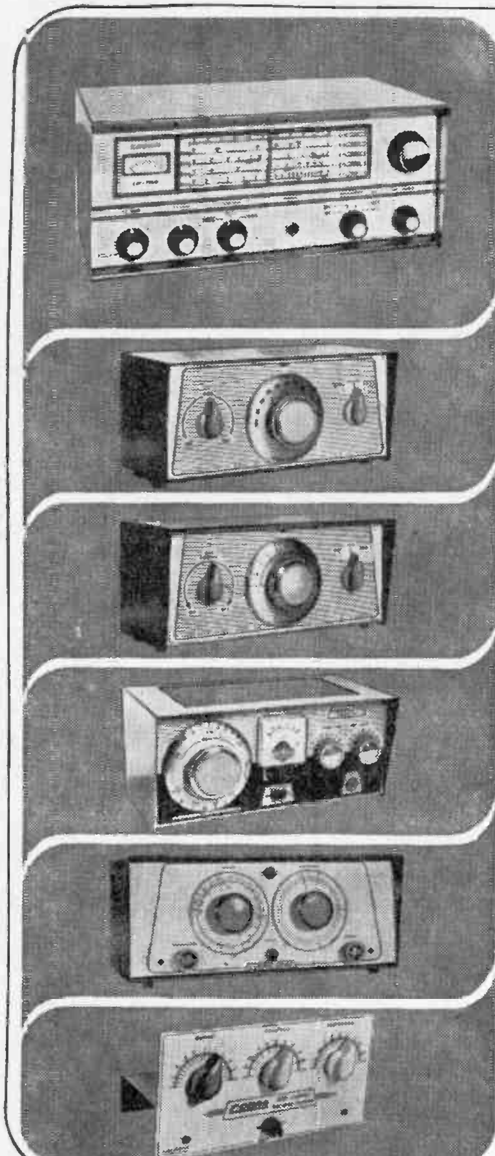

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THE CR.70A COMMUNICATION RECEIVER.

This completely new receiver sets a new high standard for performance and finish unequalled at the price, and is a worthy addition to the outstanding range of **CODAR** quality communication equipment. Frequency range: 560 Kc/s-30 Mc/s (540-10 metres) in four ranges; 560 Kc/s-1.5 Mc/s; 1.5 Mc/s-4.2 Mc/s; 4.2 Mc/s-11.5 Mc/s; 11.5 Mc/s-30 Mc/s. Slide rule scales for each band calibrated in frequencies plus an additional logging scale in degrees. Two speed vernier tuning control with reverse slow tune action. Unique aerial input stage exclusive to the CR.70A employing High 'Q' Air-spaced **CODAR-COIL** Inductor giving extremely high gain with low noise level. Panel aerial trimmer for peaking weak signals. Double tuned I.F. Iron cored transformers, 470 Kc/s with EF183 frame grid valve for maximum gain and selectivity. 5 valves (including two twin triodes) giving 7 valve line-up. Separate B.F.O. stage for CW and SSB reception. Calibrated signal strength 'S' meter, illuminated. Automatic Volume control. Panel phone jack for 'private' listening. 2-3 ohm output for external speaker. (Matching unit optional extra.) Superb styling, metal cabinet in the new Organasol Satin lustre finish. Size: 13" x 5¾" x 7¾". For A.C. 200/250v Ready built. **Not a Kit at the fantastic low price of £19.10.0.** Carr. 7/6.

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CODAR "Q" MULTIPLIER MODEL R.Q.10. For use with any superhet receiver with an I.F. between 450 and 470 Kc/s. Provides considerable increase in selectivity for either peaking or rejecting a signal on AM, CW, or SSB, BFO. Size 8½ x 5 x 4in. Power requirements 180-250v. H.T. at 5mA 6.3v. .3 amp L.T. Ready built complete with cables, plugs and instructions. £6.15.0. Carr. 4/6. **MODEL R.Q.10X.** Self powered version for 200-250v. A.C. and also provides 25mA at 200v. H.T. and 6.3v. 1 amp. L.T. for other accessories £8.8.0. Carriage 4/6.

CODAR A.T.5, 12 WATT 2 BAND TRANSMITTER. The newest most compact transmitter for fixed or mobile use on 160-80 metres. "The tiny TX with the BIG voice". Size only 8½ x 5 x 4in. (Base area is less than two-thirds of this page!) High stability new type calibrated VFO. 1.8-2.0 Mc/s and 3.5-3.8 Mc/s (up to 4 Mc/s export). Air-spaced CODAR COIL Pi-net output. P.A. Plate current meter plus neon indicator. Plate-Screen modulator. AM/CW switch and Panel key jack. Plug change over for 6 or 12 volts heater supply. Ready built £16.10.0. Carr. 4/6. **A.T.5 POWER SUPPLY UNITS.** For 200-250v. A.C. and 12v. Solid state for Mobile use, complete with all Transmit/Receive changeover switching available.

CODAR-KIT CR.45K MAINS T.R.F. SHORT-WAVE RECEIVER. World wide reception—North and South America, Russia, India, Australia, Far East, Amateurs, Shipping, etc. ★Separate electrical bandspread. ★ 3 slow motion vernier drives. ★ Low loss polystyrene plug-in coils, factory aligned ★ Dials calibrated in frequencies and degrees. ★ Power output 3 watts for 2/3 ohm speaker. ★ Valve line-up: ECC81, EL84, EZ80. Size 12 x 5¼ x 7in. **CODAR-KIT CR.45K** complete with valves, 3 coils (10-28, 25-75, 60-176 metres) and 11 page instruction manual, £9.10.0. Carr. 6/-. Extra coils 5/- each. Instruction manual only 4/- (credited on order). (Can also be supplied ready built—price on request).

CODAR-KIT MINI-CLIPPER—OUR FAMOUS SHORT-WAVE RECEIVER ★ Can be built in one evening ready to switch on and bring the World to your fingertips at very low cost. ★ Supplied complete with valve, one coil 25-75 metres and 4-page instruction manual. PRICE 39/6. Carr. 3/-. Extra coils 5/- each. Instruction manual only 2/- (credited on order). Electrical bandspread available. Provision to add 2 transistor amplifier.

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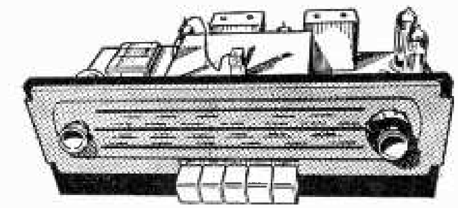
BRAND NEW AM/FM (V.H.F.) RADIOGRAM CHASSIS AT £15.15.0 (Carriage Paid)



Chassis size 15 x 6¾ x 5¾in. high. New manufacture. Dial 14½ x 4in. in 2 colours; predominantly cream. 200-250v. A.C. only.
Pick-up Ext. Speaker. Ae., E. and Dipole Sockets. Five push-buttons—LW, MW, SW, FM and Gram. Aligned and tested. O.P. Transformer Tone control 1000-1900M; 200-550M; 88-98 Mc/s. 6-17 Mc/s. EZ80 rect.; ECH81 EF89 EABC80 EL84, ECC85, 3-ohm speaker required.
9 x 6in. ELLIPTICAL SPEAKER, 20/- to purchasers of this chassis.
TERMS: (Chassis). £5.5.0 down and 5 monthly payments of £2.5.0. Total H.P. price, £16.10.0. Cheap Room Dipole for V.H.F., 12/6. Feeder 6d. per yard. Circuit diagram 2/6. Carriage to N. Ireland, 20/- extra.

NEW 6 PUSH-BUTTON STEREOGRAM CHASSIS. M.W.; S.W.1; S.W.2; V.H.F., Gram; Stereo Gram. Two separate channels for Stereogram with balance control. Also operates with two speakers on Radio. Chassis size: 15 x 7 x 6½in. high. Dial cream and red. 15 x 3in. 190-550M; 18-51M; 60-187M; VHF 86-100 Mc/s. Valves: ECC85, ECH81, EF89, 2 x ECL86, EM84 and Rect. Price £19.19.0, carr. paid or £6.13.0 deposit and 5 monthly payments of 56/6. Total H.P. price £20.15.6. Cream moulded escutcheon included.

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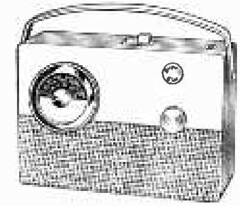
Chassis 12½ x 5½ x 4½in. high. Plastic front panel "gold" finish — 12½ x 4½in. 200-250 A.C. Record/Playback amp. switch; Off/On-Tone; Vol/Mic; Vol/Gram; Mic. Input; Gram. Input; Monitor; Speaker Sockets. Valves 6BR7; 12AX7; EM84; EL84; 6X4 Separate power pack. Complete amp. and power pack, £10.17.6. (6/- P. & P.). Rexine covered cabinet (tan) 15½ x 17 x 9½in. high with sloping front for amp; complete with two tweeter speakers, and special adapting brackets for Magnavox Deck—85/- (8/- carr.) 3 speed Magnavox 2 track tape deck £10.17.6; 4-track £12.15.0. Complete Recorders (with speed compensation) 2-track £29; 4-track £32 (carr. 25/-). Worth £10 more on normal retail prices.

The SUPER 6

LONG & MEDIUM WAVE TRANSISTOR RADIO



A quality radio available as a kit or ready-built. The sparkling performance and superb finish of the completed receiver give you value equivalent to a £21.12.0 commercial model.
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Write for list, S.A.E. **COMPLETE KIT ONLY** **£4.0.0**
OR FULLY BUILT £6.7.6. *Tax and Carr. Paid.* P. & P. 5/-

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Valves ECC83, 2 x EL84, on printed circuit approx. 4 x 4in. Neg. feed back. Controls (vol. or tone) on separate panel, 6½ x 2in. Separate power pack with rect., double wound mains trans., connection socket, etc. Supplied fully wired and tested with two O.P. transformers for 3-ohm speakers, only £4.15.0 (7/6 P. & P.). Two speakers, 8in., 3-ohm for 20/- each, post paid, if ordered with above Amp.

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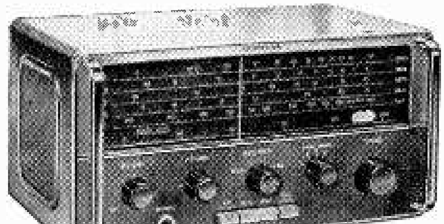

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DF96	7/-	PC97	7/6	25L6GT	6/6	AFZ11	17/-	OAZ205	8/6	OC66	25/-
DK91	5/6	PCC84	6/-	30C15	10/-	AFZ12	12/6	OAZ206	8/6	OC70	4/-
DK92	8/-	PCC89	11/-	30FL2	10/6	ASY26	6/6	OAZ207	9/6	OC71	4/-
DK96	7/-	PCC189	11/-	30FL14	11/-	ASY28	6/6	OAZ208	6/6	OC72	5/-
DL92	5/-	PCF80	7/-	30L15	11/-	ASZ20	7/6	OAZ209	6/6	OC73	7/6
DL94	5/9	PCF86	8/6	30P12	9/-	GET20	10/-	OAZ210	6/6	OC75	6/-
DL96	7/-	PCL82	7/-	30P19	13/-	GET102	6/-	OAZ211	6/6	OC76	5/-
DY86	6/4	PCL83	8/6	30PL2	10/6	GET103	4/6	OAZ212	6/6	OC77	7/-
EBC41	7/6	PCL84	7/6	30PL13	12/-	GET105	8/6	OAZ213	6/6	OC78	5/-
EBC81	6/3	PCL85	9/-	35L6GT	6/-	GET113	5/-	OAZ222	9/6	OC78D	5/-
EBC90	4/3	PCL86	8/6	35Z5GT	5/6	GET114	4/-	OAZ242	4/6	OC81	5/-
EBF89	6/9	PL36	9/-	50L6GT	6/6	GET115	9/-	OAZ245	4/6	OC81D	5/-
ECC81	4/-	PL81	7/-	AC107	10/-	GET116	12/6	OAZ246	4/6	OC81M	5/-
ECC82	5/-	PL82	6/6	AC126	6/6	NKT213	6/-	OAZ247	4/6	OC81DM	5/-
ECC83	5/6	PL83	6/6	AC127	7/6	NKT216	7/6	OAZ290	9/6	OC81Z	9/-
ECC85	5/-	PL84	6/6	AC127Z	9/6	NKT251	5/-	OAZ291	9/6	OC82	6/-
ECF80	7/-	PL500	13/6	AC128	6/6	NKT255	6/6	OAZ292	9/6	OC82D	5/-
ECH35	10/9	PY32	8/6	AC176	7/6	NKT304	8/-	OC16	20/-	OC83	5/-
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ECH81	5/2	PY82	5/6	ACY18	5/6	OA5	4/-	OC22	10/-	OC122	15/-
ECH84	8/10	PY83	6/-	ACY19	6/6	OA7	4/-	OC23	12/6	OC139	7/6
ECL80	7/-	PY88	7/3	ACY20	5/-	OA10	3/-	OC24	17/6	OC140	9/6
ECL82	6/3	UBC41	7/6	ACY21	6/-	OA47	3/-	OC25	9/6	OC169	5/-
ECL86	9/-	UBC81	7/6	AD140	16/-	OA70	2/-	OC26	7/6	OC170	5/-
EF80	5/-	UCC85	6/6	AD149	16/-	OA73	2/6	OC28	12/6	OC171	6/-
EF86	6/3	UCH42	8/6	AD161	11/-	OA79	2/6	OC29	15/-	OC200	7/6
EF183	6/4	UCH81	6/3	AD162	11/-	OA81	2/6	OC35	12/6	OC201	11/6
EF184	6/4	UCL82	7/3	ADT140	15/-	OA85	3/-	OC36	12/6	OC202	13/6
EL34	9/6	UL41	8/6	AF102	18/-	OA86	4/-	OC41	6/-	OC203	10/6
EL41	8/6	UL84	6/3	AF114	6/6	OA90	2/6	OC42	5/-	OC204	15/-
EL84	4/9	UY85	5/6	AF115	6/-	OA91	2/6	OC43	9/-	OC205	15/-
EM84	7/-	U25	9/6	AF116	6/6	OA95	3/6	OC44	5/-	OC206	22/6
EY51	7/-	U26	8/6	AF117	5/-	OA200	3/3	OC44M	5/6	ORP12	8/6
EY86	6/6	5U4GB	6/6	AF118	12/6	OA202	4/3	OC45	4/-	ORP60	5/-
EZ40	7/6	5Y3GT	5/-	AF124	9/-	OA210	7/6	OC45M	4/-	1S202	4/6
EZ80	5/-	5Z4GT	8/-	AF125	8/6	OA211	9/6	OC46	5/6	2SO12	20/-
EZ81	5/-	6F23	10/-	AF126	8/-	OAZ200	11/-	OC47	7/6	2SO12A	25/-
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JOYSTICK VFA turns PRO!

History repeats itself!

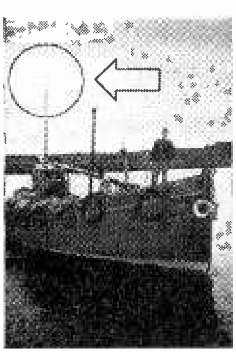
Throughout the development of radio communication the keen private experimenter has contributed largely to the advance of our science. The amateurs of the thirties pioneered reliable shortwave transmission and reception. Basic theories and their practical application are to this day hatched in the fertile minds of ingenious men who are the leading amateurs of our time.

The Joystick Aerial System can now be regarded as the perfect example of a purely amateur development "turning professional". Thousands of Joystick variable frequency aerial systems have been sold. The enormous number of enthusiastic testimonials that have accumulated at the Joystick factory are now in themselves calling for a separate filing room! The continuing success of the VFA has not only spread right round the world but has finally penetrated the barrier of professional and official circles. Professional bodies in the USA, Europe, Africa and the Far East have ordered VFA systems for operational use and for experimental work. Security forbids the whispering of names but clearance has been given to mention the Nigerian Police and an Australian fire control organisation.

In the Scottish fishing boats which have installed the system, communication with other ships and shore stations has become considerably more reliable over difficult paths.

This VFA system is a remarkable invention and its unique quality of high performance at any selected frequency from 1 M/c to 30 M/cs—particularly from difficult locations—has radically changed the attitude of both the licensed amateur and the shortwave listener towards their aerial problems.

Each Joystick VFA system is complete with a Joymatch matching unit suitable for each type of operation.

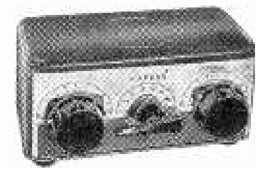


Scottish Fishing Boats Aerial Problems solved!

The Joystick aerial was successfully subjected to the most rigorous tests under appalling weather conditions aboard the MFV *Crystal Sea* OB104 and the MFV *Margaret Ann* OB79 out of Mallaig. Previously the old-fashioned wires had to be lowered every time the ships' derricks were used. Communication with shore stations and other ships was consistently good.

U.S. Patent No. 3274600. S. Africa Patent No. 63/4389. U.K. and World Patents applied for.

Joymatch Type 2A—General medium wave coverage extending over short wave spectrum.



Joymatch Type 3A—General short wave coverage for SWL. Bandswitched for amateur bands. **Joymatch Type 4**—(similar to Type 3A). For transmission and reception. Bandswitched on 160—10 metres.

Joymatch Type 4RF—For transmission and reception on 160—10 metres. Includes RF meter for peak efficiency.

Joymatch Type 3—General shortwave coverage SWL (Junior model).

You cannot afford to ignore the potential of the Joystick VFA. The system is simple to use—the Joystick VFA will clip to a chimney, tree or mast, can be laid upon a pelmet, stood in the corner of a room, will even give a good account of itself in a basement.

Mobile Joystick systems are available and a new marine model has been introduced for the nautical types!

You are strongly recommended to contact the Joystick factory immediately (or one of our agents) for a brochure with full details.

U.K. Agents: G. W. Smith & Co. (Radio) Ltd., 3 Lisle Street, London, W.C.2. Stephens-James Ltd., 70 Priory Road, Liverpool, 4. Chas. H. Young, 170/172 Corporation Street, Birmingham, 4. R.S.C. (Manchester) Ltd., 326 Argyle Street, Glasgow, C.1 (and all branches) or ask your local dealer.

Overseas: France: Vareduc-Comimex, 2 Rue Joseph-Riviere, Paris, Courbevoie, France.

Scandinavia: Permo, Nygaardsgaten 42, Fredrikstad, Norway.

West Germany: Ing. Hannes Bauer, 86, Bamberg, Hornthalstrasse, 8, Stotz & Goessl, 8 Munchen 15, Bayerstrasse 3, and World Wide Agencies.

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for Record Playing units. Teak finish cut for Garrard 1000, 2000, 3000, AT6 Mk 2, AT60, SP25 or Goldring GL68. Available with clear Perspex cover as illustrated £5.19.11. **66/-** complete.

RECORD PLAYING UNITS

Ready for plugging in to Amplifier or Tape Recorder.
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RP3 As above but with Goldring Lenco GL68 Transcription unit and CS90 Cartridge. Normally over £33. Terms available both units. Carr. 15/- Only **26½ Gns.**

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Send S.A.E. for list of brand new lines which must be cleared. Includes Record Playing Units, Amplifiers, Tape Decks, Cabinets, etc.

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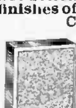
Consisting of matched 12in. 12,000 line, 15 ohm high quality speaker; cross-over unit and Tweeter. Smooth response and extended frequency range ensure surprisingly realistic reproduction. Standard 10 watt rating. Or **Senior 20 watt** inc. Fane 122/10 speaker **7 Gns.** Carr. 8/9. **5 Gns.** Carr. 6/9

ALL LEADING MAKES OF HI-FI EQUIP. STOCKED Cash or Terms

HI-FI LOUDSPEAKER ENCLOSURES

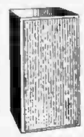
All types of pleasing modern design acoustically lined and ported and in finishes of light Teak or medium Walnut. Credit terms available.



SE8. For optimum performance with any Hi-Fi 8in. speaker. Size 22 x 15 x 9in. Carr. 7/6 **£5.17.9**
SE10. For 10in. Hi-Fi speaker with provision for tweeter. Size 24 x 15 x 9in. Carr. 10/- **£6.19.9**
SE12. For outstanding performance with any 12in. Hi-Fi speaker. Cut for tweeter. Size 24 x 20 x 10in. Or Deposit **27/-** and 9 monthly payments of **18/2 (Total £9.10.6.)** **8 Gns.** Carr. 10/-
FHE8. Folded Horn type. Size 27 x 16 x 10in. Designed for high flux 8in. speaker with which exceptional quality can be obtained. **9 Gns.** Carr. 10/-

HIGH FIDELITY LOUDSPEAKER UNITS

Cabinets of latest styling Satin Teak or Walnut, acoustically lined (and ported where appropriate). Credit Terms available on all units.



MINI 8 8 WATT rating. 3 or 15 ohm. Frequency response 50-13,000 c.p.s. Specially designed high flux 5in. speaker with low fundamental resonance. Handsome Teak veneered cabinet. 9¾ x 6¾ x 7in. Carr. 7/6 **£6/19/11**
The DORSET Size 16 x 11 x 8in. Response 45-18,000 c.p.s. Rating 10 watts. Fitted Audiotrine HF811D speaker. Impedance 3 or 15 ohms. Carr. 7/6 **£7/15/0**
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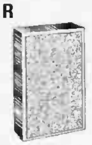


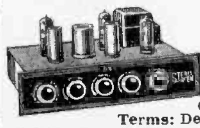
The BRONTE Size 22 x 15 x 9in. Fitted Wharfedale Super 8 RSDD or Audiotrine HF 815D Speaker, with Roll surround and dual cone. Rating 6/10 watts. Impedance 3 or 15 ohms. Carr. 15/-. **12½ Gns.**

Tweeters R.A. 3 ohm or 15 ohm 25/9

15 watt HI-FI TRANSISTORISED AMPLIFIER TYPE A15

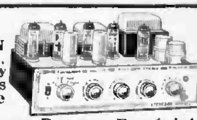
with integral pre-amp tone control stages. Output for 3, 7.5 and 15 ohm spkrs. Kit includes Printed Circuit and all parts including 9 latest type semi-conductors. Heat sink and full wiring instructions or with printed circuit fully wired and tested 21/- extra. **£4.12.9** Post 5/- **Frequency Response:** ±1dB 20-20,000 c.p.s. **Harmonic Distortion:** 0.1%. **Hum and Noise:** —80dB. **Sensitivity:** 2mV. **Bass Control:** +9dB to —14dB at 40 c.p.s. **Treble Control:** +8dB to —13dB at 10 Kc/s. **Will operate from batteries giving 24v.** Suitable Power Pack Kit 47/9 or ready built 69/9

R.S.C. STEREO/TEN HIGH QUALITY AMPLIFIER



A complete set of parts for the construction of a unit giving 5 watts high quality output on each channel (total 10 watts). Sensitivity is 50 millivolts. Suitable all crystal or ceramic stereo heads. Ganged Bass and Treble Controls. Provision is made for use as straight (monaural) 10 watt amplifier. Valve line-up ECC83, ECC83, EL84, EL84, EZ81. Outputs for 2-3 ohm speakers. Point to point wiring diagrams and instructions supplied. Send **S.A.E.** for leaflet.
Or supplied factory assembled with 12 months' guarantee for **11 gns.** **£8.15.0**
Terms: Dep. **36/-** and 9 monthly payments **25/5 (Total £13.4.9).** Carr. 11/6

R.S.C. STEREO 20/HIGH FIDELITY AMPLIFIER



PROVIDING 10/14 WATT ULTRA LINEAR PUSH-PULL OUTPUT ON EACH CHANNEL. SUITABLE FOR "MIKE", GRAM, RADIO OR TAPE. Employing valves ECC83, ECC83, ECL86, ECL86, ECL86, ECL86, EZ81. **Frequency Response:** ±2dB 30-20,000 c.p.s. **Hum Level:** 65dB down. **Sensitivity:** 5 millivolts maximum. **Harmonic Distortion:** (each channel): 0.2%. ★**Four-position tone compensation and Input Selector Switch.** ★**Stereo/Mono switch.** ★**Will amplify direct from Tape Heads.** ★**Neon panel indicator.** ★**Handsome Perspex Frontplate.** ★**Separate Bass "Lift" and "Cut" and treble "Lift" and "Cut" controls.** Output transformers are high-quality sectionally wound to required specification. Output matching for 3 and 15 ohm spkrs. on each channel. Complete set of parts, point-to-point wiring diagrams and instructions. Carr. 12/6 **14 Gns.**
Or factory assembled, tested and supplied with our usual 12 months guarantee. Or Deposit £3 and 9 monthly payments 43/2 (Total £22.4.6). *Send S.A.E. for leaflet.* Carr. 12/6 **19 Gns.**

R.S.C. TFM1 TRANSISTORISED VHF/FM RADIO TUNER

Total cost of parts with detailed wiring diagrams and instructions. Carr. 10/- **12½ Gns.** Or factory built **15½ Gns.** Or in Teak finished cabinet as illustrated **19½ Gns.** Terms: Deposit £5 and 9 monthly payments 39/-. Total £22.11.0.

★ **High-sensitivity** ★ **200-250v. A.C. Mains operation.** ★ **Sharp A.M. Rejection.** ★ **Drift-free reception.** ★ **Output ample for any amplifier (approx. 500 m.v.).** ★**Simple alignment instructions.** ★ **Output available for feeding tuning meter.** ★ **Output for feeding Stereo Multiplexer.** ★ **Tuner head using Silicon Planar Transistors.** ★ **Designed for standard 80 ohm co-axial input.**
Made to visually match our Super 15 and 30 amplifiers and of the same high standard of performance and reliability. The pre-wired tuning head facilitates speed and simplicity of construction. Printed circuitry. Only first grade transistors and components used. Our latest product giving you the best at half the cost of comparable units. Stereo Multiplexer available.

AUDIOTRINE HIGH FIDELITY LOUDSPEAKERS

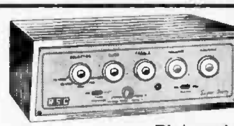
Heavy cast construction. Latest high efficiency ceramic magnets. Dual Cone for extended frequency range. Plastic treated surround giving low fundamental resonance. Response 35-20,000 c.p.s., Impedance 3 or 15 ohms. Carr. 5/6.

HF811D	8in. 10 WATT	4 Gns.
HF101D	10in. 12 WATT	5 Gns.
HF100D	10in. 15 WATT	£5.15.0
HF121D	12in. 20 WATT	£6.15.0
HF127D	12in. 30 WATT	9 Gns.

R.S.C. SUPER 15 HI-FI AMPLIFIER

FULLY TRANSISTORISED 200/250v. A.C. Mains.
OUTPUT 10 WATTS R.M.S. cont. into 15 ohms.
15 WATTS R.M.S. cont. into 3-4 ohms.
Maximum instantaneous Peak power output 28 watts.
PRINTED CIRCUIT CONSTRUCTION.
LATEST MULLARD TRANSISTORS. AD149, AD149, OC127Z, OC81Z, OC44, OC44, OC81Z, OC44, AC107.
5 POSITION INPUT SELECTOR SWITCH
EQUALISATION to Standard R.I.A.A. and C.C.I.R. Characteristics for Gram and Tape Heads.
FULL TAPE MONITORING FACILITIES.
SENSITIVITIES: Magnetic P.U. 4 mV. Crystal or Ceramic P.U. 400 mV. Microphone 4.5 mV. Tape Head 2.5 mV. Radio/Aux or Ceramic P.U. 110 mV.
FREQUENCY RESPONSE: ± 2dB 20-20,000 c.p.s.
TREBLE CONTROL: +15dB to —14dB at 10 Kc/s.
BASS CONTROL: +12dB to —15dB at 50 c/s. **HUM LEVEL:** —75dB.
HARMONIC DISTORTION at 10 Watts R.M.S. 1,000 c.p.s. 0.25%.
NEGATIVE FEEDBACK: 52dB.
Complete Kit of parts with full constructional details and point to point wiring diagrams. Carr. 11/- **11 Gns.**
Supplied factory built **15 Gns.** Carr. 12/6. Terms: Deposit **49/-** and 9 monthly payments **33/9** (Total **£17.12.9**). Or fitted in beautiful Walnut or Teak veneered cabinet as illustrated, **4 Gns.** extra.
ALL COMPONENTS ETC. ARE OF A HIGH STANDARD AND SUPPLIED BY LEADING BRITISH MANUFACTURERS.

TECHNICAL SPECIFICATIONS COMPARE MORE THAN FAVOURABLY with SIMILAR AMPLIFIERS AT TWICE THE COST

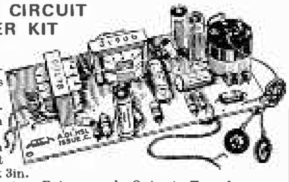


R.S.C. SUPER 30 STEREO AMPLIFIER

A DUAL CHANNEL VERSION OF THE SUPER 15. Employing Twin Printed Circuits. Close tolerance Ganged Pots. Matched Components.
CROSS TALK: —52dB at 1,000 c.p.s.
CONTROLS: 5 position Input Selector. Bass Control, Treble Control, Volume Control, Balance Control, Stereo/Mono Switch. Tape Monitor Switch. Mains Switch.
INPUT SOCKETS (Matched Pairs). (1) Magnetic P.U. (2) Ceramic or Crystal P.U. (3) Radio/Aux. (4) Tape Head/Microphone. Operation of the Input Selector Switch assures appropriate equalisation.
Rigid 18 s.w.g. Chassis. Size approx. 12in. Wide, 3in. High and 8in. Deep. Neon Panel Indicator. Attractive Facia Plate and Spun Silver Matching Knobs. Above facilities, etc., except for Ganging and Balance Control, apply also to Super 15.
THESE UNITS ARE EMINENTLY SUITABLE FOR USE WITH ANY MAKE OF PICK-UP OR MICROPHONE (Crystal, Ceramic, Magnetic, Moving Coil, Ribbon) CURRENTLY AVAILABLE. SUPERB SOUND OUTPUT QUALITY CAN BE OBTAINED BY USING WITH FIRST RATE ANCILLARY EQUIPMENT. All required parts, point to point wiring diagrams and detailed instructions. Carr. 13/9 **18½ Gns.**
Unit factory built **25½ Gns.** or deposit **83/9** and 9 monthly payments **56/9** (Total **£29.14.6**). Fitted cabinet as Super 15 **29½ Gns.** Carr. 15/- or Deposit **£4.14.9** and 9 mthly paymts **65/10** (Total **£34.7.3**). *Send S.A.E. for leaflet.*

HIGH GAIN 4 TRANSISTOR PRINTED CIRCUIT AMPLIFIER KIT

Type TA1

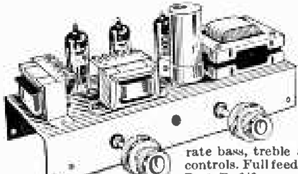


- Peak output in excess of 1½ watts.
- All standard British components.
- Built on printed circuit panel, size 6 x 3in.
- Generous size Driver and Output Transformers.
- Output transformer tapped for 3 ohm and 15 ohm speakers.
- Transistors (GET 114 or 81 Mullard OC81D and matched pair of OC81 o/p).
- 9 volt operation.
- Everything supplied, wire, battery clips, solder, etc.
- Comprehensive easy to follow instructions and circuit diagram 1/6. (Free with Kit). All parts sold separately.

SPECIAL PRICE 45/-. P. & P. 3/-.
Also ready built and tested, 52/6. P. & P. 3/-.
A pair of TA1s are ideal for stereo.

STEREO AMPLIFIER

Incorporating 2 ECL86s and 1 EZ80, heavy duty, double wound mains transformer. Output 4 watts per channel. Full tone and volume controls. Absolutely complete.



ONLY **£4.19.6** P. & P. 6/6

Super De-luxe version with ECL86 valves separate bass, treble and balance controls. Full feed back. **8 gns.** P. & P. 6/6.

6 TRANSISTOR AND DIODE SUPERHET

A first-class 2 waveband transistor superhet. ● Printed circuit panel (size 8¼ x 2⅜in.). ● 3 pre-aligned IF transformers. ● High-gain Ferrite Rod Aerial. ● All First-grade transistors. ● Car aerial winding. ● Push-pull output ● All parts supplied with simple instructions. **All parts sold separately.** Set of parts if purchased at one time ONLY **£4.5.0.** P. & P. 2/6 (Circuit diagram 2/-. Free with set of parts.)

35 OHM SPEAKERS

Suitable for use with above. 2in. Goodmans. Ideal replacement for most pocket portables, **8/6**; 3¼in. **12/6**; 7 x 4in., **21/-**; P. & P. 2/- per speaker.

Portable CABINET

Size approx. 9½ x 6⅜ x 3¼in. Suitable for above using 3¼in. speaker, **25/-**. P. & P. 2/6.

COIL AND TRANSFORMER SET FOR TRANSISTOR SUPERHET

3 IF transformers one oscillator coil one driver transformer and wound Ferrite aerial (med. long and car aerial coupling), **32/6** complete post 2/-. 6 transistor printed circuit board to match **8/6**. Post 1/-. Circuit diagram 1/6 extra.

MINIATURE PRECISION AIR-SPACED TWO GANG TUNING CONDENSER. 176+176 p.F. size 1½"w x ⅞"d x 1⅛"h with vanes open. Built in trimmers **5/-**. P. & P. 1/-

BRAND NEW TRANSISTOR BARGAINS

GET 15 (Matched Pair) **15/-**; V15/10p, **10/-**; OC71 **5/-**; OC76 **6/-**; AF117 **7/6.**
Set of Mullard 6 transistors OC44, 2—OC45 OC81D matched pair OC81 **25/-**, ORP12 Cadmium Sulphide Cell **10/6.**

EDISWAN MAZDA

PXA101 **6/6**; XA103 **6/6.**
R.F.I. Pack: 1—PXA102 Mixer; 2—PXA101 I.F. Amp. (Equiv. OC44 and OC45) **10/6**
R.F. 2 Pack: 2—PXA101 I.F. 1—PXA102 Osc.1—PXA102 Mixer **12/6**
L.F.6 Pack: Consisting of PXB113 Driver Matched pair. PX171 mounted complete with heat sinks (Equiv. OC81D and OC81) **12/6**
ALL TRANSISTORS POST FREE.

TAPE DECKS

B.S.R. MONARDECK (Single speed) 3¾in. per sec., simple control, uses 5¾in. spools, **£6.15.0** plus 7/6 carr. and ins. (Tapes extra).
LATEST COLLARO MAGNAVOX 363 TAPE DECK DE LUXE. Three speeds, 2 track, takes up to 7in. spools. **10 gns.** Plus 7/6 Carr. & ins. on each (Tapes extra).

PORTABLE TAPE RECORDER CASE

Beautifully made and expensively finished in dark grey heavy grade rexine. Satin Chrome metal grille front and chrome fittings. Speaker aperture 9" x 4". Overall size 15½" w. x 15" d. x 7½" h. Will take any standard tape deck or single record player. Limited number only. Worth at least £5. OUR PRICE **49/6.** P. & P. 5/-. Brand new and unused.

ACOS CRYSTAL MIKES. High imp. For desk or hand use. High sensitivity, **18/6.** P. & P. 1/6.
TSL CRYSTAL STICK MIKE. Listed at 45/-. Our price **18/6.** P. & P. 1/6.

QUALITY RECORD PLAYER AMPLIFIER

A top-quality record player amplifier. This amplifier (was used in a 29 gn. record player) employs heavy duty double wound mains transformer, ECC83, EL84, EZ80 valves. Separate Bass, Treble and Volume controls Complete with output transformer matched for 3 ohm speaker. Size 7in. w. x 2½in. d. x 5½in. h. Ready built and tested. **PRICE 69/6.** P. & P. 4/9.
ALSO AVAILABLE mounted on board with output transformer and 6in. speaker ready to fit into cabinet below. **PRICE 89/6.** P. & P. 5/9.

QUALITY PORTABLE R/P CABINET

Uncut motor board. Will take above amplifier and B.S.R. or GARRARD Autochanger or Single Record Player Unit. Size 18 x 14 x 8½in.
Price £3.9.6. Carr. 7/6.

4-SPEED PLAYER UNIT BARGAINS

All brand new in maker's original packing.

SINGLE PLAYERS

B.S.R. TU/12	**£3.9.6**	Carr. 5/6.
GARRARD SP25 De Luxe	**£10.10.0**	Carr. 5/6.
B.S.R. GU7 with unit mounted pickup arm.	**£4.18.8**	Carr. 5/6.

AUTO CHANGERS

Latest B.S.R. UA25 Super slim	**£6. 2.6**
GARRARD 1000 with special Hi-Fi cartridge	**£6.19.6**

GARRARD AT60 **£9.19.6.** Carr. 6/6 on each.
All the above units are complete with t/o mono head and sapphire styli or can be supplied with compatible stereo head for 12/6 extra.

BRAND NEW CARTRIDGE BARGAINS!

ACOS GP67-1. Mono complete. List price 21/-. Our price **13/6.** P. & P. 1/-.

BRAND NEW 3 OHM LOUDSPEAKERS

5in., **12/6**; 6½in., **15/-**; 8in., **21/-**; 10in., **25/-**; 7in. x 4in., **15/-**; 10in. x 6in., **26/-**.
E.M.I. 8" x 5" with high flux ceramic magnet, **23/6.**
E.M.I. 13½ x 8in. with high flux ceramic magnet, **42/-** (15 ohm, **45/-**). P. & P. 5" 2/-, 6½" & 8" 2/6, 10" & 12" 3/6 per speaker.

> **SPECIAL OFFER!**
> Limited number of 12in. 10 watt "R.A." Speakers: 3 ohm **25/-**; 15 ohm, **27/6.** P. & P. 3/6.

E.M.I. PLASTIC CONED TWEETERS. 2¾" 3 ohm. Limited number **12/6** each. P. & P. 1/6.
BRAND NEW HEAVY DUTY 12in. SPEAKERS Response 45 c/s-13 Kc/s. 1½in. voice coil. Available in 3 or 15 ohms. Guaranteed full 15 watts British rating. Heavy cast aluminium frame. These are current production by world famous maker and as they are offered well below list price we are not permitted to disclose the name. LIMITED NUMBER ONLY. UNREPEATABLE at **89/6** P. & P. 5/-. Also 25 watt Guitar Model available at **£5.5.0.** And 35 watt Guitar Model **£8.8.0.**

VYNAIR AND REXINE SPEAKER AND CABINET FABRICS.
Approx. 54in. wide. Usually 35/- yard. OUR PRICE **13/6** per yard length. P. & P. 2/6 (min. one yd.) S.A.E. for samples.

> **SPECIAL OFFER!**
> GENUINE HIGH QUALITY TYGAN FABRIC. 48in. wide. Our price **10/-** per foot run. P. & P. 1/6. **30/-** per yard run. P. & P. 2/6.

SEMI SHROUDED DROP THRO' MAINS TRANSFORMER. Tapped pri 200/250 v. Sec. 300-0-300 v. at 110mA. and 6.3 v. at 3 amp. (E/S screen). Stack size 3¾ x 3¼ x1½in. **30/-.** P. & P. 3/6.
MAINS TRANSFORMER. For Transistor power supplies. Pri. 200/240v. Sec. 9-0-9v. at 500mA. **11/-.** P. & P. 2/6.

MAINS TRANSFORMER. For transistor power supplies. Tapped pri 200-250v. Sec. 40-0-40 at 1 amp (with electrostatic screen) and 6.3v at .5 amp for dial lamps etc. Drop thro mounting. Stack size 1¾" x 3¾" x 3¼" **27/6.** P. & P. 4/6.
MATCHED PAIR OF 2½ WATT TRANSISTOR DRIVER AND OUTPUT TRANSFORMERS. Stack size 1¾ x 1¼ x ⅞in. Output trans. tapped for 3 ohm and 15 ohm output. **10/-** pair plus 2/-. P. & P.
7-10 watt OUTPUT TRANSFORMERS to match pair of ECL 86's in push-pull to 3 ohm output. ONLY **11/-.** P. & P. 2/6.

WELL-KNOWN MAKERS SURPLUS!

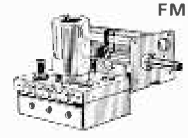
ONE TRANSISTOR PRE-AMP

Suitable for use with Medium or High Impedance mikes, guitars, gram pickups, tape decks etc; For operation from 200/300 volt H.T. rail or 9 volt battery. Gain approx 14:1. Fully isolated input by Mu-Metal screened transformer. Size 4¾" x 1" x 1". Ready built complete with full circuit diagram and instructions. ONLY **15/-.** Post free.

Dual Purpose Bulk Tape Eraser and Tape Head Demagnetiser, 35/-. P. & P. 3/-.

TWIN TELESCOPIC AERIAL. Comprising two 3-section heavily chromed rods. Closed 12-in. each extending to 32in. Completely adjustable from vertical to horizontal. Supplied complete with universal mounting bracket, coax lead and plug. Suitable for F.M. or TV. **12/6.** P. & P. 2/6.

SPECIAL HARVERSON OFFER! FM/AM TUNER HEAD



Beautifully designed and precision engineered by Dormer and Wadsworth Ltd. Supplied ready fitted with twin .0005 tuning condenser for AM connection. Prealigned FM section covers 86-102 Mc/s. I.F. output 10.7 Mc/s. Complete with ECC85 (6L12) valve and full circuit diagram of tuner head. Another special bulk purchase enables us to offer these at **27/6** each. P. & P. 3/-. Order quickly! Limited number also available with precision geared 3:1 reduction drive, **30/-.** P. & P. 3/-.

MATCHED PAIR AM/FM I.F.'s

Comprising 1st I.F. and 2nd I.F. discriminator (465kc/s /10.7Mc/s). Size 1 x 1¼ x 2½in. high. Will match above tuner head. **11/-** pair. P. & P. 2/-.

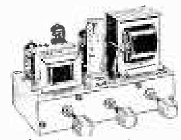
SPECIAL PURCHASE! TURRET TUNERS

By famous maker. Brand new and unused. Complete with PCC84 and PCF80 valves 34-38 Mc/s IF. Biscuits for Channel 1 to 5 and 8 and 9. Circuit diagram supplied. **ONLY 25/-** each. P. & P. 3/9.

GORLER F.M. TUNER HEAD

88-100, Mc/s 10.7 Mc/s I.F., **15/-**, plus 2/- P. & P. (ECC85 valve **8/6** extra).

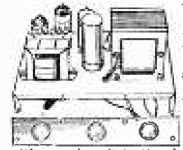
3-VALVE AUDIO AMPLIFIER MODEL HA34



Designed for Hi-Fi reproduction of records. A.C. Mains operation. Ready built on plated heavy gauge metal chassis, size 7½in. w. x 4in. d. x 4¾in. h. Incorporates ECC83, EL84, EZ80 valves. Heavy duty, double wound mains transformer and output transformer matched for 3 ohm speaker, separate Bass, Treble and volume controls. Negative feedback line. Output 4½ watts. Front panel can be detached and leads extended for remote mounting of controls.
The HA34 has been specially designed for us and our quantity order enables us to offer them complete with knobs, valves, etc., wired and tested for only **£4.5.0** P. & P. 6/-.

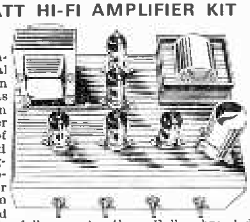
HSL 'FOUR' AMPLIFIER KIT

A.C. Mains 200/250v., 4 watt, using ECC83, EL84, EZ80 valves.



● Heavy duty double-wound mains transformer with electrostatic screen. ● Separate Bass, Treble and Volume controls, giving fully variable boost and cut with minimum insertion loss. ● Heavy negative feedback loop over 2 stages ensures high output at excellent quality with very low distortion factor. ● Suitable for use with guitar, microphone or record player. ● Provision for remote mounting of controls or direct on chassis. ● Chassis size only 7¼in. wide x 4in. deep. Overall height 4¾in. ● All components and valves are brand new. ● Very clear and concise instructions enable even the inexperienced amateur to construct with 100% success. ● Supplied complete with valves, output transformer (3 ohms only), screened lead, wire, nuts, bolts, solder, etc. (No extras to buy.) PRICE **79/6.** P. & P. 6/-.
Comprehensive circuit diagram, practical layout and parts list 2/6 (free with kit).
This kit although similar in appearance to HA34 employs entirely different and advanced circuitry.

10/14 WATT HI-FI AMPLIFIER KIT



A Stylishly finished monaural amplifier with an output of 14 watts from 2 EL84s in push-pull. Super reproduction of both music and speech, with negligible hum. Separate inputs for mike and gram allow records and announcements to follow each other. Fully shrouded section wound output transformer to match 3-15Ω speaker and 2 independent volume controls, and separate bass and treble controls are provided giving good lift and cut. Valve line-up 2 EL84s, ECC83, EF86, and EZ80 rectifier. Simple instruction booklet 1/6. (Free with parts.) **All parts sold separately.** ONLY **£7.9.6.** P. & P. 8/6. Also available ready built and tested complete with std. input sockets, **£9.5.0.** P. & P. 8/6.
Carrying case for above **28/6.** P. & P. 7/6.

NEON A.C. MAINS INDICATOR. For panel mounting, cut out size 1⅛ x ⅜ x ⅜in. deep inc. terminal. White case with lens giving brighter light. For mains 200/250v. **2/6** each. P.P. 6d. (6 or more post free).

Open all day Saturday
Early closing Wed. 1 p.m.
A few minutes from South Wimbledon Tube Station.

HARVERSON SURPLUS CO. LTD.

170 HIGH ST., MERTON, S.W.19 CHErrywood 3985

SEND STAMPED ADDRESSED ENVELOPE WITH ALL ENQUIRIES

(Please write clearly)
PLEASE NOTE: P. & P. CHARGES QUOTED APPLY TO U.K. ONLY P. & P. ON OVERSEAS ORDERS CHARGED EXTRA.

LASKY'S RADIO — FOR THE FINEST VALUE AND TO HOME CONSTRUCTORS

TRANSISTOR PORTABLES

THE SKYROVER De Luxe

7 transistor plus 2 diode superhet, 6 waveband portable receiver covering the full Medium Waveband and Short Waveband 31-94M and also 4 separate switched bandspread ranges, 13M., 16M., 19M. and 25M., with Band Spread Tuning for accurate Station Selection. The coil pack and tuning heart is completely factory assembled, wired and tested. The remaining assembly can be completed in under three hours from our easy to follow, stage by stage instructions. Superhet, 470 Kc/s. All Mullard Transistors and Diodes. Uses 4 U2 batteries. 5in. Ceramic Magnet P.M. Speaker. Easy to read Dial Scale. 500 MW Output. Telescopic Aerial and Ferrite Rod Aerial. Tone Circuit is incorporated, with separate Tone Control in addition to Volume Control. Tuning Control and Waveband Selector. In a wood cabinet, size 11½ x 6½ x 3in. covered with a washable material, with plastic trim and carrying handle. Car aerial socket fitted.

Can now be built for **£8.19.6** Post 5/- extra

H.P. Terms: 60/- deposit and 11 monthly payments of 12/9. Total H.P.P. £10.0.3.

★ **LONG WAVEBAND COVERAGE IS NOW AVAILABLE FOR THE SKYROVER**

A simple additional circuit provides coverage of the 1100/1950M. band (including 1500M. Light programme). This is in addition to all existing Medium and Short wavebands. All necessary components with construction data.

Only **10/-** extra Post Free.

This conversion is suitable for receivers that have already been constructed.

Data 2/6 extra: refunded if you purchase the parcel. All components available separately.

Four U2 batteries 3/4 extra.

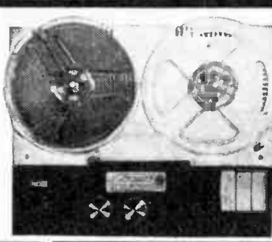
SINCLAIR SUPER MINIATURE KITS

Write for details of Package Deals

THE MICRO-6 miniature radio only 1⁴/₅ x 1³/₁₀ x ½in.	£2 19 6
THE MICRO-FM (tuner/receiver)	£5 19 6
THE X-20 20 watt P.W.M. amplifier	£7 19 6
Available ready built, tested and guaranteed	£9 19 6
THE Z-12 12 watt amp. and pre-amp., fully built	£4 9 6
PZ-3 power pack for Z-12	£3 19 6
STEREO 25 Pre-amplifier control unit, fully built	£9 19 6

TAPE RECORDERS

MAGNAVOX 363 TAPE DECKS



The very latest 3 speed model—1⅞, 3¾, 7½ ips, available with either ½ track or ¼ track head. Features include: pause control; digital counter; fast forward and rewind; new 4 pole fully screened induction motor, interlocking keys. Size of top plate 13¾ x 11in. x 5½in. deep below unit plate. For 200/250v. A.C. mains, 50 cps operation. New, unused and fully guaranteed.

Lasky's Price ½ track model **£10.10.0**

Lasky's Price ¼ track model **£13.9.6**

Carriage and Packing 7/6 extra.

NEW MARTIN TAPE RECORD/REPLAY AMPS.

Now available from stock—for use with the Magnavox 363 Tape Deck.

½ track model.............. LASKY'S PRICE £14.19.6 Carriage and

¼ track model.............. LASKY'S PRICE £15.19.6 Packing 4/6 extra.

Optional extra: Control panel escutcheon to take deck and amplifier controls.

LASKY'S PRICE 12/6 Post & Packing 2/6.

INTERNATIONAL TAPE

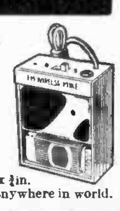
Famous American Brand—Fully Guaranteed

3in.	Message tape, 150ft.	2 6	5¾in.	Long play, 1200ft. Acetate	12 6
3in.	Message tape, 225ft.	3 9	5¾in.	Standard play, 850ft. PVC	11 6
3in.	Message tape, 300ft.	7 6	5¾in.	Long play, 1200ft. Mylar	15 0
3¼in.	Triple play, 600ft. Mylar	10 0	5¾in.	Triple play, 2400ft. Mylar	45 0
4in.	Triple play, 900ft. Mylar	17 6	7in.	Standard play, 1200ft. Acet.	12 6
5in.	Double play, 1200ft. Mylar	15 0	7in.	Standard play, 1200ft. Mylar	12 6
5in.	Long play, 900ft. Acetate	10 0	7in.	Long play, 1800ft. Mylar	19 6
5in.	Standard play, 600ft. PVC	8 6	7in.	Double play, 2400ft. Mylar	25 0
5in.	Triple play, 1800ft. Mylar	35 0	7in.	Long play, 1800ft. Acetate	15 0
5¾in.	Donble play, 1800ft. Mylar	22 6	7in.	Triple play, 3600ft. Mylar	50 0

P. & P. 1/- extra per reel. 4 reels and over Post Free

MICROPHONES

THE TTC MODEL B4002 FM WIRELESS MICROPHONE



Highly sensitive—suitable for either static or mobile use. Signals can be picked up by any FM radio or tuner which receives frequencies between 96—104 Mc/s over several hundred yards. Size only 3 x 2½ x 1in. (in leather case). Operates in one PP3 type battery. Complete with neck cord, clip on dynamic extension mike (¾ x ¾ x ⁵/₁₆in.) and battery. LASKY'S PRICE 10 Gns. Post Free anywhere in world.

THE TTC MODEL 13/500. More powerful version of above—size 7½ x 1¾ x ¾in. Operates on one PP3 type battery. LASKY'S PRICE 12 Gns. Post Free anywhere in world. These cannot be operated in the U.K.

CONSTRUCTORS BARGAINS

SPECIAL PURCHASE—UHF/VHF TV TUNERS

Well known British makers surplus stocks. Now available for the first time to the Home Constructor. Add 2/6 Post and Packing on each.

TRANSISTORISED UHF MINIATURE MODEL 1

Shielded metal case only 3¼ x 1¼ x 3in. Fully tunable—complete with two AF139 transistors. LASKY'S PRICE 39/6

TRANSISTORISED UHF MODEL 2

Metal case size 3¾ (plus spindle) x 2¾ x 1¼in. Fully tunable with slow motion drive. Complete with two AF186 transistors. LASKY'S PRICE 25/6

VALVE UHF MODEL (illustrated)

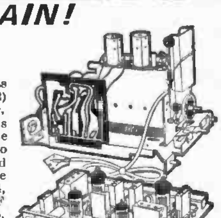
In metal case size 4 x 6 x 1½in. Fully tunable—complete with PC86 and PC88 valves. LASKY'S PRICE 29/6 Without valves 12/6

TRANSISTORISED VHF TUNER

Sub-Miniature turret type fitted with 12 sets of coils and 3 Mullard AF102 transistors In metal case size 3 x 1¼ x 2½in. LASKY'S PRICE 37/6

TREMENDOUS BARGAIN!

TV UHF TUNER AND IF AMPLIFIER PANEL

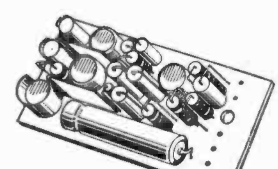


Model No. 89384 made by famous manufacturer as standard conversion unit to 625 line reception (BBC 2) for 19" and 23" 405 line (convertible model) Cossor, Philips, Scott and Stella television receivers. The units are boxed, brand new and fully guaranteed, complete with detailed conversion and operating instructions. To effect conversion on the sets mentioned above you need only a pair of pliers and a screwdriver! The units are fitted with 7 Mullard valves—PCF 80 x 2, EF183, EF184, ECC82, PC86, PC88. Size of units; tuner 7½ x 4 x 8in.. IF panel on 9 x 4½in. printed circuit board x 2½in. deep. Complete with all leads, screws, washers etc. Original Price £10.10.0.

LASKY'S PRICE 49/6 Post 5/-

TREMENDOUS VALUE IF BOUGHT ONLY FOR THE VALVES AND COMPONENTS

NEW—LASKY'S MINIATURE TRANSISTOR AMPLIFIER MODULES



Incorporating the very latest circuitry to provide high sensitivity and good quality in conjunction with extreme small size and compactness. High quality Newmarket transistors used throughout. All designed to operate on 9v. miniature battery.

Add 1/- on each for Post and Packing.

TYPE LRPC 1. 3 transistor. Input sens. 50mV. output 150mW, output imp. 40 Ω, 2 x 1 x ¾in. .... PRICE 27/6

TYPE LRPC 2. 5 transistor. Input sens. 1mV. ouput 330mW, output imp. 15 Ω. Size 2½ x 1¼ x ¾in. .. PRICE 22/6

TYPE LRPC 3. 5 transistor. Input sens. 5mV. output 400mV. output imp. 15 Ω, size 2½ x 1¼ x ¾in. .... PRICE 25/-

TYPE LRPC 4. 5 transistor, Input sens. 150mV, output 330mW, output imp. 15 Ω, size 2½ x 1¼ x ¾in. .... PRICE 22/6

TYPE LRPC 5. 6 transistor. Input sens. 8mV, output 3W, output imp. 3 Ω, size 5½ x 1¾ x 1in. .... PRICE 59/6

TYPE LRPC 6. Tape record/playback amp. (for use with self oscillating erase head). Output 750mW, output imp. 8 Ω. Size 4½ x 2 x 1in. .... PRICE 39/6

FULLY ENCAPSULATED MODULES

Special function modules—all one size 1¾ x 1 x 1¼in. Complete with detailed function and installation instructions. Send S.A.E. for specification sheets.

TYPE PA-1. Public address amp. for use with carbon, crystal or Dynamic microphones, 3 Ω output imp. .... PRICE 30/-

TYPE GR-1. Gramophone amp.—provides sufficient power to fill average room. 3 Ω output imp. .... PRICE 30/-

TYPE CO-1. Morse code practice oscillator—for use with morse key and 3 Ω speaker. PRICE 20/-

TYPE MT-1. Metronome module—provides audible and visual beat from 30 to 240 beats per minute (for use with 3 Ω speaker or indicator lamp). .... PRICE 22/6

GORLER UT 340 FM/VHF TUNING HEART

Permeability tuned—covering 87 to 108 Mc/s. For use with one ECC85 valve. In metal case, size 3 x 2½ x 1½in. Circuit supplied.

LASKY'S PRICE 15/11 Post 2/-. ECC85 valve 9/- extra.

TRANSISTORS

ALL BRAND NEW AND GUARANTEED

GET 81, GET 85, GET 86 2/6; 873A, 874P 3/6; OC45, OC71, OC81D 4/6; OC44, OC70, OC76, OC81 5/6; (match pair 10/6); AF117, OC200 6/6; OC42, OC43, OC73, OC82D 7/6; OC201, OC204 15/-; OC205, OC206 19/6; OC28 24/6; OC75 8/-.

TRANSFILTERS

by BRUSH CRYSTAL CO., Available from stock.

TO—01B 465 kc/s. ± 2 kc/s.
TO—01D 470 kc/s. ± 2 kc/s.
TO—02B 465 kc/s. ± 1 kc/s.
TO—02D 470 kc/s. ± 1 kc/s.
TF—01B 465 kc/s. ± 2 kc/s.
TF—01D 470 kc/s. ± 2 kc/s.

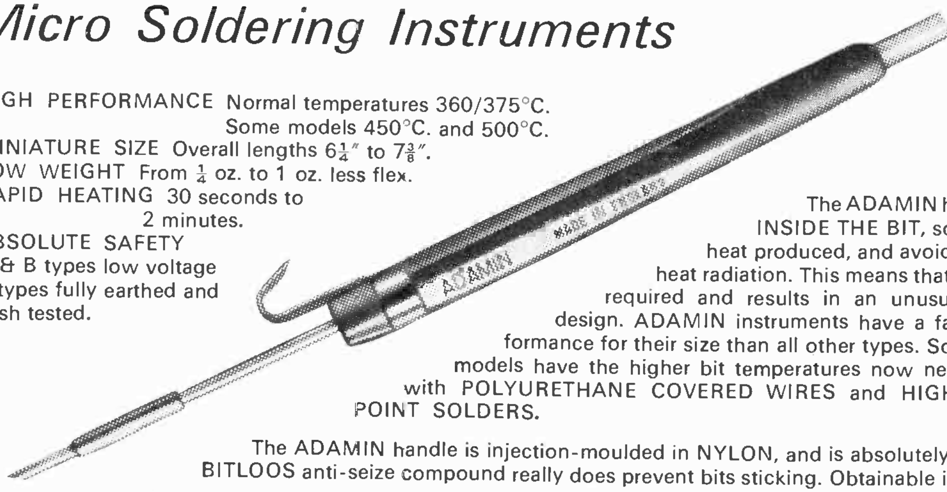
9/6 each Post 6d.

NOW AVAILABLE—OUR NEW BARGAIN BULLETIN. 24 foolscap pages packed with hundreds of bargains for the "ham" and service man—exclusive to Lasky's—plus full list of regular stock items. PRICE 6d. *POST FREE.*

LASKY'S RADIO FOR FINEST VALUE and COURTEOUS SERVICE

Adamin

Micro Soldering Instruments



- HIGH PERFORMANCE Normal temperatures 360/375°C. Some models 450°C. and 500°C.
- MINIATURE SIZE Overall lengths $6\frac{1}{4}''$ to $7\frac{3}{8}''$.
- LOW WEIGHT From $\frac{1}{4}$ oz. to 1 oz. less flex.
- RAPID HEATING 30 seconds to 2 minutes.
- ABSOLUTE SAFETY
  A & B types low voltage
  C types fully earthed and flash tested.

The ADAMIN has its element INSIDE THE BIT, so using all the heat produced, and avoiding excessive heat radiation. This means that less power is required and results in an unusually compact design. ADAMIN instruments have a far higher performance for their size than all other types. Some ADAMIN models have the higher bit temperatures now needed to cope with POLYURETHANE COVERED WIRES and HIGH MELTING-POINT SOLDERS.

The ADAMIN handle is injection-moulded in NYLON, and is absolutely unbreakable. BITLOOS anti-seize compound really does prevent bits sticking. Obtainable in 2-oz. tubes.

Free details in brochure SP10.

LIGHT SOLDERING DEVELOPMENTS LTD.

28 Sydenham Road, Croydon, Surrey *Telephone: CROydon 8589 and 4559*

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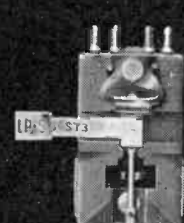
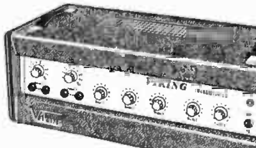
surprise surprise



VIKING TRANSISTOR

40-50 WATT AMPLIFIER

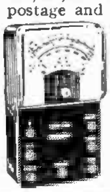


OPERATING INSTRUCTIONS GENERAL. An extremely reliable lightweight amplifier capable of giving 40-50 watts of undistorted sound, made possible by the use of the latest semi-conductors (transistors) and techniques which ensure space-age reliability under the most rugged conditions. It is designed as a general purpose amplifier particularly suitable for use with musical instruments that require exceptionally high treble response (not recommended for Bass Guitar). Tremolo facilities are available on Channel 1 only. INPUTS—CONTROLS—CHANNEL 1 (Tremolo): this contains two high gain input jack sockets controlled by **Volume Control 1** which is mounted directly above the two sockets marked tremolo. BASS 1: gives a controlled boost to the lower frequencies on Channel 1 only. TREBLE 1: gives a controlled boost to the high frequencies on Channel 1 only. TREMOLO: this operates on Channel 1 only and the variations of intensity and speed of the Tremolo beat is adjusted by the controls DEPTH and SPEED. A socket is provided in the rear of the amplifier so that the Tremolo may be switched on and off by the use of a footswitch plugged into the socket. If you wish the Tremolo to be used without the footswitch, this is possible as the footswitch is only used to short out the effect. INPUTS AND CONTROLS—CHANNEL 2 (Normal): this contains two high gain input jack sockets controlled by **Volume Control 2** which is mounted directly above the sockets marked **Normal.** TREBLE: gives a controlled boost to the treble frequencies on Channel 2 only. MAINS VOLTAGE: fully adjustable, 200-250 volts, A.C. 50 cycles. POWER OUTPUT: 40-50 watts sine wave British rating. Very little distortion. OUTPUT IMPEDANCE: 3 ohms. Price **21** gns. plus £1 postage and packing.

WOLSEY U.H.F. AERIAL AMPLIFIER, two stage, gain 23 db, noise factor 8 db, power consumption 6 m/a at 14 volts. Two AF186 transistors, complete with built-in power supply in metal case, list price 9 gns., our price **4½ gns.** plus 2/6 postage and packing.

MAINS TRANSFORMER, primary 200/250 volt, secondary 425/425 volt, 250 mA, 6.3 volt 4 amp, 5 volt 3 amp; fully shrouded, chassis mounting. Price **£2.5.0** plus 7/6 postage and packing. Auto transformer step-up-step-down, 240/110 volt 400 watt. Price **£1.5.0** plus 7/6 postage and packing.

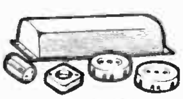
MAINS TRANSFORMER 200/250 volt, secondary 250/250 volt, 70 mA, 6.3 volt, 3 amp drop through. Price **12/6** plus 4/6 postage and packing. Elac 10 inch, 10,000 lines ceramic magnet, 3 or 15 ohms, 7½ watt, **£1.9.6** plus 4/6 postage and packing.



POCKET MULTI-METER

Size 3⅞ x 2½ x 1⅛in. Meter size 2½ x 1⅞in. Sensitivity 1000 O.P.V. on both A.C. and D.C. volts. 0·15, 0·150 0·1000. D.C. current 0·150mA. Resistance 0·100kΩ. Complete with test prods, battery and full instructions, **42/6.** P. & P. 3/6. **FREE GIFT** for limited period only. 30 watt Electric Soldering Iron value 15/- to every purchaser of the Pocket Multi-Meter.

40W FLUORESCENT LIGHT KIT

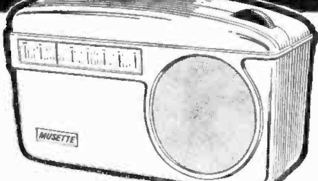


Incorporating **GEC** Choke size 8½in. x 1⅝in. x 1⅛in., 2 bi-pin holders, starter and starter-holder. P .& P. 5/6. **11/6**

Similar to above: 80W. Fluorescent Light Kit incorporating **GEC** choke size 11⅝in. x 1⅝in. x 1⅛in. 2 bi-pin holders, start and starter holder. P. & P.6/6. **17/6**

Twin 40W Choke instant start for 2 x 2ft tubes 17/6, P. & P. 5/6.

MUSETTE 6 TRANSISTOR SUPERHET PORTABLE RADIO



39/6

P. & P. 3/6.
Circuit diagram 2/6.
Free with parts.

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- IF 470 kc.
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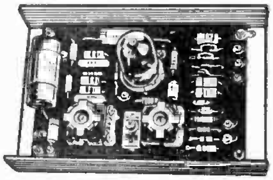
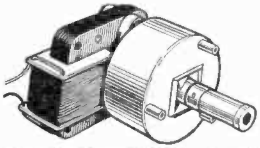
For receiving Stereo FM

Now is your chance to benefit in full from the new B.B.C. stereo transmissions with our Multiplex Decoder. Design features: Highly efficient Mullard vinkor pot cores. Two semi-conductor diodes. Double purpose valve. Printed circuit type construction high input impedance. Specification: Cross talk minus 26 dB at 1 kc/s. Input requirements 0·5—1·5 RMS. Stability plus or minus 0·1%. Voltage requirements H.T. 190—250 volts. D.C. at 5 mA. heaters 6·3 volts. A.C. at 300 mA. Self powered unit shortly available, price to be announced. Size 5½" x 3½" x 1". Fully built and tested.



Price **£4.4.0** P. & P. 3/-



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Small A.C. mains motor 230/250 volts complete with gearbox. 6 r.p.m. Price 15/- plus 4/-. P. & P.
Similar to above motor but without gearbox. Price 9/6 plus 3/-. P. & P.

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5¾in.	Std.	850ft.	.. 9/-		5in.	L.P.	850ft.	..	10/6
7in.	Std.	1200ft.	.. 11/6		3in.	T.P.	600ft.	..	10/6
3in.	L.P.	240ft.	.. 4/-		5in.	T.P.	1800ft.	..	25/6
5¾in.	L.P.	1200ft.	.. 11/6		5¾in.	T.P.	2400ft.	..	32/6
7in.	L.P.	1800ft.	.. 18/6		7in.	T.P.	3600ft.	..	42/6
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P. & P. on each 1/6, 4 or more post free.

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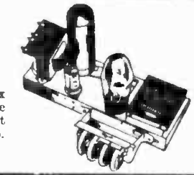
Capstan-driven, battery operated 7½ and 3¾ i.p.s. Precision made. Push-button controls. High quality 2¾in. speaker. Push-pull circuit. Output 400mW. Frequency response: 200-7,000 kc/s. Fast rewind. Up to 1 hour twin track playing time. Automatic erasing for re-recording. Dimensions: 8in. x 11in. x 3¼in. Weighs only 7lb. Takes 5in. spools.

£11.11.0 plus 9/-. P. & P.

SILICON RECTIFIERS

250 v. P.I.V. 750 milliamps. Six for 7/6 post paid.

3 to 4 WATT AMPLIFIER



3-4 watt Amplifier built and tested. Chassis size 7 x 3½ x 1in. Separate bass, treble and volume control. Double wound mains transformer, metal rectifier and output transformer for 3 ohms speaker. Valves ECC81 and 6V6. £2.0.0 plus 5/6 p. & p.
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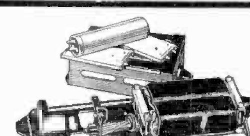

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Size 5½" x 3½" x 1½". For IF and RF alignment and AF output 700 c/s frequency coverage 460 kc/s to 2 mc/s in switched frequencies. Ideal for alignment to our Elegant Seven and Musette. Built and tested. **39/6** P. & P. 3/6

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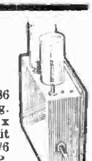

Complete with PC88 and PC86 Valves. Full variable tuning. New and unused. Size 4½ x 5½ x 1½in. Complete with circuit diagram. **35/-** plus 3/6 P. & P.

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PRACTICAL WIRELESS

VOL 42 No 11

issue 721

MARCH 1967

TOPIC OF THE MONTH

More 'Pop' & Local Radio

The White Paper issued recently on Broadcasting has done a jolly good job of whitewashing and it is difficult from this document to comprehend the Government's attitude towards broadcasting in the United Kingdom. It has denied Independent Television the right to broadcast in colour (which would not cost the general public an extra penny), yet has permitted the BBC to start a popular music programme in the medium wave band and to run an experimental chain of local radio stations in the v.h.f. band.

"It has of course been the Government's duty," the White Paper explains, "to consider what the proposals for further extending the broadcasting services should seek to serve, and what organisation could best promote these purposes. The Government have also had to consider to what extent it would be in the national economic interest to allow the extensions. It is not enough that they should be desirable in themselves. The overriding consideration is whether the country can afford them."

What a lot of rubbish! The "pirate" radio stations have clearly shown that there is a need for "pop" music and that in general, listeners are not offended by the accompanying advertising. The Government have totally disregarded public opinion in deciding to set up a "popular" music station of a character which will not replace the "pop pirates".

Nine experimental local radio stations operating in the v.h.f. band are to be set up by the BBC in different parts of the country during the year. Locations have not yet been decided, but the stations are hoped to offer a full-scale local service and to be financially supported from local sources. Commercial advertising will not be accepted, yet the BBC will be prepared to accept financial support from local authorities, Chambers of Trade and Commerce, local Councils of Churches, arts associations and other representative bodies active in the social and cultural life of the community. The BBC will not, however, take a direct grant from the local rate fund, but will accept money from local authority departments, such as education. Thus, it would appear that this scheme is just another burden upon the ratepayer.

W. N. STEVENS—*Editor*

NEWS AND COMMENT

CONSTRUCTIONAL

GENERAL ARTICLES

APRIL ISSUE WILL BE PUBLISHED ON MARCH 3rd

All correspondence intended for the Editor should be addressed to: The Editor, "Practical Wireless", George Newnes Ltd., Tower House, Southampton Street, London, W.C.2. Phone: TEMple Bar 4363. Telegrams: Newnes Rand London. Subscription rates, including postage: 36s. per year to any part of the world.

Power supplies

I WAS unable to follow the reasoning in the article by H. T. Kitchen that appeared in the January 1967 issue.

Obviously $\frac{250}{25} \times \frac{60}{230}$ is not equal to 38 ohms as he states. Of course $\frac{250}{25} \times \frac{230}{60}$ is equal to 38 but what happened to the milliamps, that 10^{-3} bit, and how on earth did he come by the equation $\frac{E^1}{I} \times \frac{E^2}{I^2} = R$ (internal) and then confuse the product IR as being internal resistance?

P. Murphy. Aldermaston, Berkshire.

The author replies:

I admit guilt in committing the sin of confusing my multiplication and division signs. The error is undoubtedly mine, and as the perpetrator thereof I must, bravely smiling, take the consequences.

It is, I regret, yet another example of the fallibility of human nature; of how a temporary loss of sync between brain and pen can virtually ruin much otherwise painstaking and accurate work.

As I see it, however, the bone of contention is the ultimate equation for calculating IR. Here, of course, I was well and truly up the creek when I used a multiplication sign instead of a minus one. The equation should have read $\frac{E^1 - E^2}{I^2 - I^1}$

Using the new set of rules the IR for my power supply works out at 571 "point something" ohms. And as for forgetting our little milliamp friends, I hang my head in shame.—H. T. Kitchen.

THE P.W. FILM SHOW

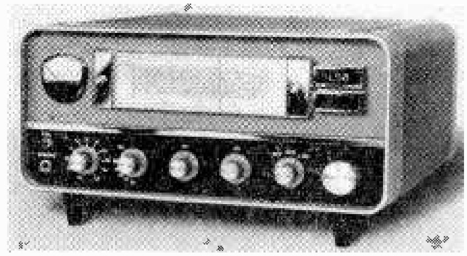
The annual film show, organised jointly by Mullard Ltd. and Practical Wireless, is to be held, as before, at Caxton Hall, Caxton Street, Westminster, London, S.W.1. The date is Friday, **April 14th,** and the show will start at 7.30 p.m. prompt.

The programme will include a film *Electrons in Harness* and a topical talk on *Transistors and Television.* Refreshments will be served in the interval.

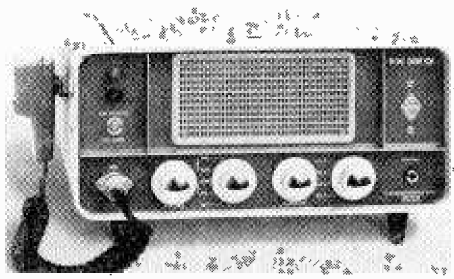
Applications for tickets—which are free—should be made now to Film Show, Practical Wireless, Tower House, Southampton Street, London, W.C.2. A stamped addressed envelope must be included with all applications.

NEWS AND..

TWO NEW MODELS FROM K.W. ELECTRONICS



KW201 Amateur Band Receiver
11 ranges, 1·8—30 Mc/s. Crystal mixer. Crystal BFO. Q Multiplier.
Sens: 1μV/500mW.
S/N: 1μV/20dB.



KW2000CA SSB Transceiver
3—19 Mc/s. 180W p.e.p. (SSB), 75 watts (CW), 25 watts (AM). Mains or Battery.
Transceiver—18 lb.
A.C. p.s.u.—23 lb.
D.C. p.s.u.—6½ lb.

The KW201 incorporates a mechanical filter which gives an i.f. selectivity of 3·1 kc/s at 6dB and 6 kc/s at 60dB. The Q multiplier (optional extra) gives a range of 3·1 kc/s to 200 c/s selectivity. The slide-rule vernier dial is accurate to 1 kc/s. The KW201, designed for optimum performance on single sideband, measures 13¾ x 6 x 12½in. and weighs 19 lb. Power supply is 200—240V, but a 115V version is available. The price is £105, complete with 13 crystals.

The KW2000CA is a commercial long range unit with a frequency stability of 1 part in 10^6 in ambients between +70C° to −10°C. Enquiries to K.W. Electronics Ltd., 1 Heath Street, Dartford, Kent.

SILICON PLANAR TRANSISTORS—NEW TYPES

Mullard have added seven new p-n-p types to their range of silicon planar transistors. Because of their linear gain/current characteristics they are all suitable for both switching and linear applications.

The BCY70 and BCY72 are both 350mW type, the former having a high Vceo of 40V and low saturation voltage and intended for medium-speed switching applications. The BCY72 is a general purpose type.

Low leakage current, low saturation voltage and high cut-off frequency (in excess of 200 Mc/s) are features of the new 600mW transistors 2N2904, 2N2904A and 2N3133 (high speed switching and driving) and 2N1131, 2N1132 (medium speed switching).

Mullard also announce new additions to their range of miniature and sub-miniature glass-encapsulated quartz crystal units. An AT-cut unit is available for a range of 1·6—87 Mc/s. There is also a special 10 Mc/s unit for secondary frequency standards (QX3100). A data book with full specifications is available on request.

IMPROVED SURFORM TOOLS

Stanley Works announce a completely redesigned range of their well-known Surform tools which have replaceable blades and can be used on materials from balsa wood to mild steel. Most readers will be familiar with these tools and will be interested to hear that an additional heavy duty blade specifically recommended for use on harder materials such as metals is now available for the first time.

...COMMENT

NEW YORK STATE LAW ENFORCEMENT FACSIMILE SYSTEM

Recently Governor Nelson A. Rockefeller, and Mayor John Lindsay and Commissioner Howard Leary, inaugurated a new communication system to aid New York State criminal justice agencies in fighting crime.

The equipment being supplied by Western Union for New York State Identification and Intelligence System is manufactured by the Muirhead Group of Companies.

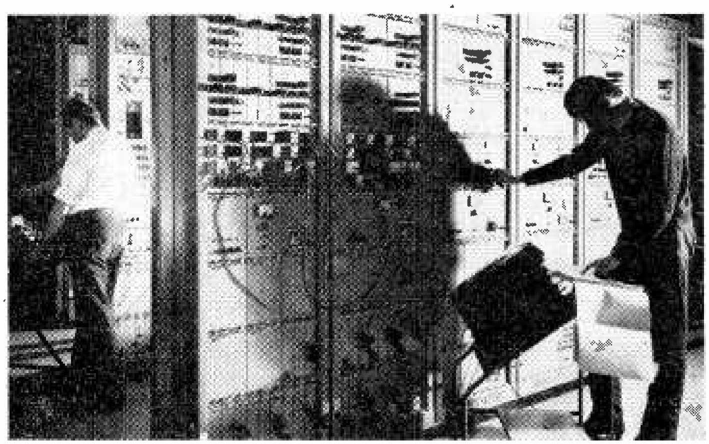
Prior to the installation of this equipment when a suspect was fingerprinted, identification could take 7 to 10 days, it now takes 2 to 3 hours.

The suspect's fingerprint card is placed on a photographic transmitter and within 14 minutes is sent over a telephone circuit to an automatic photographic facsimile recorder. The received copy is automatically processed within the machine to produce a finished photographic copy of the original fingerprint card. This automatic processing takes approximately 12 seconds.

Once the suspect's identity is verified, a copy of his criminal history is transmitted by a rapid message facsimile system to the originating agency in 4 minutes.

The installation is one of some 105 similar systems to be installed during the next 18 months, linking the various criminal justice agencies throughout the State with the State's Division of Identification in Albany.

WORLD'S LARGEST TELEGRAPH CENTRE



Automatic error-correcting telegraph equipment has been installed by The Marconi Company at the GPO's Fleet Building Telegraph Centre, the largest of its kind in the world. Situated in the heart of London, the equipment will provide for a substantial increase in the traffic handling capacity of radio telegraph services. Already the telex calls through Fleet Building exceed the total overseas telephone traffic from the whole of the United Kingdom, and the telex service is still expanding.

The photograph shows the Marconi equipment, which is known as Autoplex, undergoing final acceptance tests at the GPO's Telegraph Centre.

Autoplex is completely transistorised and housed in tall slim racks. At Fleet Building, 36 of these have been installed, increasing the centres radio-telegraph capacity to 296 circuits, each capable of carrying four separate telegraph links.

No news is good news

YOUR editorial and four-column article on the prosecution of pirate radio stations was a waste of space. Everyone interested had heard the outcome on radio, TV and read it in newspapers long beforehand.

I'm not against editorial comment about such issues, after all that is what maintains a magazine's individuality, but a full account *and* a promise of another detailed case is too much. The space could have been put to better use as constructional articles.

If this is going to be the future policy of P.W. how about the prosecutions of "ham" pirates, not to mention a sound version of Underneath the Dipole (from P.T.)?

A far better policy would be to refuse advertised non-convertible 27 Mc/s walkie talkie spreads unless boldly indicated as such.

I.N.R.W. Newport. New Marston, Oxford.

[*Although we cannot obviously compete with newspapers in reporting news items we feel it is reasonable to devote some space to important happenings in the radio world. A newspaper is usually thrown away after reading, whereas most readers retain their copies of hobby magazines. This provides a useful reference source for the future.*

With regard to 27 Mc/s walkie-talkies, readers can be left in no doubt of our feelings on this point. Advertisers are asked to state that such equipment cannot be used in the U.K. (for P.W. has a worldwide circulation, including countries where C.B. facilities are *available). For the benefit of those who may still be unaware of the facts may we again point out that the use of 27 Mc/s walkie-talkies for communications purposes (however limited the range) is strictly illegal and renders the user liable to prosecution*]—Editor.

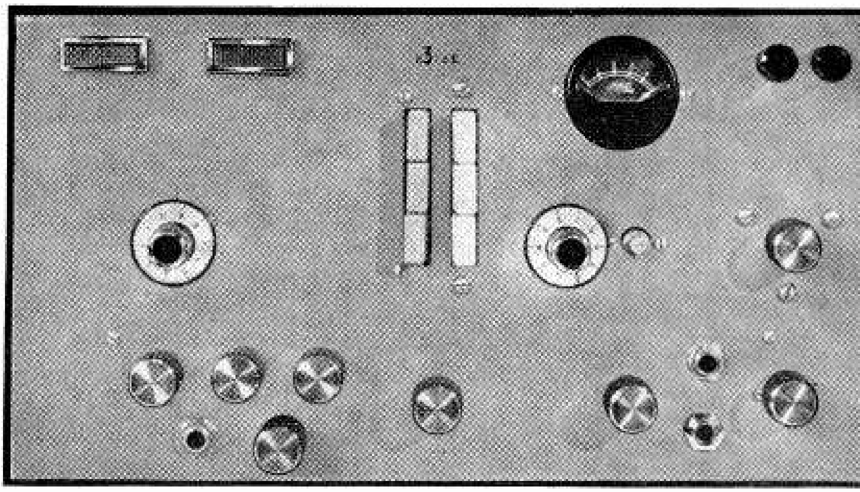
Club spot

I would like to say how much I enjoy reading the Club Spot feature in this magazine. It is very useful to members of other clubs as it shows the activities that can be enjoyed from club membership and gives club committees ideas for their own organisations.

Brian Smith. Ilford, Essex.

[*We are pleased to hear that you enjoy the Club Spot feature. We would like to take this opportunity to appeal to clubs to send in information about themselves together with one or two photographs of QTH's and/or members and equipment. All will be considered for publication.*]—Editor.

More News and Comment on Page 844



TOP BAND TRANSCEIVER

BY

T. SIMON

COVER SUBJECT

THE trend in amateur circles these days is toward compact units as opposed to the huge rack and panel arrangements of earlier years. In a multi-band transmitter running 150W, it becomes necessary to "loose" 140W if topband is to be included and the 10W power limit observed. The unit to be described is based on observing the first statement above, while avoiding all the complications implied by the second.

The cheapest commercial topband transmitter on the market sells at around £15 and then requires the additional expense of a power supply. The unit described here cost less than £15 to construct and is not merely a transmitter. This price included the power supply unit; built-in frequency marker including crystal; and a receiver to boot. Briefly, the unit comprises a complete self-contained phone/c.w. station for the 1·8—2·0Mc/s amateur band, occupying a space 12 × 6½ × 4½in. It is based on economy and simplicity and uses only six valves, two in the transmitter, one in the modulator, and three in the receiver.

The circuit diagrams of the complete unit are divided into two sections; transmitter, and receiver plus power unit. Thus just the transmitter could be built, this would form the basis of a useful miniature topband rig, or just the receiver portion might be constructed, this being of particular interest to s.w.l's., and again the unit could be very small indeed.

Receiver Circuitry

This section of the unit employs three valves all Mullard type EFC82/6U8. The aerial input circuit ignores the coupling winding on L1 and the coil is top-capacity coupled to the transmitter tank circuit via C49 and S1e on the T/R switch. In this way the extra stage of selectivity afforded by the tank circuit is utilised on receive. In the writer's area there is strong break-through from the BBC at Brookmans Park (908kc/s 2nd harmonic). This is entirely eliminated by the tank circuit which peaks quite sharply.

V1 is a standard frequency changer circuit but with the inclusion of an extra potentiometer in the cathode of the pentode section. The original idea was to provide variable mute on transmit in order to monitor one's transmissions on the receiver, but due to the very close proximity of the transmitter this does not function quite as well as was hoped, and the substitution of a fixed resistor of some 10kΩ should prove adequate. An alternative would be complete screening of the receiver section—a complication which did not justify the effort required since the simple arrangement shown does work tolerably well. On receive, the T/R switch shorts the muting resistor to earth via S1a and the circuit functions as a normal frequency changer.

The pentode sections of V2 and V3 are used as i.f. amplifiers at 465kc/s whose gain is effectively controlled by VR2. These stages are quite stable providing the anode and screen volts are not too high, hence the larger than usual values of the screen resistors R7, R12. In the prototype the optimum valves for R7/R12 were found to be 82kΩ, however to allow for different layouts, etc., it was considered safer to specify the values shown in Fig. 1. The values quoted are for maximum gain consistent with stability, however, if it is found that on peaking the i.f.t. cores the circuit becomes unstable, then it is better to drop the h.t. to the i.f. stages rather than leave the i.f.t's. slightly off tune. If this latter procedure is adopted the receiver will work but the selectivity will suffer.

The triode of V2 is a straightforward audio amplifier fed from the diode detector D1. The triode section of V3 functions as a b.f.o. with VC2 as a pitch control for resolving s.s.b. and c.w. while S2 switches the b.f.o. out for a.m. reception. The high value decoupling and load resistors R10/R11, and the consequent low volts on the anode of V3b were found to be a necessity. Even with two 47kΩ resistors here there was still too much b.f.o. injection. Also note there is no b.f.o. coupling capacitor as such. This proved to be superfluous presumably due to the coupling afforded by the inter-electrode capacity within the valve V3 itself.

Transmitter Circuitry

This section utilises the remaining three valves in which the first stage comprises another ECF82/6U8 as a Clapp v.f.o. and tuned buffer-amplifier/crystal oscillator (V5).

The v.f.o. is cathode coupled to the buffer stage via the v.f.o. crystal switch S6. With this switch depressed the v.f.o. output is disconnected and the pentode section reasonates at 1·9Mc/s thus forming a frequency meter giving a marker right in the centre of the band. It might be possible to use a 100kc/s crystal and get a 1·9Mc/s point plus two very useful band-edge points on 1·8 and 2·0Mc/s but this idea has not been tried.

The p.a. V6 is a 5763, this valve merely because it happened to be in the junk box. Other suitable valves would be the 6BW6 or 6AQ5. Note alternative valves might require adjustment of circuit values, and some are B7G bases not B9A as for the 5763.

Departure from the time honoured pi-tank might shock some, since this has become almost an accepted standard. However the present system does permit odd lengths of wire presenting all sorts of impedances to be matched quite precisely and accurately. Those who still prefer a pi-tank might p.a. valve to limit the anode current to a safe value during the key-up periods, when there would otherwise be no bias (due to there being no drive) on the 5763 or p.a. valve used. If the v.f.o. were keyed, the buffer amplifier would also require cathode bias, or some means of protection during key-up.

The modulator section V4, provides frequency modulation and uses the two triodes of a 12AX7 in cascade. Doubtless one section might prove sufficient, but with two stages the QSO can be conducted in a confidential whisper with the mike gain half way up. Frequency modulation was chosen mainly because of the modest requirements both in circuitry and components, not to mention its tendency *not* to aggravate t.v.i. as opposed to, say, amplitude modulation. A class A audio amplifier suitable for a.m. would be required to produce around 5 watts of audio with attendant consumption of some 40-50mA of h.t. current plus the heavy and somewhat bulky modulation choke or

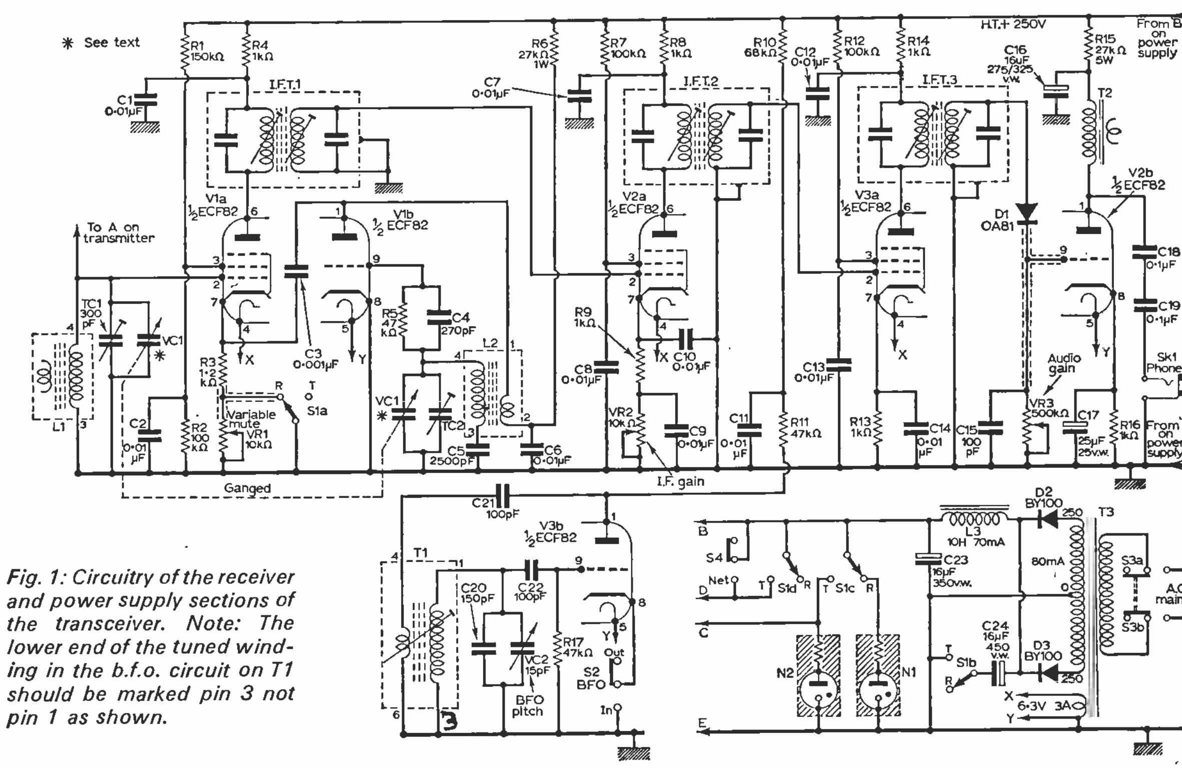


Fig. 1: Circuitry of the receiver and power supply sections of the transceiver. Note: The lower end of the tuned winding in the b.f.o. circuit on T1 should be marked pin 3 not pin 1 as shown.

substitute a 500 + 500 pF variable capacitor, both sections in parallel, for the tank coil tapping switch S7. Due allowance for this should be made in the layout and size of chassis when planning. If this procedure is adopted then VC4 would also benefit from being a higher value, say 200-300pF. In the event of very short antennas such as whips being used, then the 500 + 500pF suggested for the pi-tank modification would benefit from being increased by the inclusion of a 1,000pF capacitor wired in parallel.

The transmitter is keyed in the cathode of the p.a. since this method has proved satisfactory in the past. If keying is inserted in the buffer or v.f.o. then a bias resistor and decoupling capacitor should be included in the cathode return of the transformer. The 12AX7 on the other hand consumes but a few mA, thus one gets a bonus of being able to use a much smaller mains transformer, less complex circuitry, and fewer components. There has, to date, been no sign of t.v.i. at any time with the prototype.

The input circuit is intended for a crystal mike and although the input impedance is not matched, the 500kΩ pot. VR4 being an abnormally low value for a crystal mike, there is sufficient gain and the speech quality is quite good. The 100pF capacitor across the mike input is included to avoid the BBC being re-radiated due to the mike lead acting as an aerial. The 500kΩ audio gain control is really a luxury, as once set for a particular mike it requires very little adjustment, thus a fixed resistor could be substituted if desired. The value will depend on the particular mike used, but around 330kΩ would be a good starting point for most crystal mikes.

The modulator receives its h.t. supply whenever the T/R switch S1c is in the transmit position, but it is not coupled to the transmitter until the phone c.w. switch S5 is depressed.

Although the p.a. tuning capacitor and the modulator section are in the same compartment and are not screened from each other, there is no interaction nor any trace of feedback.

Power Supply Circuitry

This scarcely needs any comment since it boasts well proven circuitry with little originality, consisting of standard full-wave rectification with choke or capacity input.

In the prototype design the place now occupied by the crystal held two 85A2 stabiliser valves wired in series to provide 85 volts stabilised to the v.f.o. and buffer screen, and 170 volts stabilised to the buffer anode. The v.f.o. tuned 900kc/s-1Mc/s, and its anode load consisted of a 1·6Mc/s i.f.t. modified to form a wide-band coupler. The buffer anode also had one of these and the system worked extremely well. However once the p.a. was brought in, there was so much r.f. in so small a space that the p.a. just could not be tamed. Those who prefer this arrangement might consider using a slightly larger case to allow better screening and improved layout. The stability of the present v.f.o. tuning 1·8-2·0Mc/s was found quite adequate without any stabilisation, thus the 85A2's were omitted.

The two neons in the power unit illuminate to show immediately on the front panel whether the station is on transmit or receive. For those build-

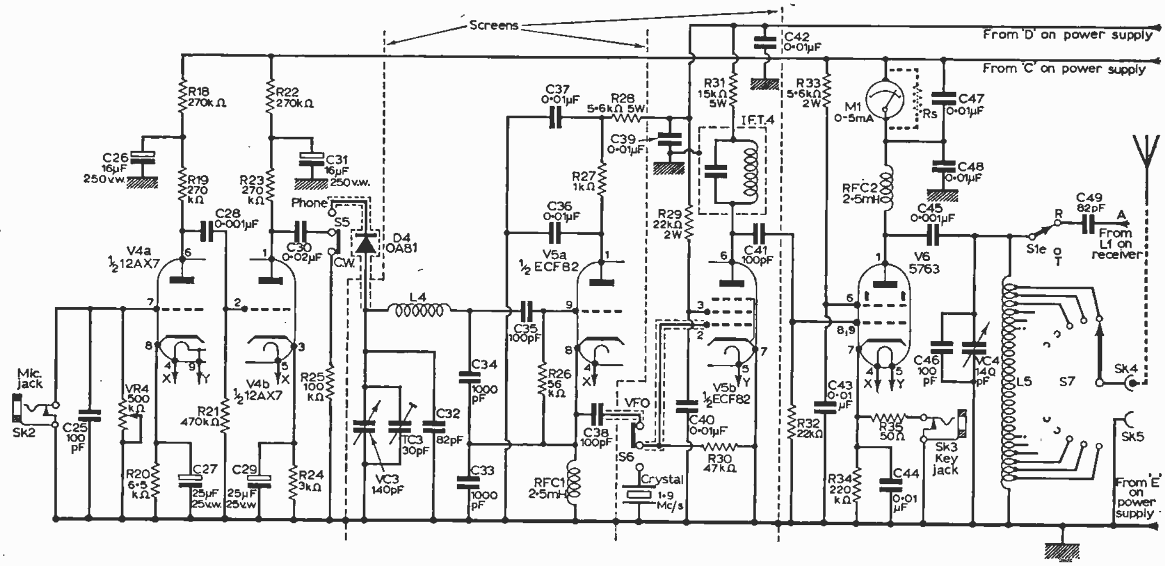


Fig. 2: Circuit of the transmitter and modulator sections. Note complete screening of the modulator diode.

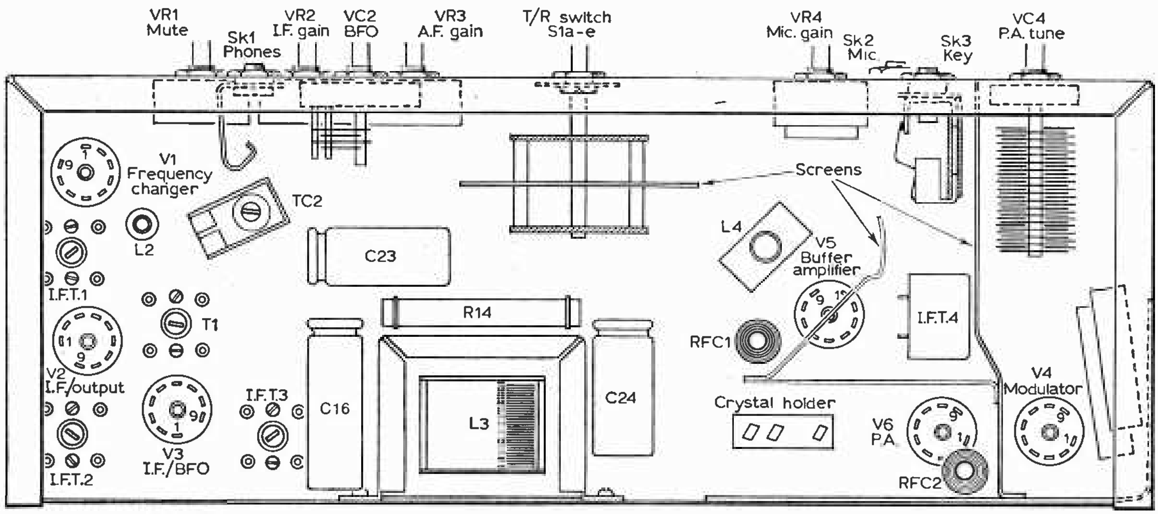


Fig. 3: Under chassis view showing positioning of main components and screens.

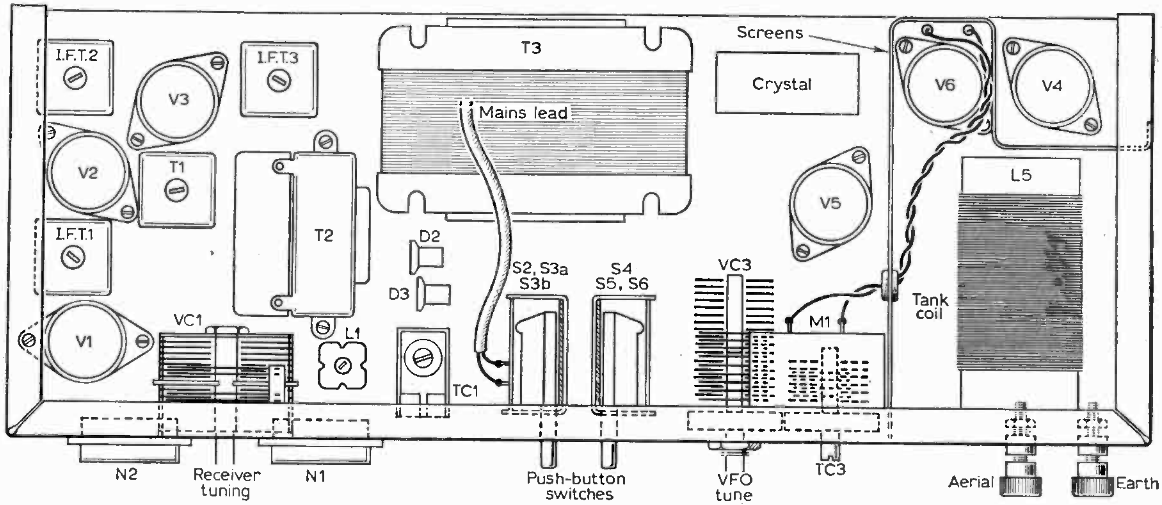


Fig. 4: Layout of the main components above chassis. Smaller items omitted for clarity

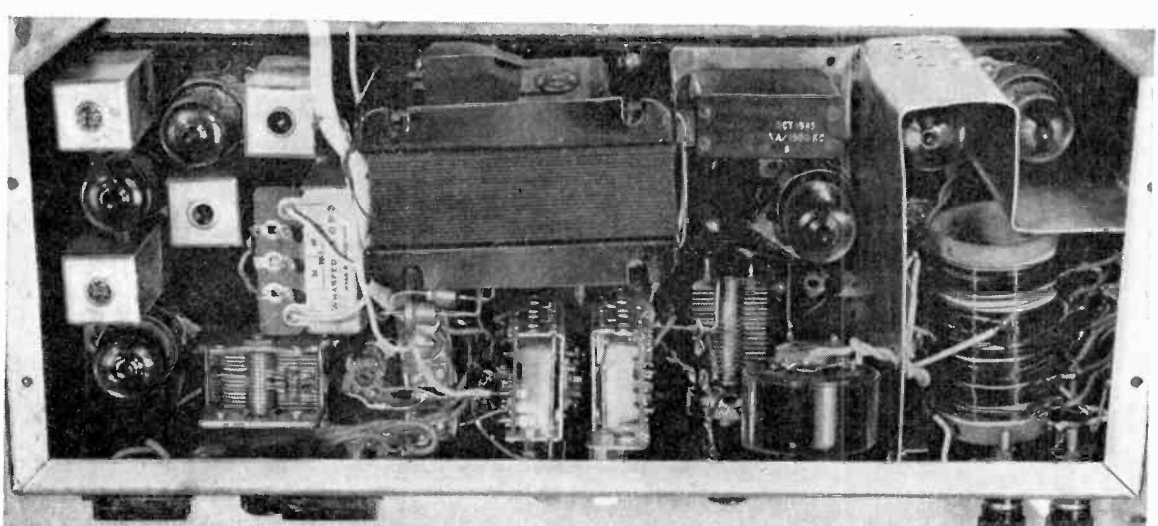
ing the rig, a fuse from the mains transformer centre tap to earth is strongly recommended, perhaps on the front panel in place of the variable mute control or the mike gain pot. VR4.

None of the components in the power section are unduly critical, for example any choke that will fit in will suffice from 8-20H providing it is capable of passing some 70mA. A 60mA component might tend to run a little warm.

It is not advisable to use a larger value electrolytic for C24, 16μF being considered rather high by some and 8μF is perhaps a safer value. It will be noted that on receive the power unit uses choke input, whereas on transmit, capacitor input is used by switching in C24 via S1b on the T/R switch in order to obtain a higher h.t. voltage. This is optional and if preferred choke input can be successfully employed on both functions. In addition to switching the neons the T/R switch also provides h.t. to the p.a. and modulator via S1c, and h.t. to the v.f.o./b.a. via S1d. When the T/R switch is in the receive position, the Net switch, when depressed, supplies h.t. to the v.f.o. and buffer stages. This allows the operator to zero beat the v.f.o. with an incoming signal on the receiver without radiating a note which could annoy others. (V.F.O. swishers please note.) This facility also allows the crystal oscillator to be used to line up the receiver dial. Also, if the transmitter is now zero beat with the note from the crystal oscillator, it is possible to line up the transmitter dial at the same time.

Next month, the layout and constructional details will be given, and would-be constructors are urged to wait for these before attempting construction as certain snags could arise which can be avoided if they are known in advance.

to be continued ....



Photograph of the top chassis. Compare this with Fig. 4 above. Receiver section is on the left, transmitter and modulator on the right, power supply in the centre.

BALANCE CONTROLS
for stereo amplifiers

By J. B. Willmott

ADDING a stereo balance control unit to a hi-fi installation often improves the end product. It is not readily appreciated that a pair of amplifiers of the same make and type do not necessarily have the same gain characteristics. Nor, for that matter, do the other links in the chain (such as loudspeakers, preamplifiers, microphones, etc.) of the same make and type always match up. In order to overcome this difficulty, one can adjust the individual controls of the main amplifiers, but this is rather a clumsy way of doing things when it is relatively simple to add a balance control which will increase the gain of one amplifier and at the same time reduce the gain of the other.

Nine different circuits are touched upon in this article. This is by no means all, but should fire the imagination of the serious constructor and give the novice a good insight.

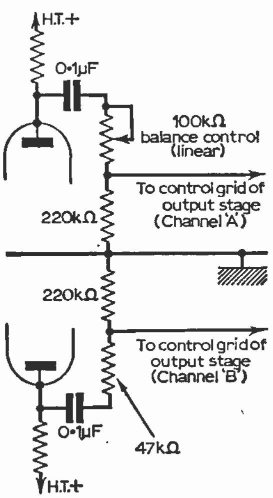
Before considering the various circuits, one must also appreciate that environment is important. Most hi-fi installations are accommodated in rooms that are not acoustically perfect, and the positioning of the loudspeakers in relation to the furnishings can have a marked effect on the end product. Also it is worth considering your own hearing; possibly that is not perfectly balanced. So to obtain the best results, why not let your ears be the judge?

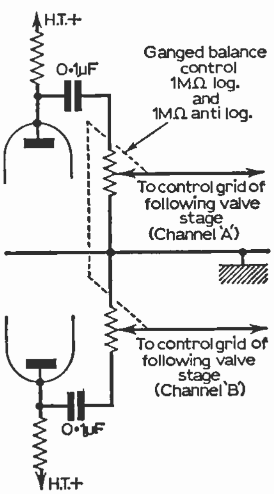
SUGGESTED CIRCUITS

Possibly the simplest system of all is that shown in Fig. 1, in which the the gain of channel "A" is made variable by the insertion of a 100kΩ potentiometer, in place of the 47kΩ fixed resistor used in the same position in channel "B". However, it may be found that there is insufficient variation of gain of channel "A" to achieve balance under certain conditions. In Fig. 2 use is made of a twin-gang potentiometer wired up so that channels "A" and "B" are controlled in reverse (i.e., as the gain of one channel is increased, that of the other is correspondingly decreased). This, however, requires the use of a specially designed twin potentiometer, known as "log./anti-log."; obtainable from most component suppliers. The advantage of this system is that either channel can be reduced to "zero" (with a corresponding rise to maximum gain in the other channel) so that even the most widely differing output requirements can be met, the only drawback is that at no setting of the control can both channels be working at full gain simultaneously.

Figure 3 depicts a very simple but effective inter-stage control of balance, in which only a single linear law 1MΩ potentiometer is used. The slider of this control is connected to earth (chassis) line, and the control grids of the following valve stages are fed from the "top" and "bottom" of this same potentiometer. Note the inclusion of 47kΩ resistors in the grid leads to each of the subsequent valves. These should be connected as close as possible to the valveholder grid tag; the components serve as grid stoppers (reducing the danger of instability) and prevent the control grid of the succeeding valve from being connected directly to chassis (and thus cutting off grid bias) should the balance control be adjusted to the limit of its setting in either direction. Component values of the cathode bias resistor and capacitor are not shown, as these will depend on the type of valve employed in the output stages. With the popular EL84, suitable values would be 150Ω and 25μF (25 VW). The previous valve stage can be any high or medium impedance triode (or the two halves of a double triode such as an ECC83).

By way of a change, Fig. 3 shows a circuit for incorporation directly across the pick-up, and for sake of completeness, the associated volume and tone (top cut) controls are included in





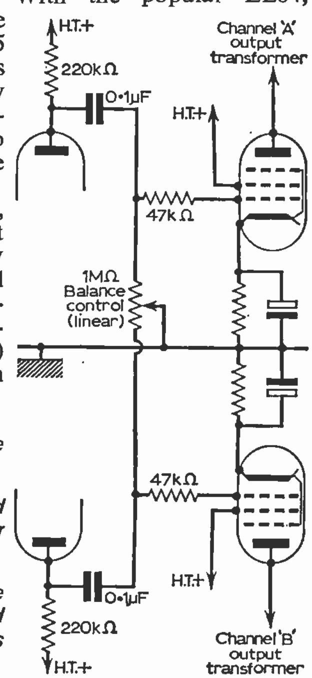
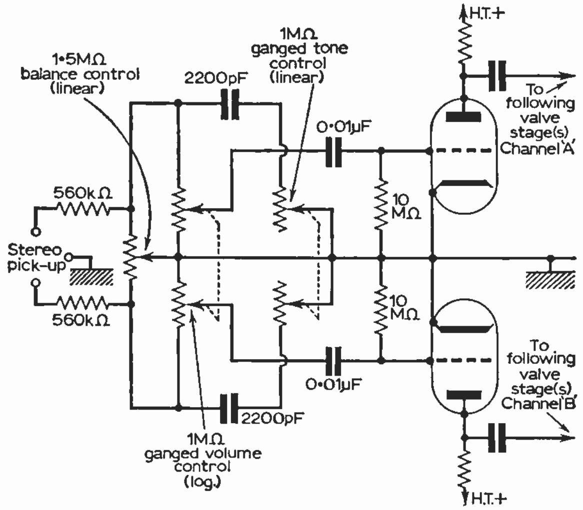
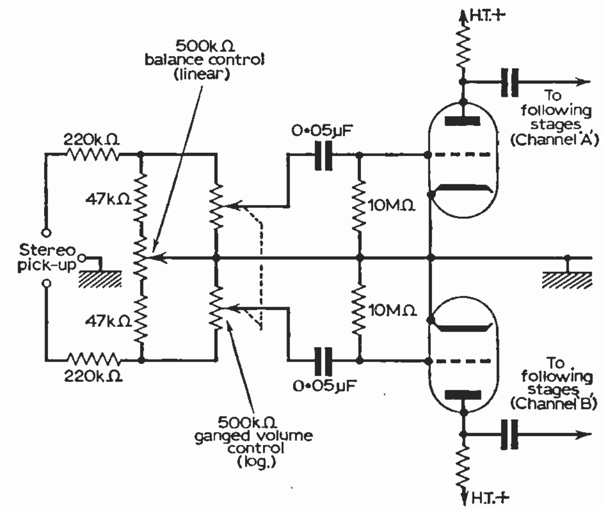


Fig. 1 (far left): Simple form of balance control.

Fig. 2 (near left): A ganged log./anti-log. potentiometer is needed for this circuit.

Fig. 3 (right): A single linear potentiometer is used in this circuit to vary the bias to the p.a. valves.





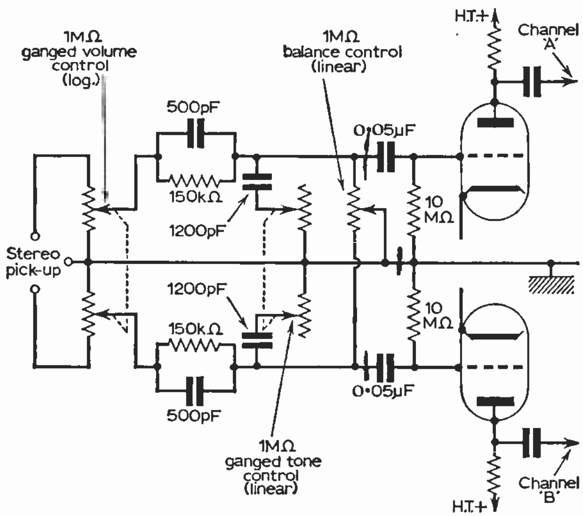
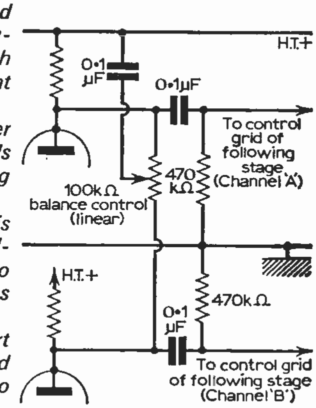


Fig. 4 (top left): Tone and volume controls are included in this circuit which balances the signals at the pick-up.
Fig. 5 (top right): Another circuit in which the signals are balanced before being amplified.
Fig. 6 (lower left): In this circuit the tone and volume controls are also directly connected across the pick-up.
Fig. 7 (lower right): Part of the signal is shunted through the h.t. rail to achieve balance.



the circuit diagram. The system would be ideally suited to a simple inexpensive two stage amplifier. Note that the grid bias for the first valve stage is provided by the voltage resulting from the minute grid current flow through the high value grid leak resistor (10MΩ). No cathode bias components are then required for this stage, and this system works very well indeed in stages where the signal level is quite low. The component values suggested have been used by the author in an amplifier fed from a crystal pick-up in a B.S.R. "Monarch" autochanger unit, and should suit any of the popular crystal pick-ups in the modest price range.

A further circuit suitable for insertion directly across the pick-up is shown in Fig. 4. In this circuit, the tone controls, either a simple "top cut" or more elaborate separate Bass and Treble, would be incorporated in the coupling between the valve stage shown and that following.

As in the previous circuit, bias for the first valve is obtained through a high value grid leak resistor. The component values of the anode load resistors and coupling capacitors to the following stage are not given, as these will vary according to the type of valve employed. Practically any triode or pentode valve can be used, but for convenience, the use of one half of a double triode (such as an ECC83 or 6SL7) in each channel is recommended.

Another design eminently suitable for two stage audio amplifiers is shown in Fig. 6. In this arrangement the volume and "top-cut" tone controls are connected directly across the pick-up (which with the component values suggested, should be of the high output crystal type referred to earlier), followed by the balance control, which is a 1MΩ linear potentiometer. The 500pF capacitor paralleled by a 150kΩ resistor (in between the volume control slider and the coupling to the grid of the first valve in each channel) are inserted to provide a degree of frequency correction from the pick-up.

Figure 7 and the following two circuits, represent a less conventional approach to the control of balance. In the first circuit, the 0·1μF capacitor connected to the slider of the balance control (100kΩ linear), shunts a proportion of the audio signal away from the following stage to the h.t. line, and eventually via the power supply smoothing capacitor, to "earth". The proportion of signal so by-passed depends on the position of the balance control slider; movement of this decreases the signal passed on from channel "A", for example, at the same time as increasing that passed on from channel "B", or vice versa. Whereas all the

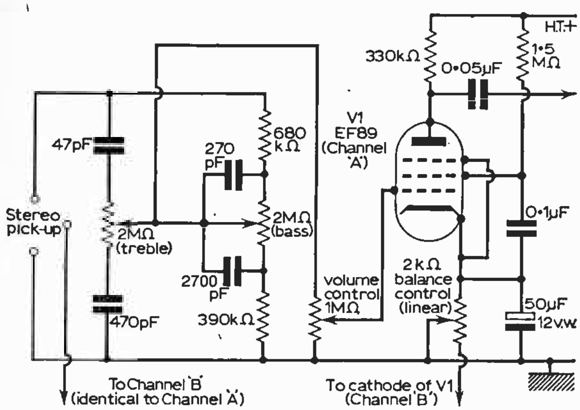
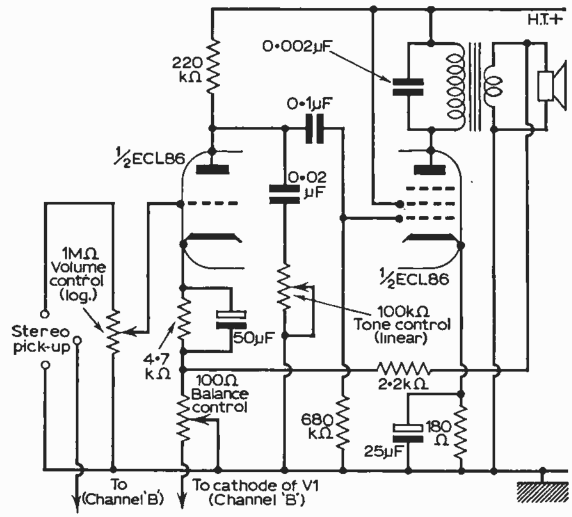


Fig. 8 (above): This circuit shows how it is possible to vary gain using vari-mu valves.

Fig. 9 (right): The level of negative feedback is varied to achieve balance in this circuit.

Note: The Channel 'B' circuits to match those given in Figs. 8 and 9 are identical, with the volume and tone controls ganged with those of Channel 'A'.



previous circuits have made use of potentiometers varying the signal strength fed between one valve and the next, or between pick-up and first amplifier valve stage, Fig. 8 shows how it is possible to vary the gain of an amplifier with vari-mu valves. This is, of course, common practice in r.f. and i.f. circuitry in radio receivers; it is not always realised that vari-mu valves can, in certain circumstances, be used in audio frequency circuits. The main proviso is that the signal level should be fairly low, as any attempt to deal with large swings of signal voltage in a vari-mu valve will introduce an intolerable level of distortion. However, if such a valve is used at low signal level, quite satisfactory control of gain can be secured by varying the grid bias. In the example shown, the author used EF89 valves, with very satisfactory results. Bass, treble and volume controls are shown and the circuit will give all the necessary controls for an inexpensive stereo amplifier. A valve such as the popular EL84 could follow the EF89's in each channel, and would provide some 4 watts output. The actual control of balance is provided by the 2kΩ linear wirewound potentiometer, which should have a rating of about 5 watts. The slider is connected to chassis, and variation of its setting will vary the bias between wide limits. *One word of warning,* operation of the amplifier with the balance control set at the extreme ends of its track will leave one valve with zero bias, and if operated for any length of time in this position, will damage the valve. This can be avoided, if thought necessary, by inserting a fixed value resistor of say 100Ω between each valve cathode and the balance control.

There is another method of varying the gain of an amplifier, Fig. 9, and that is by adjusting the amount of negative feedback. In the example shown, the balance control is a 100Ω wirewound potentiometer inserted between the junction of the negative feedback line (the 2·2kΩ resistor from output transformer secondary to the lower end of the cathode bias resistor of the first valve stage) and chassis. Variation in the setting of this control changes the amount of negative feedback applied; it will be seen that both channels are controlled simultaneously, but in an inverse manner, i.e., increased feedback in channel "A" would be accompanied by simultaneous decreased feedback in channel "B", and vice versa. The purist will no doubt exclaim that variation in negative feedback not only varies the gain of an amplifier, but also affects the frequency response; a greater degree of feedback giving a better low frequency response, so that relative volume levels will be controlled. This does not appear to have any serious effect in practice, at any rate in amplifiers in the inexpensive class. Indeed a system similar to this has been used by a number of commercial manufacturers of stereograms. The circuit diagram represents one complete channel of a stereo amplifier, using the two halves of an ECL86 valve; the second channel is identical, and only a power supply is needed to complete the equipment. As in all circuits using negative feedback, it is important to ensure that the feedback is correctly phased, otherwise positive feedback, resulting in uncontrollable oscillation, will result. The amplifier should be first constructed with the connections to the secondary of the output transformer (other than the speaker speech coil of course) omitted, and once tested and found to be working satisfactorily, the earth and feedback connections can be made temporarily to the output transformer secondary. If an uncontrollable howling results, the connections to the output transformer should be reversed.

One word of warning, the control potentiometers used should be of first class manufacture, and in the case of "ganged" components, must be properly matched during manufacture. Cheap surplus, or salvaged, potentiometers just will not do; they will lead to more annoying intermittent faults and noisy operation and can ruin the enjoyment of reproduction from an otherwise impeccable amplifier system.

Finally, don't let your enthusiasm for straining your ears to hear every grain of "movement" hamper your enjoyment of listening to stereo recordings. Get your tone and balance controls adjusted to your liking, and then leave them well alone. ■

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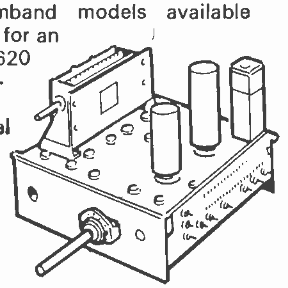

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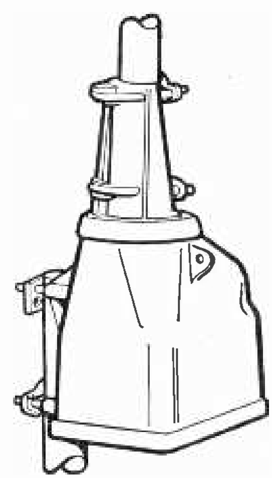

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ON THE SHORT WAVES

MONTHLY NEWS FOR DX LISTENERS

Times in GMT
Frequencies in kc/s

THE BROADCAST BANDS

by JOHN GUTTRIDGE

EUROPE

DENMARK: *Radio Denmark* (Shortwave Department, Radio House, Copenhagen V) now transmits on 15,165 to South America in Danish at 1600-1645 and Spanish at 1645-1715.

German Federal Republic: *Deutsche Welle* (Bruederstrasse 1, Postfach 344, 5 Köln) has made changes recently:—the following English transmissions: 0300-0345 7,160/9.530; 1550-1630 11,765/9,535; 0130-0250 9,735.

German Democratic Republic: *Radio Berlin International* (116 Berlin Nalepastrasse 18-50) now uses 1,430 / 6,080 / 6,115 / 7,185 / 7,300 for the 2200-2230 English transmission.

Radio Volga (Menzelstrasse 5, Potsdam) is now using shortwave as well as the 263 long wave outlet. Has been heard in Russia in evening on 9,680.

Italy: R.A.I. (Via del Babuino 9, Rome) now uses following outlets for English transmissions: 2115-2135 (Europe) 7,240/6,050; 2205-2225 9,710/6,010; 2020-2040 7,265/5,990; 0100-0120 9,630/6,010. New languages introduced are Maltese 1225-1230 on 9,575/7,235 and Amharic 2020-2040 15,150/11,810/9,570.

Norway: *Radio Norway* (Oslo) now using two 11 m.b. outlets. Schedule is 0300-0430 9,550/9,610/11,850/1,578; 0700-0830 21,670/11,850/9,610/17,825/25,900; 1100-1230 9,610/11,850/21,730/25,730/25,900; 1300-1430 21,670/21,630/17,825/25,730/25,900; 1500-1630 21,670/15,175/17,825/25,730/21,730; 1700-1830 21,670/15,175/17,825/11,850; 1900-2030 11,850/15,175/9,610/21,670/21,730; 2100-2230 11,850/9,610/11,735; 2300-0030 11,850/9,550/9,610.

Poland: *Radio Warsaw* (Al Niepodleglosci 75/77, Warsaw) now transmits in English as follows: To Europe 1830-1857 7,145/6,135; 1930-2000 9,540/7,145/6,135/1,502; 2030-2100 7,125/5,950; 2130-2155 7,145/6,135; 2230-2300 5,950/9,540/1,502; 2303-2330 818; To Africa 1200-1230 and 1300-1330 7,145/11,840/15,275; to Australasia 0730-0800 and 0830-0900 9,675/11,840/15,275.

Rumania: *Radio Bucharest* (P.O.B. III, Bucharest) now has six new QSL cards which may be obtained by sending six reception reports numbered one to six.

Sweden: *Radio Sweden* (Box 955, Stockholm 1) has completely revised English schedule which includes use of 13 m.b. for first time. Times and frequencies are 0900-0930 6,065/21,690; 1100-1130 6,065/9,705; 1230-1300 9,705/21,690; 1400-1420 11,810/17,840; 1600-1630 11,705/17,840; 1900-1930 6,065/11,705; 2245-2315 7,270 11,705; 0030-0100, 0200-0230, 0330-0400 5,990; 0515-0545 11,705; 2015-2045 6,065/11,705; 2330-2400 1,178.

U.S.S.R.: *Radio Moscow.* There is a new service entitled "Radio Station Peace and Progress, the Voice of Soviet Opinion". Programmes are English 0900-1000 and French 1000-1030 on 12,060/15,200/15,360/15,450/17,710/17,795.

Radio Minsk (Minsk) may be heard in Bielorussian from 2130-2200 on 5,940.

Yugoslavia: *Radio Belgrade* (2 Hilendrarska, Belgrade) now using 6,100/7,200 only for the 1830-1900 English transmission.

AFRICA

Cape Verde Islands: *Radio Clube de Cabo Verde* (Casilla Postale 26, Praia) gives good reception on 3,883 in Portuguese 2000-2200.

Ethiopia: *Radio Voice of the Gospel* (P.O. Box 654, Addis Ababa) has changed the following English transmissions recently: 1345-1400 15,315; 1900-1910 9,705; 0430-0455 11,810; 0530-0555 11,785; 1655-1710 6,065; 1900-1945 15,115; 1630-1645 11,925; 1755-1810 9,565.

Morocco: *Radiodiffusion Television Marocaine* (1 Piere Paient, Rabat) now transmits English at 1800-1900 over 15,408.

Voice of America relay, Tangier (Washington 25, D.C., U.S.A.) now using the new outlet of 9,660 to Eastern Europe.

Nigeria: *Nigerian Broadcasting Corporation* (Broadcasting House, Lagos) now carrying foreign service from 1300-2200 over 7,275/9,690/11,900. English is at 1500-1600, 1700-1900, and 2100-2200.

Rwanda: *La Voix de l'lem Fé* (Kigali) broadcasts from 2000-2200 over 9,575/11,715 in French.

South Africa: *Radio South Africa* (P.O. Box 8606, Johannesburg) has replaced 15,205 by 15,215 for the 2200-2255 European English transmission. Other frequencies are 9,720/11,785.

Tanzania: *Radio Tanzania* (Box 9191 Dar es Salaam). Test transmissions over a 240kW transmitter have been reported as follows 0930-1000 21,600; 1000-1300 15,435; 1530-1600. Reports are wanted. It is believed a regular service may now be in operation.

ASIA

Saudi Arabia: Saudi Arabian Broadcasting (Ministry of Information, Airport Road, Jeddah) is now using 9,670 after the scheduled 2100 close down time.

Ceylon: *Radio Ceylon* (Department of Broadcasting, P.O. Box 574, Colombo 7) broadcasts in its External Service as follows: 0700-0815 to Europe, West Africa and Middle East on 15,330; 0915-1030 to South Asia on 17,850. The station is considering changing the times of its broadcasts and would appreciate listeners' views. QSL cards for the station commercial service may be obtained from Radio Advertising Services (Radio Ceylon) Cecil Court, Lansdowne Road, Bombay, India.

News was received this month from J. D. Ashworth, T. Ibbitson, D. Hobro, S. L. Brunt, A. B. Thompson, World Communications Club of G.B., P, Quin, International Short Wave Club, J. N. Newport, Radio New York Worldwide, Swiss Broadcasting Corporation W. E. Bartlett J. W. Smith S. Ormerod.

ONE puzzling question posed to experts and laymen alike is "Where do all the flies go in the wintertime?". Variations on a theme now prompt me to enquire "Where do all the s.w.l.'s go at Christmas?". Either nobody listened, or else you've all gone shy and are not going to confess to Auntie Dave what you got up to in the festive season. Only a handful of letters in the postbag this month (sobs quietly into dirty hanky), so let's hope you are all saving those lovely logs for next month.

Top band has been surprisingly good at times and GDX has been about at quite good signal strength. GM stations and the North and Midlands have been heard near London at 5 and 6 on a.m. phone. Topband addicts might be interested to hear that G3JDG is now mobile /M on 160 and many Northern stations have been received on the loaded whip.

Frank Videan (St Albans) AR88, long wire, listened on 160 in the wee small hours. His log for the period 0103-0630 however is certainly neither wee nor small—DJ4SS, HB9CM, OK2KHF, OL9-KRA, PAØPN, VP6TK, W1HGT, W1BTK, W8A-NO, ZD8J, 9H1AE. Who said 160 has had it? When one considers that these stations were received through fish-phone, Loran, v.f.o. swishers and all the other noise on 160, it's a very fine effort indeed.

Mc/s Mixture

Often an s.w.l. will send in a log for several bands, and in order to get in as many logs as possible I usually take one or perhaps two bands from each report. This month however, I thought I'd put in the complete log, just to show how seriously and diligently some s.w.l.'s listen.

Robert Iball (Notts), AR88D, 80ft. top and 35ft. of 72Ω co-ax feeder running S/N. Bob skimmed just the cream from his logs and offers—1·8 Mc/s—K8CRJ, K8HKB, K8RRH, K9PAW, OE5KE, VE3-BWY, VO1FB, W1BHQ, W1HGT, W1WY, W2FYT, WA8EMJ, W8GDQ, W8HGW. 3·5Mc/s—VE2BZL, W4YWX, W8JMC, W9BGX, YV2GC. 14Mc/s—KL7EB, LA2NK/MM, TN8AA, VE5US, VE8BB, VP9FK, VP9DH, YV5ALK, 5Z4SS. 28Mc/s—CR-7CZ, CX2CO, HI8XAL, HKØAL, KP4CQZ, KZ5-TW, LA2MA/MM, UA9EU, UA9WJ, VK5DS, VK7SM, 4X4DH, VS9AJC.

N. Henbrey (Sussex), EA12, 20 metre dipole at 25ft. Offers a five-band log starting with 80—HI8X-AL, K2DXV, K2ISP, K2RBT, K8YWG, UAØBP, VE1ABZ, VE2KC, VE3XK, VO1FX, VO2AW, VS-9AJC, W1FZJ/KP4, W3BMS, W4GFW, YV5BTS. 40—CN8AW, EP2BV, IS1DMN, K5HWA, PY6WA, PY7KOG, UA9BE, UW9AF, VK2AVA, VP2AA, VP6KL, W3BMS, W4AZK, ZD8ARP, 5A3TW, 5N2AAS, 9H1AL, 9H1AM, 9X5MH. 20—CE6EZ, CR5SP, HP9FC/MM, KR6CO, KL7EBK, OD5AR, U5ARTEK, UA9YO, ZP3AB, ZS3XG, ZD8L, 3A-2CQ. 15—K2UTC, K3TGS, K4DI, K8RHK, K9HCG, MP4BBA, UF6FE, UL7JA, VE1AIT, VE2BDT, VE3FJZ/SU, VP5RB, WA1FDU, W5P-MZ, YA1FV, ZS4MZ. 10—FH8CD, OD5CN, VE3-WQ, VK6CF, ZC4CI, ZC4CN, ZC4RM, ZE5JS, 4U1SU.

J. Farrer (Herts), HMV domestic receiver, 90ft. l.w. says W6 and W7 are now breaking through on 28Mc/s, while down the other end John remarks on the increase in s.s.b. stations on topband. His log for 3·5Mc/s reads—CN8AW, CT1EE, DJ1SU, EA-2FF, EI4J, F2MO, HI8XAL, K3UZE, K4YGU, K8YWG/P (using 50 watts), LA2PM/MM, MP4T-BO, OZ1SF, SV2MB, UA3TN, UC2LVK,UP2OJ, UR2REK, VE1AIJ, VE2AUU, VE3DMU, VO1FG, VS9AJC, W1DRS, W2ZPO, W3AQH, W4RNG, W4UHA/P, ZL1BDW, ZL3AKJ, ZL3JC, ZL3RK, ZL4KE, ZL4OD, 4X4OV.

Higher up

I did wonder, some little while ago, if 14 and 21 were dying or losing their popularity. Not so, as some logs prove a different story.

Paul Baker (Mon.) HE30, 45ft. l.w. sends in a log for 14 and 21 of stations heard at various hours. 20—FB8YY, HL9TH, HS4AK, UAØEH, VK9AG, VP-8CW, VS9OC, YK1AA, 4S7PB. 15—CO8RA, CR3K-D, CR4BC, FL8RA, KL7CSR, KV4CX, MP4BBA, OH2BBF/MM, PX1PA, ST2SA, TF2WK, VEØMB, K4OMM, VK9XI, W7ETD, YA5RG, ZL1AFN, ZL2AJV, ZL2KP, 5N2AAR, 6Y5RS, 7XØWW, 9M2DQ. Paul reckons to hear Australia, New Zealand and Japan on 15 metres between 0830—0930 and very often from 1200—1500 during a second opening.

J. Dunnett (Singapore), Racal 17, 7Mc/s dipole at 70ft. for all bands writes in with a report on 14 and 21Mc/s from way out East. All that lovely sunshine and he has to pinch my best DX too! On 14 c.w. Jim logged—EA8FG, EA9EO, FK8AH, FM7-WP, MP4MAW, VP6PJ, ZD8J, 5R8AW, 6W8CQ. While on 14 s.s.b.—CN8CB, CT2YA, CT3AU, G5A-AV/K5ZKN, KJ6BZ, KG6IJ, KL7FRY, KW6EG, U5ARTEK, VK9XI (Christmas Is.), 3W8AD, 7Q-7EC, 9Y4AR. On 21Mc/s c.w.—HP1RP, PZ1BX, VS6FS, 5N2AAW, 5Z4JW, 9G1RW. With a b.f.o. in, s.s.b. stations heard were CR7AN, CT3AU, GB3MM, VK9CJ, (Papua), 6O6BW, 9M1AF. Jim says "We also hear lots and lots of G's here".

Mumblings

News and natterings from here and there. First, for those trying to brush up their c.w. The RSGB organise slow c.w. most evenings on topband. The ARRL station has set sessions on most bands most days and does a special run at up to 35 w.p.m. for those who really reckon they can take c.w. Ten metres, still going strong. An interesting letter from **Barry Tew** (G8AVW). Barry says he tuned his CR150 down below 28 and heard American Citizens Band Stations between 27 and 28Mc/s. He thinks these stations are restricted to 5 watts and a 60 inch antenna. Anyone else heard anything? Mind you don't pick up 28Mc/s image if it's a single conversion superhet. Contests for the chilly 4 weeks called February: 4th.—5th., ARRL phone contest; 12th., First 70Mc/s contest; 18th.—19th., First 1·8Mc/s c.w. contest; 18th.—19th., ARRL c.w. contest; March 4th.—5th., Second 2 metre contest. The deadline for reports this month is the 20th. How about an epistle from you?

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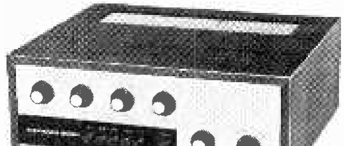

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Terms: Deposit £13.6.0 and 12 monthly payments of £2.8.10. Total credit price £42.12.0. Carriage and Insurance 8/6.

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High grade dynamic insert in black plastic body with grey and silver trim. With pull-out stand for desk use. Direct replacement for many recorders; standard 50 K ohms impedance permits use with most other equipment. Size 2⅝ × 1⅞ × 1in. deep. With 4ft. cable and standard phono plug.

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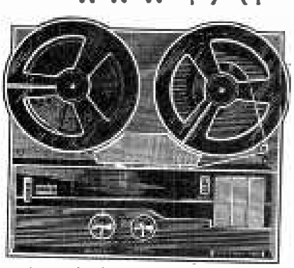
***TAPE RECORDING EQUIPMENT



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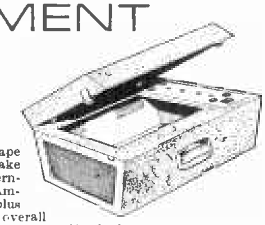
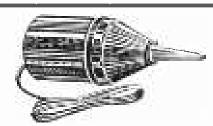
With ½ track heads **£10.10.0** — With ¼ track heads **£13.10.6** *Add 10/- carriage and insurance*

3B1 RECORDER CASE £5



Houses a complete tape recorder. Designed to take the Magnavox 363, Stern-Clyne HF/TR3 Tape Amplifier and Power Pack plus 10 × 6in. speaker. Size overall 19¾in. wide × 14½in. deep × 10½in. high.

TAPE HEAD DEMAGNETIZER



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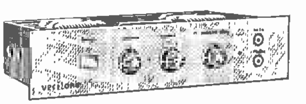
A must for serious tape users! Tape heads become permanently magnetized with constant use; effect is cumulative and leads to background noise that prevents the achievement of perfect recordings. Highly effective, mains operated device is simply applied to recording head and carries magnetic condition through series of hysteresis loops of diminishing amplitude leaving head substantially free of magnetism. Cleans any tape head in seconds.

TYPE 'C' TAPE PREAMPLIFIER



Specially developed by Mullard Laboratories for use with high quality replay systems and supplied specifically matched for use with the Magnavox 363 tapedeck.

Features include: Ferroxcube pot core inductors for treble equalization, push-pull oscillator incorporating ferroxcube transformer, adjustable output for matching to existing high-quality amplifier systems, inputs for Mic. Pick-up, Radio, etc. Valves: 3 × EF86, EC82 and EM81. Totally enclosed in case. Size 11¼ × 6¼ × 3¾in. high (Panel 11¾ × 3½in.). Power supply of 300 v. d.c. at 25 mA. and 6.3 v. at 1.5 A. is on separate sub-chassis. Size 6¼ × 4¼ × 4¾in. high to facilitate remote location from tape heads.

Pre-amp. and power pack. Kit of parts **£14.10.0** — Assembled and tested **£20.10.0** Add 7/6 carriage

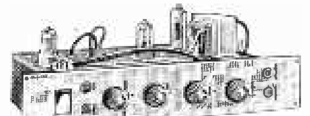
Terms: Deposit £6.17.0 and 12 monthly payments of £1.6.11. Total credit price: £23.

DUVIDAL TAPE SPLICER 14/6

Carriage 1/6.

Essential for editing the making immaculate joints in broken tape. Twin clamps hold broken ends in perfect alignment: integral cutting tool makes diagonal splice and trims away surplus splicing tape when join is complete. Size only 3 × 2 × 1½in. high.

HF/TR3 TAPE AMPLIFIER



Easily the best complete tape amplifier available to the home builder. Supplied already matched for the Magnavox 363 tapedeck, but may be readily matched to most other decks. Features include: switched equalization for all speeds (CCIR standards at 7½ i.p.s.). Treble boost incorporated during Record. Bass boost during playback, speaker output matched for 3, 7.5, and 15 ohms, additional outputs for extension speaker, phone monitoring on Record and Hi-Fi playback through existing systems. Inputs for Mic. Pick-up, and VHF Radio. Valves: EF86, ECC83, EL84, EM81, EZ81. Size overall: 11 × 6 × 6in. (Panel 13¾ × 3in.). Power pack on separate chassis size 7½ × 3 × 4½in.

Amp. power pack. Kit of parts **£14.10.0** — Assembled and tested **£20.15.0** Add 7/6 carr.

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5in.	600ft. Standard	8	6
5in.	900ft. Long Play	10	0
5¾in.	1,200ft. Long Play	12	6
7in.	1,200ft. Standard	12	6
7in.	1,800ft. Long Play	15	0
TENSILIZED POLYESTER			
3¼in.	600ft. Double Play	11	6
5in.	1,200ft. Double Play	15	0
5¾in.	1,800ft. Double Play	22	6
5¾in.	2,400ft. Triple Play	37	6
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practically wireless commentary by HENRY

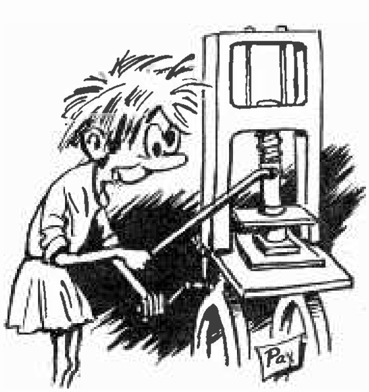
No 31

To Kit Or Not

WE began this series—so long ago, it seems—with a passing glance at the kitmaker. From time to time we have taken a harder look. Now, with the glittering commercial confections of the Radio Show behind us, and our corns beginning to heal, we may return to glare more closely at the subject. Recently, the need arose for an inexpensive portable amplifier. Inexpensive, for Henry's relations all appear to be touchingly impecunious. Portable, because the thing had to be lugged around the country as an aid to illustrated lectures.

Obviously, a transistorised version was called for. Equally obviously, the various commercial products had to be ruled out—first because their prices indicated the parts were at least gold-plated, and second because no manufacturer considered that mono production was worthwhile. The answer—build it yourself.

But the particular kit that seemed appropriate for the purpose, and remarkably cheap, was from a firm a little less illustrious. A preliminary (unofficial) glance



An old Caxtonian duplicator

at the circuit showed it to come from a fairly trustworthy stable. The advertisement showed an attractive finished job. So Henry showed his money and plunged . . . up to his top-knot in trouble!

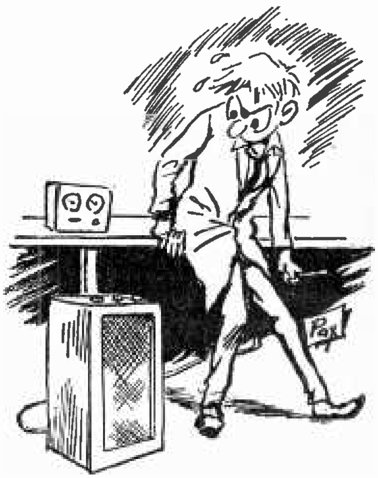
The kit came in a tatty cardboard box, each piece wrapped in a screw of crumpled paper. Careless unpacking could easily have whittled away half the contents. But the greatest disappointment was the literature that pretended to be a guide to construction.

Apparently run off by a shell-shocked operator of an old Caxtonian duplicator, on Government surplus blotting paper, pinned in a Chinese order of page numbering, it should have deterred us from the start.

Between us we managed to make some sense of the hieroglyph and laid out the parts for checking against the list. (My typewriter nearly wrote 'lost'—and it would have been more appropriate.) Several components were missing, and remained so, despite a ferreting amidst the packing. Others had been substituted, which only became confirmed as we ploughed through the barely legible text. We made up the missing quantity—secretly commiserating with some innocent not blessed with a pretty full spares box. Then we amended the given list, if only for the sake of posterity.

The actual building was not too bad, provided one already had a fair knowledge of the techniques. The absolute beginner, despite what the advertisements claimed, would have been bogged down before the third page. The selector switch was physically different from the diagram, and connections had to be worked out. One or two unexplained wires appeared, and the projected colour coding could not be followed because different lengths of different colours had been included. Again, no obstacle to the experienced, but . . .

We shall skate mercifully over some other points—vital paxolin spacers missing; too many nuts of one size, not enough of another; an extra switch on the



The thing refused to work

diagram, not mentioned in the text; no flats on the control spindles; no spigot holes drilled, and chassis holes out of alignment. And, incidentally, no solder!

The important point was that the thing refused, pointblank, to work. At this stage, the novice slings it back to his supplier and pays the fee he could have laid out *before* his hair went grey, to have his pet rebuilt. We reverted to first principles and cast aside the instructions, checked the diagram against the original design in an old technical magazine, made due allowances for the alterations that had obviously been done more with a view to economy than efficiency, and eventually got results.

An unlucky case? Maybe, but we would like to hear of other experiences. We would even like to see a Constructors' Guide to Kits. Henry reckons he knows which firms would top the list as 'Best Buys'.

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IMPROVING THE R1155

C. MOLLOY

ALMOST twenty years have gone by since the first R1155 communications and direction finding receiver became available to the public through the surplus market. Since that time a lot of useful information has been published on this R.A.F. aircraft h.f. receiver in the technical journals, but often in issues that are now out of print. This article does not include a complete circuit diagram, but gives general information plus details of improvements that the author has made to his own receiver.

The standard model covers the range 75kc/s to 18·5Mc/s in 5 bands, with a gap from 500kc/s to 600kc/s and another from 1·5Mc/s to 3·0Mc/s. A second, less common version, designated L or N, omits the lowest range, 75kc/s to 200kc/s, but covers the Trawler Band, 1·5Mc/s to 3·0Mc/s. The two types are otherwise identical, having a single r.f. stage, mixer, two i.f. stages, a b.f.o. and a triode output stage feeding high impedance phones. An external power unit is used.

REMOVAL OF D.F. COMPONENTS

As the R1155 is a dual purpose receiver, many of the d.f. components can be removed without affecting the performance of the communications section leaving space for additional items to be added and, incidentally, reducing the total power consumption. A circuit diagram of the R1155 together with notes, is available from an advertiseiser in PRACTICAL WIRELESS. From this the readers can locate the d.f. components and decide which of them he would like to remove. The associated valves are V1, V2 and V8 and these are shown in Fig. 1. The meter balance control, meter amplitude control, meter deflection switch, aural sense switch, and associated wiring also can be taken out, to give extra front panel space.

The job of removing the d.f. components should be tackled systematically, removing one item at a time and checking in each case that the receiver's performance is unaffected. If a mistake is made it should then be easy to pin point where it occurred. Care should be taken, especially at valve bases, not to break the continuity of the heater and h.t. lines.

DECOUPLING CAPACITORS

At this stage a check of all paper decoupling capacitors is advisable. There are two types, both of which are metal cased. Those mounted above the chassis are easily found, being cylindrical ($\frac{3}{4}$in. diameter, 3in. high) and secured to the chassis by a large nut. Age may have brought about leakage and an easy method of checking is to use a voltmeter set to a range suitable to measure the h.t. supply. Connect the meter positive lead to the receiver's h.t. positive line and the negative to the capacitor to be tested after electrically removing it from the h.t. line. A good capacitor will make the meter needle kick and then return to zero; this is caused by the charging current flowing into the capacitor. A faulty capacitor will either give a steady reading or the needle will gradually fall to a low value. Any faulty capacitors should, of course, be replaced. The lot had to be changed on the author's receiver (using modern components of the same value).

A number of smaller cylindrical decouplers can be found in several places within the coil compartment. These seem to be less prone to leakage and can probably be left alone. But it is well worth checking all the paper decoupling capacitors, as a defective one can make a considerable difference to the performance of the receiver.

LINING UP

No difficulty should be experienced lining up the i.f. stages. Figure 1 shows the position of the three i.f. transformers and the dust cores are readily accessible through the screening cans. The i.f. frequency is 560kc/s.

Disconnect the top cap of the frequency changer valve V4 and apply 560kc/s to the valve from a signal generator. The magic eye can be used as a peaking indicator, but make sure the a.v.c. is inoperative by turning the master switch to either the OMNI or O position. Set the volume control to maximum (reducing signal generator output as necessary) and adjust the cores of each i.f. transformer in turn, starting at the last stage (number 3) and working towards the front end.

The r.f., mixer and oscillator circuits can be lined up on each band in turn by choosing alignment points near the ends of the bands and inject-

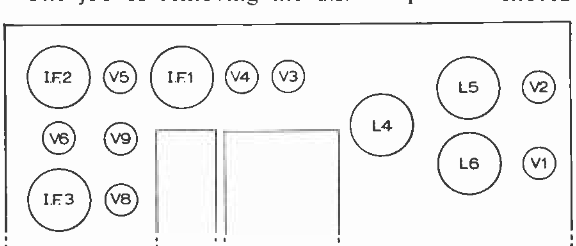


Fig. 1: Top view of the receiver showing position of the major components.

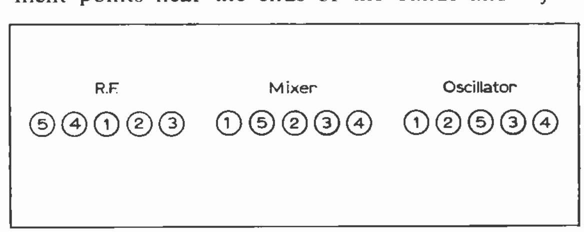
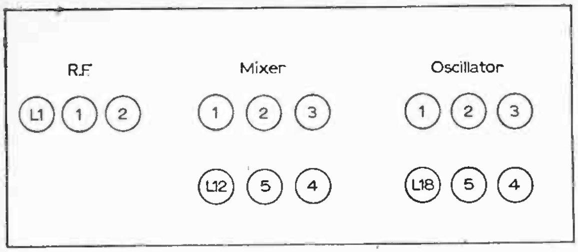


Fig. 2: Layout of the trimmers, viewed from the front of the receiver.



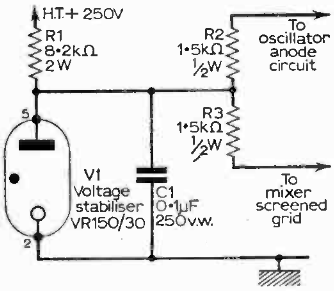


Fig. 3 (above): Side of the coil compartment viewed from front of the receiver.

Fig. 4 (left): Simple stabiliser, see text for details.

ing an appropriate signal to the aerial input. If a signal generator is not to hand tune to a broadcasting station of known frequency and use it instead. This is not really a satisfactory method owing to the difficulty of obtaining a steady signal, but at a pinch it will do. Switch off the a.v.c., turn the gain control to maximum and use the tuning indicator. The trimmers are adjusted at the h.f. end of the band and the dust cores at the other. It will not be necessary to touch the oscillator section unless the scale calibration is out of adjustment: often peaking the r.f. and mixer trimmers will suffice. The location of all trimmers is shown in Fig. 2. A 4BA box spanner will be required to adjust the majority of them. The layout of the coils is shown in Fig. 3. The cores can be adjusted without removing the cover of the coil compartment.

L18 comprises 2 tuned chokes which assist in maintaining a constant oscillator voltage throughout ranges 1 and 2. They should not be adjusted.

L12 is an i.f. rejector and is connected to the mixer grid circuit on ranges 3 and 4. To adjust, inject 560kc/s to the r.f. circuits, then tune the receiver to the l.f. end of range 3 or the h.f. end of range 4 and adjust the core for *minimum* output.

L1 is only used on d.f. and can be ignored.

L4, L5 and L6 are the r.f. coils for ranges 3, 4 and 5 respectively. These are located above the chassis inside large cylindrical cans (see Fig. 1) and the cores are accessible from the top.

AERIAL TRIMMER CONTROL

A simple but very useful addition to any receiver is an aerial trimmer. A small variable capacitor of 50pF will do, connected in parallel with the r.f. section of the main tuning capacitor. It is used to counteract any loading effect the aerial may have on the first tuned circuit. The capacitor can be mounted on the front panel in the space vacated by the meter deflection or aural sense switches. The moving vanes are connected to chassis and a short length of coaxial cable is run from the fixed vanes to the rear section of the main tuning capacitor; the cable braiding should be earthed. The r.f. trimmers will now have to be re-adjusted on all bands and this is done with the aerial trimmer set to minimum capacitance (vanes out). The aerial trimmer is used to peak signals after they have been tuned in and the effect will be most apparent at the h.f. end of each band.

BANDSPREADING

Although the slow motion drive, especially the later type, is excellent, a bandspread control is a definite advantage on the higher frequencies. It can also be used for dial setting to counter the effects of oscillator drift on lower frequencies. Ideally, a twin-gang variable capacitor of about 20pF per section can be used, mounted below the chassis underneath the main tuning capacitor. One section should be connected in parallel with the oscillator (front section) and the other to the mixer (centre section) of the main tuning capacitor. The writer was unable to obtain a twin-gang capacitor of suitable dimensions and as two single variable capacitors were to hand, decided to use these instead. It was found advantageous to have two controls instead of one, though of course they were less convenient to use. After making this modification, the oscillator and mixer trimmers have to be re-peaked and this should be done at the h.f. end of each band with the vanes of the band spread control fully open.

Care should be taken when drilling through the front panel as it is of double thickness at this point. Swarf may fall between the inner and outer sections and later find its way into other parts of the receiver. It is not too difficult to remove the outer panel including the scale cover, if the slow motion drive is taken off first.

VOLTAGE STABILISER

Frequency drift, especially on the higher frequencies, can be a nuisance and a considerable improvement can be obtained by stabilising the voltage at the oscillator anode. A type VR150/30 voltage stabiliser was used (Fig. 4 shows the connections). This stabiliser has an octal base and can be plugged into the valveholder previously used for V8. All the d.f. wiring should, of course, be removed from this valveholder including the heater supply. The 22kΩ resistor (R28) in the oscillator anode circuit has to be replaced with a 1·5kΩ ½ watt resistor. Resistor R28 is located inside the coil pack on a small tag-board which is mounted on the chassis at the left hand side as viewed from the rear of the receiver. One side of this resistor is connected to h.t. positive and the other side goes to a common lead which runs between L15, L16, L17 and L18. Remove the strap to the h.t. positive line and run a wire to pin 5 on the base of the stabiliser.

It was thought worthwhile to stabilise the voltage at the screened grid of the frequency changer too. Voltage changes on the screen grid can cause small changes to the oscillator frequency. Since the screen grid voltage can vary in sympathy with the a.v.c. voltage it is possible for some kinds of fading to produce variations in the oscillator frequency which will give rise to objectionable distortion. The majority of receivers do not apply a.v.c. to the mixer valve, probably for this reason. An obvious solution is to disconnect the mixer from the a.v.c.

line, however, the a.v.c. on the R1155 is very efficient and rather than disturb it, it was thought better to stabilise the screen grid voltage. Only one additional resistor is required to do this and it is shown in Fig. 4 connected between pin 5 of the stabiliser valve and pin 4 of V4. The two resistors connected to pin 4, a 22kΩ and a 27kΩ, should be removed but the connection to the decoupler should be left.

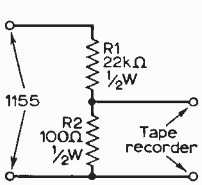
R.F. GAIN CONTROL

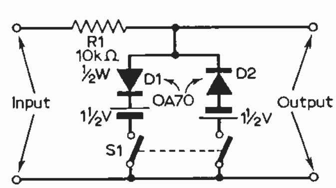
The volume control on the R1155 is a little unusual as it consists of a twin-gang potentiometer. One section (0·5MΩ) is an audio volume control while the other (50kΩ) controls the gain of V3, V4, V5 and V6 by applying a steady controllable voltage to the a.v.c. line. When the master switch is in the a.v.c. position only the audio gain control is effective, V3 to V6 being controlled by the normal a.v.c. voltage. When the master switch is in the OMNI postition, the 0·5MΩ section is out of circuit allowing maximum audio gain. Also, the a.v.c. line is disconnected from the a.v.c. diode load and joined to the 50kΩ section which then forms part of a biasing network situated between h.t. negative and the chassis.

In short, when the a.v.c. is *on*, the receiver output is controlled manually by the audio gain control. When the a.v.c. is *off*, the audio gain is fixed and the combined r.f./i.f. gain control is effective. This is a sensible arrangement and is more or less how one woud use a receiver with separate r.f. and audio gain controls. There are occasions though when one wants to reduce only the r.f. gain to avoid overloading the frequency changer with a strong signal. However, to do this with the R1155, the i.f. gain has to be reduced too.

A separate r.f. gain control will solve this problem and one can be installed quite easily by placing a 5kΩ potentiometer between the chassis and pin 8 of V3. The potentiometer can be fitted underneath the chassis so that the shaft projects through the front panel below and to the right of the main tuning capacitor, maintaining symmetry of control layout (including the two bandspread controls). Alternatively, the potentiometer can be fitted in one of the spaces along the top of the front panel which were previously occupied by d.f. components.

The left hand terminal of the potentiometer as viewed from the rear, is connected to chassis. The strap from V3 pin 8 to chassis is removed and a wire is run to the central terminal of the r.f. gain control. A 0·1μF decoupling capacitor must be connected from pin 8 to chassis and it is essential to connect this component direct to pin 8 and not to the centre terminal of the potentiometer, otherwise instability will occur.





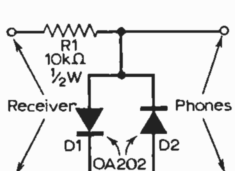


Fig. 5 (top left): Simple attenuator.

Fig. 6 (top right): Germanium diode noise limiter.

Fig. 7 (left): Silicon diode limiter.

TAPE OUTLET

The phones output from the R1155 is suitable for direct connection to a tape recorder. In a previous article a description was given of how to fit a front panel phones socket. Adjacent to this, a second socket can be fitted for use as a tape outlet. A 0·1μF 350VW capacitor was used to isolate the headphones from the input of the tape recorder and it was wired between the line terminals of the phones and tape socket, at the rear of the front panel. The second terminal of each socket was connected to the chassis which should be earthed.

An attenuator may be required for some recorders. Figure 5 shows a simple attenuator which, if it is required for permanent use, can be wired between the tape and phones socket.

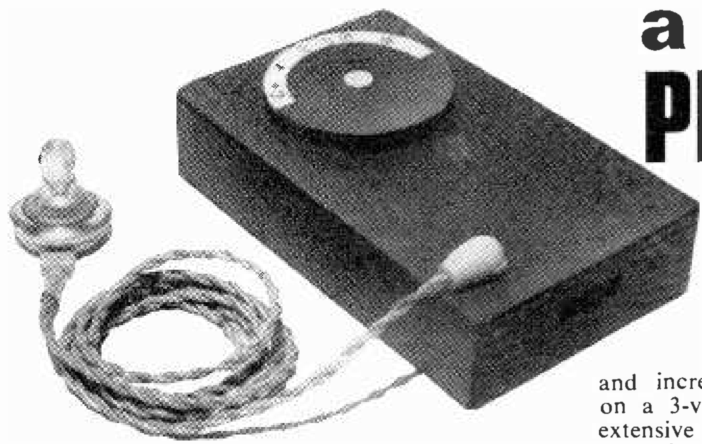
NOISE LIMITER

A subject that is almost certain to start a discussion among radio enthusiasts is that of noise limiters. Many circuits have appeared: some are good, others not so good; the method of operation of some is simple, of others it is obscure; some operate on the i.f. stages of the receiver, others are used on the audio; some automatically adjust themselves to the signal level, others have to be set manually; and so on. Unfortunately there are snags of one sort or another connected with many noise limiters. To be effective, some of them have to be set so that they tend to clip the signal causing distortion, which may, of course, be acceptable. It is obviously better to have a partly distorted signal that is audible, than one which is lost in noise.

It was finally decided that a simple audio limiting circuit applied to the phones output of the R1155 would probably be as good as any. Figure 6 shows the circuit of a parallel type of audio limiter. Either valve or semiconductor diodes can be used but in each case the main drawback of this circuit is the same. The diodes have to be reverse-biased so that they will only conduct when the bias voltage is exceeded. If 1·5V dry cells are used, the limiter will not act until 3V peak-to-peak is applied to it, which is ample to drive a pair of headphones.

It is possible to throw away the biasing batteries and use silicon diodes in the noise limiter circuit; since these devices do not conduct in the forward direction until a forward bias is applied (the level of which varies according to type). Figure 7 gives details of such a circuit using 0A202 diodes. Germanium diodes were tried, but discarded as they distorted the output.

The limiter is connected between the output transformer and the phones socket; it is convenient to mount the components at the rear of the socket itself. The effect of the limiter is immediately apparent, removing the usual clicks, bangs and static crashes. As the volume is turned up a point is reached where no further increase in output is obtained. Any further advance of the volume control only brings about distortion. ■



a two-transist
PERSONAL PORT

R. L

and increased volume could have been obtained on a 3-volt supply, but this would have involved extensive modification. Most of the difficulties of a t.r.f. circuit would disappear if it were designed to recieve a single frequency like the i.f. amplifier of a superhet. Instead it has to be tunable over a wide frequency band, and conditions vary considerably over the tuning range. Here the circuit is aperiodic except for the input, although L3 with only 20 turns should assist in maintaining the r.f. gain at the high-frequency end.

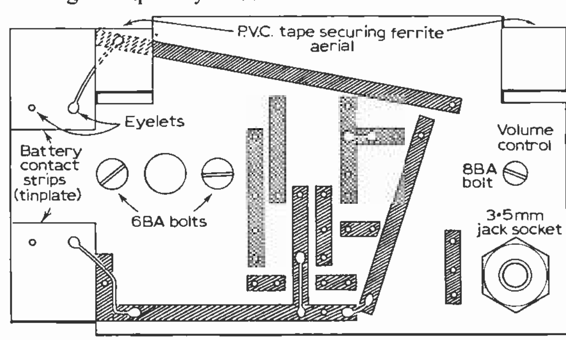


Fig. 2: Mounting board using "Cir-kit".

REFLEXING in this personal radio makes two transistors do the work of four. Often it is not easy to carry out successfully, but works reasonably well in this circuit, even over an output stage feeding an earpiece. The quality depends upon using a good earpiece and the type specified is Ardente ER250.

Alignment problems do not exist in a receiver that has only one tuned circuit. On the other hand, as it takes as many as four tuned circuits to suppress a powerful transmission and enable a weak signal to be heard, it is mainly a local station receiver. Reaction could be added to sharpen selectivity, but risks instability, and there is probably some r.f. feedback already. It is almost unavoidable when a t.r.f. circuit is put into miniature form, since the input and output of the r.f. amplifier are working at the same frequency, and are close together.

With a ferrite aerial, an r.f. amplifier is essential, because a detector can only respond effectively to strong signals. At low signal levels the detector is insensitive and produces increased distortion. A.F. amplification cannot, in general, make up for a lack of r.f. amplification.

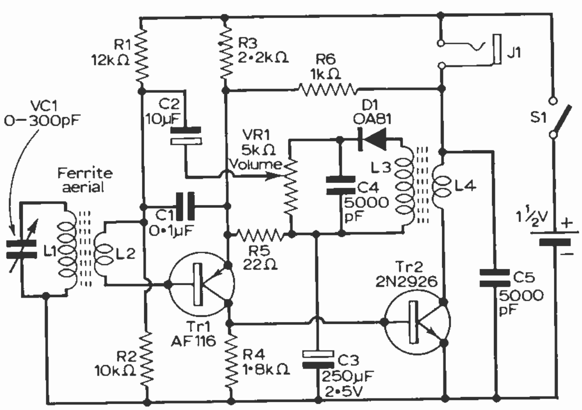


Fig. 1: Circuit diagram of the two-transistor radio.

A 1·5V battery is capable of providing all the volume needed in an earpiece. The low voltage, however, accentuates the non-uniformity of gain over the medium waves, and sensitivity decreases towards the high-frequency end. Improved sensitivity

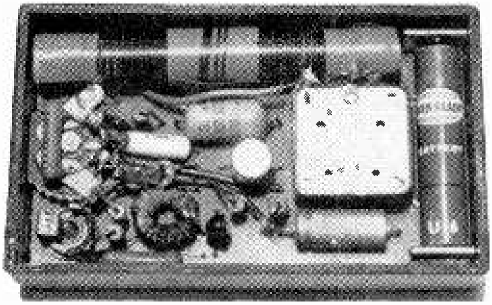
Tuning is effected by a 300pF miniature plastic dielectric capacitor across a 70 turn winding on the ferrite aerial, and this is coupled by a coil of five turns to the base-emitter input of Tr1. The two transistors serve first as r.f. stages feeding the detector via a small step-up transformer, and then as a.f. stages amplifying the a.f. from the detector. The overall a.f. gain is about 40 times with negative feedback applied by means of R5 to reduce distortion in the output stage. A step-up ratio to the detector is possible because the detector is working at a rather low signal level at which its impedance is fairly high. Ideally there would be a further step-up to a tuned circuit, but this, though desirable, would involve the complication of ganged tuning.

R.F. TRANSFORMER

The r.f. transformer is wound on a ½in. ferrite ring because this has very little external field and avoids r.f. instability through magnetic feedback to the ferrite aerial. It is more compact than a ferrite pot core, and can be wound fairly easily. Very little of the a.f. at the collector of Tr2 can reach the detector via this transformer, although winding the coils L3 and L4 on separate rings coupled by a r

BLE

LAND



capacitor of about 200pF might be a better arrangement, and would still give a step-up to the detector. The r.f. at the collector of Tr2 is passed via the transformer to the detector, but after the modulation is extracted, it too must be filtered out, and only the resulting a.f. is passed back to the base of Tr1 so that the transistors can now function as a.f. amplifiers.

The success of reflexing depends upon this sequence of filtering, and r.f. current must also be kept out of the earpiece leads in order to prevent re-radiation and hand-capacity effects when tuning. This is the purpose of the bypass capacitor C5.

TRANSISTORS

A direct-coupled circuit requires fewer components, and a complementary arrangement of a p-n-p transistor followed by an n-p-n can take a form which does not require any adjustment. D.C. feedback to overcome drift is applied via R6 to the emitter of Tr1. The potential divider consisting of R1 in series with R2 provides a "reference voltage". The resistance R3 is necessary mainly because of the low supply voltage. D.C. stability would be somewhat better on a higher supply voltage, because the base-emitter potential drops of the transistors would be a smaller part of the total voltage.

A silicon transistor 2N2926 is deliberately chosen for Tr2 because of its large base-emitter drop. This permits a larger current in Tr1 for a given load resistance R4. The total current of the receiver is under 2mA and of this about one-third of a milliamp flows in Tr1. The first transistor could also be

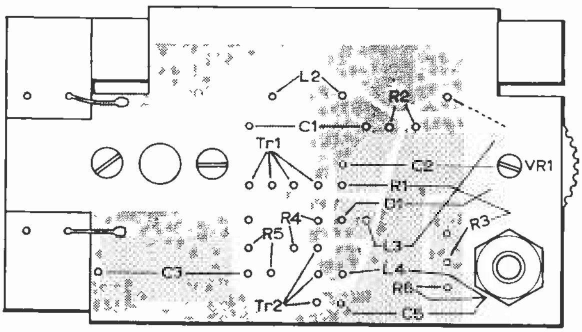


Fig. 3: Printed circuit as alternative to Fig. 2.

a silicon transistor, but of the p-n-p type, such as 2N3702. However it was found that the germanium r.f. transistor AF116 gave a larger output. Complementary circuitry can be confusing, and the lead arrangements of the two transistors should be studied carefully before insertion into the circuit. The lead arrangements of the silicon and germanium transistors are depicted in Fig. 5 which also shows the positions of the corresponding holes in the mounting board.

The detector diode D1 is connected with the red end towards the volume control. The polarities on the electrolytic capacitors should also be carefully observed, otherwise the circuit will stop working in a short time. The metal case of C2 is connected to the junction of R1 and R2, while that of C3 is connected to the negative side of the battery. The battery itself must be correctly inserted, although no damage appears to occur from an accidental reversal when the rest of the circuit is in order.

CONSTRUCTION

The components are assembled on a small mounting board of $\frac{1}{16}$in. insulating material. "Cir-Kit" strip on the underside is an alternative to a printed circuit, although rather close spacing is involved. Holes for component leads are drilled with a No. 60 drill. Guide marks are then made

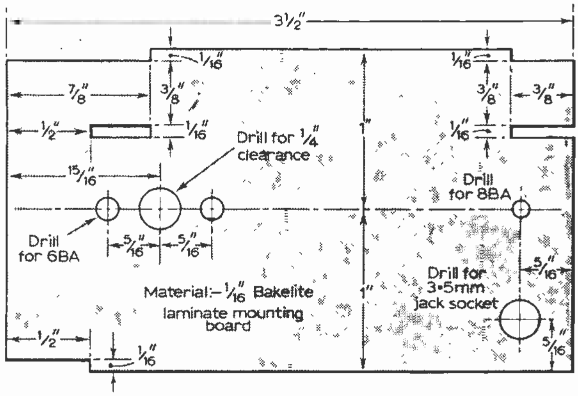


Fig. 4: Details of the mounting board.

with a scriber for the edges and ends of the strips. The "Cir-Kit" strip is cut to length, then the paper backing is prised off with the point of the scriber, holding the end of the strip with small forceps or tweezers. When all the strips have been pressed down in position, the mounting board is placed with the copper side downwards on a flat wooden surface, and the holes can then be drilled through the strips, smoothing them afterwards where necessary. Joins between adjacent strips can be made by soldering short pieces of 24s.w.g. tinned copper wire across them, and in one or two instances, gaps between the strips can be widened by cutting away some of the strip.

FERRITE AERIAL

The 3 x $\frac{3}{8}$in. ferrite rod is a piece broken off from a longer rod. A method of doing so is to wind two turns of $\frac{1}{2}$in. Sellotape tightly round at the point where the break is required. Place the rod on a hard surface and position a metal chisel at the edge of the Sellotape. A sharp tap with a hammer will usually produce a clean break at this point. The ferrite rod is then covered with p.v.c. tape and wound with 70 turns of 24s.w.g. enamelled wire. The ends of the wire are fixed with a strip of of p.v.c.

tape. A piece of the tape is then applied around the middle of the winding and the five-turn coupling is then wound on top. Owing to the shortness of the aerial the winding has to be in the middle for maximum signal. The ferrite aerial is fastened on to the

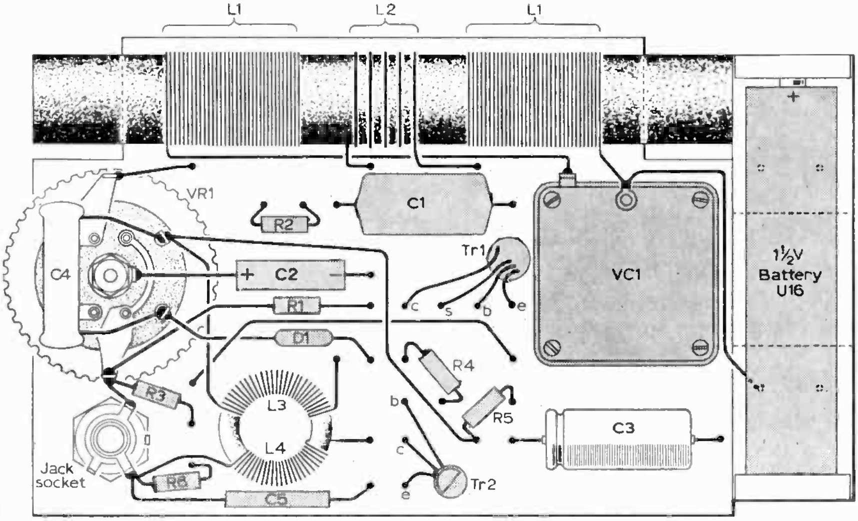


Fig. 5: Component arrangement above circuit board.

mounting board by strips of p.v.c. passed through slots in the board. It is raised above the surface by $\frac{1}{8}$in. squares of the $\frac{1}{16}$in. material cemented to the mounting board under the ends of the rod.

TUNING CAPACITOR

The round-head screws supplied with the 300pF Dilemin capacitor are too short for mounting on the $\frac{1}{16}$in. material and can be replaced by similar 6BA screws $\frac{1}{4}$in. long. The washers supplied are

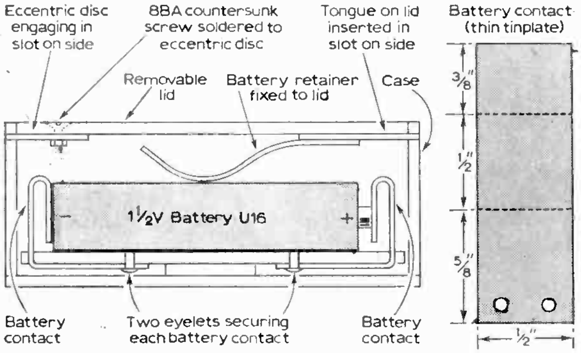


Fig. 6: Sectional elevation showing battery contacts.

placed between the capacitor and the board, as it requires to be raised slightly to clear a ridge around the tuning shaft. A check should be made on the length of the screws projecting through the board, as the capacitor will be damaged if these screw in too far. It should also be kept in mind that the end stops of the capacitor will be damaged if the shaft is turned beyond its normal range, especially as it is a little stiff to turn at first.

Before winding the two single-layer windings on the ferrite ring (type FX1593), $\frac{1}{2}$in. Sellotape is applied around the perimeter of the ring and folded inwards. It can be pushed into the centre from each side to cover the ring completely. The 40-turn winding requires 27in. of 36 s.w.g. wire. Double silk-covered may be used, but should be waxed before winding since the wire has to be threaded through the core 40 times and this can impair the insulation. The 20-twin winding may consist of 15in. of 30s.w.g. wire.

Battery contacts may be formed by folding strips of tinplate to the shape shown in Fig. 6, and are attached underneath the mounting board by small eyelets. The smallest eyelets obtainable are the type made for insertion in Veroboard, and are thus suitable for $\frac{1}{16}$in. material. In assembly, the component leads are passed through their respective holes, bent over, clipped, and soldered to the copper strips with printed circuit solder. Ease of construction is more important than the ultimate in compactness. Resistors stand vertically on the board. A heat shunt, e.g., the Antex type, can be used when soldering the transistors and diode. Special care is needed as the leads are made very short so that the transistors project no higher than the variable capacitor. Although it takes longer, the best method is perhaps to apply the soldering iron for a second at a time, followed by an adequate cooling interval. The high frequency performance of transistors seems often to be impaired by soldering without adequate precautions.

CABINET

The case is made from $\frac{1}{16}$in. material glued at the edges with Bostik clear adhesive. A strip of leathercloth is glued round the sides of the box and trimmed with scissors. A piece is glued over the top and trimmed neatly round the edge so that the join is almost imperceptible. The back, too, is covered with leathercloth, and is removable by giving a small screw half a turn with a screwdriver. The locking device consists of an eccentric disc which enters a slot in the side. The three slots required in the sides are made before assembly by drilling series of holes with a No. 60 drill. These can then be merged by inserting the tapered end of a nail file.

There is an opening in the end of the case for the edge-type volume control, which also incorporates the on-off switch; and to enable the chassis of the receiver to drop into place, the hole in the case for the tuning shaft is elongated slightly. This can be done by using the $\frac{1}{4}$in. drill in the manner of a saw.

A combined tuning knob and dial is constructed from three discs as shown in Fig. 8, and is fixed on the shaft by a piece of wire through a hole drilled in

★ components list

Resistors:
R1 12kΩ
R2 10kΩ
R3 2·2kΩ
R4 1·8kΩ
R5 22Ω
R6 1kΩ

Capacitors:
C1 0·1μF 125V polyester
C2 10μF 15V electrolytic
C3 250μF 2·5V electrolytic
C4 5,000pF tubular ceramic
C5 5,000pF tubular ceramic
VC1 300pF Jackson "Dilemin"

Coils:
L1 70 turns 24swg enam. wire
L2 5 turns 24swg enam. wire
L3 20 turns 30swg dsc wire
L4 40 turns 36swg dsc wire
(L1–L4: see text)

Miscellaneous:
Earpiece, Ardente type ER250 with cord and 3·5 mm jack plug. Jack socket 3·5 mm. Ferrite rod. Ferrite ring core type FX1593. Battery, 1·5V type U16. Edgewise pot. (Volume and on/off switch) 5kΩ with switch.

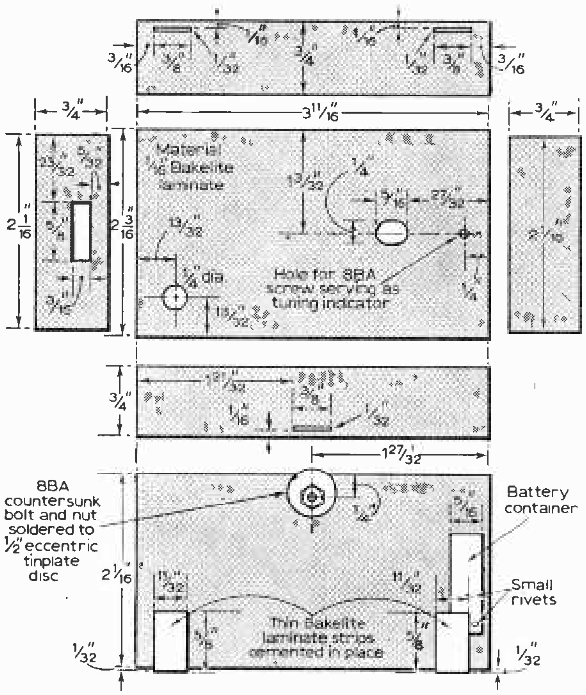
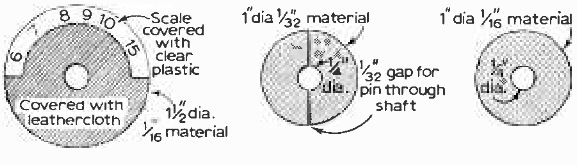


Fig. 7: Constructional details of the case.

Fig. 8: Individual parts for the tuning scale.



the shaft with the No. 60 drill. The knob is covered with leathercloth to match the case, except for the end of the shaft exposed in the centre for decorative effect. The scale round the edge is marked approximately in hundreds of kilocycles and is covered with clear plastic. ■

THE MW COLUMN

THIS month we will take a look at the Americas. The prolific stations of South America are usually best heard in the spring, when North America is less favourable. Some of the most consistent are PRG3 (1280kc/s), PRA3 (860); YVQO (650), HJED (820), LR4 (910), LR1 (1070), PRF4 (940), PRA2 (1040), ZFY (760).

Central America and the Carribean are usually more difficult to hear except for a few outstanding ones such as Radio Americas, Swan Island (1157, but frequency varies) and PJB Bonaire (800). Others to look for include CMBC Havana (690), CMCA (830), Jamaica (650), St. Lucia (840), Guadeloupe (640), ZBM1 Bermuda (1235—together with spurious pop pirate signal!), HOL55 (1315), TGRB (1120) TIRICA (625), PJD2 (1295), Belize (834) and the regular St. Pierre et Miquelon on 1375. A consistent one last season was XEW Mexico City, now suffering from splash from Milano; however it is often strong from 0500.

The east coast USA and Canadian stations, of course, can be heard very early in the evening when conditions are good, long before the Europeans sign off and loggings have occurred as early as 1730! With peak conditions they can be heard as late as 0900. Early arrivals to look for include WHDH (850), CJCH (920), CJON (930), WAVY (1350), WINS (1010), CBA (1070), CJCB (1270). Even mid-West stations have been heard comparatively early—WOAI (1200) and KMOX (1120) both before 2300.

Some channels are known as "graveyards" because they are occupied by dozens of low-powered local stations and no dominant station is apparent—just one weak signal on top of another. 1240, 1340 and 1400 are examples. Some stations make use of two frequencies (shared time), e.g. WFAA and WBAP both operate on 570 and 820. Other stations operate during daytime only. Also remember that on many channels both USA and Canadian stations operate. Which makes it important to take care in identification.

Some easy ones are WNBC (660), WCBM (680), WABC (770), WCBS (880), WBZ (1030), WHN (1050), WBAL (1090), WNEW (1130), WCAU (1210), WKBW (1520), WQXR (1560). More difficult high power stations include WFAA/WBAP (820), WCCO (830), WJR (760), WSB (750), WOWO (1190), WLS (890), WHO (1040).

You should add a few Indian stations to the log this month in the early hours between 0030—0200. Most have some English programmes (mainly newscasts). Most likely ones are Rajkot (910), Lucknow (760), Sangli (1250), Ajmer (600), Ahmedabad/Baroda (in parallel on 850), Delhi (1070), Bombay (1040). Several others have been logged. Radio Pakistan is more difficult but look for Lahore (630), Quetta (750), Rawalpindi (1150).

Japan is heard only rarely in Britain (but often in Sweden due to polar paths reflection). But try around 1500 on 1250 for Vladivostok, a good catch.

Alistair Woodland

Cycles for ever

WHAT a strange point of view Mr. Covington has (PRACTICAL WIRELESS, January, 1967). Surely, the only sane outlook is to have descriptive terms wherever possible. Everyone who can remember back must realise the difficulty a beginner has in memorising a multitude of non-descriptive terms. If all Mr. Covington is worried about is verbal speed, what can be quicker than the usual "cycles"?

Regarding written speed, surely the three letter m.p.h. is simpler than the five letter plus oblique mile/h.

I think that the answer to the change for changings' sake group is to simply ignore them—I shall certainly continue to write c/s and say cycles for cycles per second.

W. Lee. Hull.

R1155 information

RECENTLY there have been letters in this magazine concerning the R1155, from Mr. Tye and myself. I would like to state that although I said I would get copies made of any information I received, I cannot get them done free. Many readers have written asking for the information and only one has sent the money for the copying. The charge for this is 1s. per page.

A. R. Preston. London, S.E.8.

Phonetics again

I AGREE entirely with the letter of Charles Mitchell (November 1966 issue). Most amateur radio operators operate fairly powerful transmitters. They are fully competent to operate their equipment or else they wouldn't be licensed amateurs. The one quality they lack, is use of codes and abbreviations. Mr. Mitchell says he had heard a ham on 80m using very different phonetics when repeating his callsign in the same transmission. I have listened to hams doing this many a time. Sometimes the callsign is given without the use of phonetics, and we, the S.W.L. fraternity and the amateur who he is in QSO with, are subject to "garbled" call signs. I think that before licences are granted the applicants should be tested on their knowledge of abbreviations, etc., set down in the Geneva Radio Regulations, 1959. It would be interesting to hear what other readers think of my idea.

S. Haagensen. Grimsby, Lincolnshire.

Price correction

The price of the Electronics (Croydon) Ltd., "Supertone G.C.V." radio, as advertised on page 779 of February issue, should be £3 19s. 6d. and not as printed.

NEWS AND..

COBRA AND THE COMMODORE FROM K-B

The latest in the K-B range of portable radios are the Cobra (left) and Commodore (right). Both models feature modular construction which makes servicing a very easy job—the r.f., i.f. and a.f. sections being three plug-in units. The transistor complement is the same in both receivers: 2 × AF117, OC70, 2 × AC127 and 2 × OC81.

The Cobra embodies a 5in. speaker and cabinet dimensions are $5\frac{5}{8} \times 10\frac{1}{16} \times 2\frac{3}{8}$ in. and the Commodore having a $7 \times 3\frac{5}{8}$ in. speaker, measures $7 \times 12\frac{5}{8} \times 2\frac{3}{4}$ in. Both receivers cover long waves and have bandspread on the medium wave band and have provision for an earpiece which is provided as an optional extra and both sets have a car aerial socket. Tape recordings can be made from the Commodore.

The cabinet of the Cobra is Arabian blue plastic with a chrome plated fascia and satin finished aluminium fold-down handle. The Commodore is in a wooden cabinet covered in grey leathercloth with chrome finished knobs and trim. The Cobra costs 12½ gns. plus 3s.8d. surcharge and the Commodore 18 gns. plus 5s.3d. surcharge.

CHRISTMAS MAYDAY CALL FOR RARE DRUG

A ham radio broadcast from Vienna promptly translated into action by a Swedish newspaperman resulted in the emergency despatch from the Wellcome Chemical Works, Dartford, on Christmas Day of 100 tablets of a rare drug which may be the last hope of prolonging the life of a patient in Zagreb, Yugoslavia.

The emergency call, put out on behalf of Dr. Otto Schinkler of Vienna, was for the drug Alkeran needed by his sister, a doctor at the 1st Polyclinic in Zagreb, to treat Eviord Storjok, a 35-year-old patient suffering from cancer. With pharmacies closed and continental telephone lines jammed with Christmas goodwill messages, Dr. Schinkler enlisted the help of Friedrich Stobel, a ham whose Mayday call was picked up by a fellow ham in Stockholm.

Action began when Fred Bramberg, on duty at the Stockholm newspaper "Expressen", received news of the broadcast by telephone. At about 4 p.m. Bramberg was able to reach by telephone Dr. Fred Wrigley, Overseas Director of The Wellcome Foundation Ltd.

With the aid of Mr. W. L. Jeffrey, general manager in the overseas unit and Mr F. G. Rundall, General Works Manager, the tablets were located in the Wellcome Chemical Works. They were handed to Mr. Alan Stubbs, head of the Works despatch section who, despite having one leg in a plaster cast, delivered them to B.E.A. Export Cargo Unit to be put on the first connecting plane for Zagreb.

...COMMENT

THE BRITISH ACOUSTICAL SOCIETY

A significant milestone in the history of British Acoustics has been the formation of the British Acoustical Society. This resulted from meetings arranged by the Royal Society between representatives of architecture, engineering, medicine and pure science.

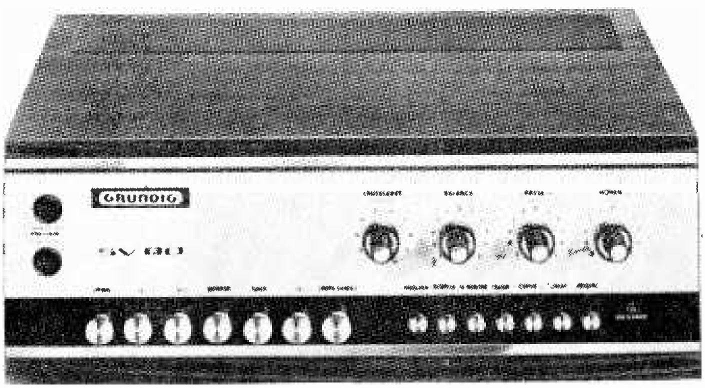
Appropriately, in view of its importance to large sections of the community, the first meeting was a two-day symposium on aircraft noise. Subsequently, symposia have been held on such diverse subjects as underwater acoustics and acoustical investigations of defects in solids.

For full particulars of membership apply to Dr. R. W. B. Stephens at the Physics Department, Imperial College, London, S.W.7.

RADIO 390 LOSE APPEAL BUT BACK ON THE AIR

An order of *certiorari* to quash the convictions against Radio 390 and two Company directors (see last month's issue for court report), was dismissed by a two-to-one majority in the High Court of Justice on 13th December. Estuary Radio Ltd., who own Radio 390, switched their transmitter on again New Year's Eve in open defiance of the Post Office, and are now broadcasting as before from the former anti-aircraft fort on Red Sands in the Thames Estuary. The other 'pirate' radio station BBMS, which was also prosecuted for illegally broadcasting from another fort in the Thames Estuary, is still, as far as we know, operating in the medium wave band.

GRUNDIG SV80 POWER AMPLIFIER



Grundig announce a range of high quality Hi-Fi units, amongst which is the SV80; a fully transistorised mains powered stereo amplifier with a transformerless output stage. Provision is made for the connection of a radio tuner, tape recorder and record player and there are output sockets for loudspeaker assemblies and headphones. Finished in light walnut or teak the cabinet matches other items in their Hi-Fi range.

Technical specification: Mains voltage, 110—130—220—240V 50/60c/s; Power Consumption, 120W max.; Transistors. 14 × BSY76—4 × BSY51—2 × BSX40—AD152—8 × 2N2148; Diodes, 2 × ZF27—2 × GF580—2 × ECO1106—8 × ECO3390—DZ62; Channel Separation, better than 46dB; Frequency Response, 20–20,000c/s ±1dB; Damping Factor 20 at 5Ω, 60 at 15Ω; Input Sensitivities, Mic 7·5mV/100kΩ, P.U. (Magnetic) 4mV/47kΩ, P.U. (Crystal) 220mV—3V/1MΩ, Radio/Tape Recorder 250mV/470kΩ; Output Sockets, Speaker 2 × 5Ω (4—16Ω), Headphones 2 × 300Ω; Output Power is 2 × 40W (Music Power) and Controls are: Volume, Stereo Balance, Bass and Treble; Distortion Factor is less than 0·5%; Power Bandwidth, 10–50,000c/s—1% distortion; and Balance Regulation, up to 10dB.

Starting a club

I WAS glad to read the letter from G3VLJ last month, and I would like to encourage any young reader in that area to contact him. There may be older readers who know young beginners and who could tell them of the proposed club. Mr. Hansen and I have corresponded earlier on the topic, and I know he is keen.

I have always thought and hoped that the next move in the youth service would be a growth of radio and science clubs, so best wishes to the Croydon area.

By the way, if there are any interested young people in the Holloway/Camden Town area who would like to contact me, I would be very pleased to hear from them.

Ken Smith, G3JIX. 82 Granville Road, Walthamstow, E.17.

Foreign equipment

FROM time to time I have observed letters published in your journal from readers who have purchased foreign-made receivers and equipment which have broken down and been left inactive due to requirement of special parts which the suppliers are unable to supply or have a "I couldn't care less" attitude when letters are written to them requesting data and availability of parts in the country the product is marketed in.

I am surprised to see, why persons in Great Britain who have such an abundant source to draw from in their own country, purchase products made abroad. It could be in my opinion, the price at which they are sold. A similar product made at home (Great Britain) does cost more, I agree, but there is always the dependability of the manufacturer being able to supply the necessary parts if they are of a special nature to the instrument concerned.

I have had similar experiences with American-made products, which I ordered from New York. Certain parts in an oscilloscope purchased in kit form were missing when the parcel arrived, and after a correspondence that lasted over a period of years, I was told that the kit-maker had gone out of business and they were sorry they couldn't supply parts; would I be interested in ordering another kit?!!! The result has been that I have a white elephant in the house.

I have, however, experienced that the British manufacturers are most co-operative in supplying technical information of their products, and any special parts for many of the test equipment that I own, and service has been very prompt.

S. M. Sharifi. Teheran, Iran.

EXPERIMENTERS CORNER

SOLID STATE THERMOMETERS AND THERMOSTATS

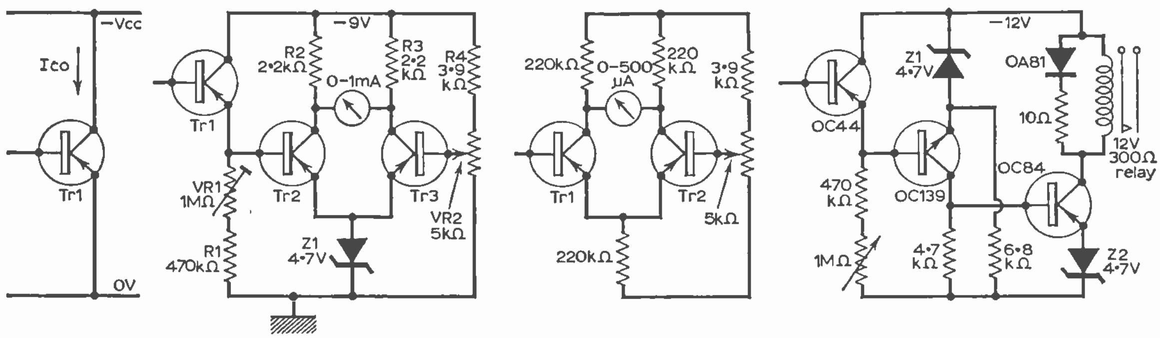
K. T. WILSON

MOST textbook descriptions of transistor action pay a fair amount of attention to the effect of varying temperatures on the operation of transistor circuits. As far as the normal operation of circuits is concerned, the temperature dependence of all the transistor parameters is a problem which must be taken care of in the design of equipment. If we wish to use transistors as temperature detectors, however, we must find a way to obtain the maximum temperature sensitivity in order to make the thermometer action as sensitive as possible.

The most temperature dependent parameters of any transistor are the leakage currents, and of the two leakage currents of importance, the more sensitive is the collector leakage current in the common emitter connection with the base open circuited. This mouthful is usually shortened to I'co. For most germanium transistors, the value of I'co approximately doubles for every ten degrees centigrade rise in temperature; or, to put it another way, the I'co increases by about ten per cent per degree centigrade.

A thermometer circuit using this principle is shown in Fig. 2. Tr1 is the temperature sensitive transistor with the base open-circuited. VR1 is adjusted so that the leakage current at room temperature produces a voltage I'co. (R1 + VR1) which is slightly greater than the stabilising voltage of the Zener diode Z1 (4·7 volts in this case). This voltage produces a current in the base of Tr2, and hence an amplified current in the collector of Tr2. The value of VR1 should be adjusted so that one milliamp flows in the collector of Tr2 at room temperature. VR2 is then adjusted so that the meter reads zero at room temperature.

The circuit as drawn provides a range of ten degrees centigrade (eighteen degrees Fahrenheit) for full scale deflection. It is therefore very suitable for interior use where temperatures fall within this range (15-25 degrees centigrade). The experimenter can readily devise methods of extending this range; for example the collector loads of Tr2 and Tr3 could be dropped to 680Ω and a 5mA meter used. Alternatively, the circuit of Fig. 3 could be used. Here the temperature sensitive transistor forms one of the long-tailed pair of the meter circuit, and the Zener diode has been replaced by a resistor. It should be noted that these circuits are entirely unsuitable for car radiator measurements, as the temperatures encountered may be destructive to the transistors.



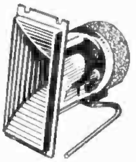
Left to right. Fig. 1: Path of leakage current I'co. Fig. 2: A simple thermometer circuit using I'co to record temperature fluctuations. Fig. 3: Alternative circuitry using a long tailed pair. Fig. 4: Circuit of a simple thermostat. (Tr1, Tr2, Tr3—OC70, 71, 44 etc).

Finally, Fig 4 shows a sensitive thermostat using the same principle. In this case the resistance in the emitter of the sensing transistor is high for the maximum sensitivity. To enable the first stage to be coupled directly to the second, Tr2 is an n-p-n type. In some cases where great sensitivity is not required and a low-current relay is available, the n-p-n transistor can operate the relay directly. As shown, the output of Tr2 is directly coupled to a power transistor Tr3 which operates the relay. This arrangement is capable of controlling temperature very closely, the only backlash being due to the relay. ■

RADIO • HI-FI • COMPONENTS • TEST EQUIPMENT

ALL ITEMS SENT POST FREE

H.T. 20 Rectangular Horn Tweeter



Ideal for 2-way and 3-way speaker systems ensuring smooth and clean reproduction. Output 20 watts. Impedance 16 ohms. Response 1,500—18,000 cps. **£4.2.6.**

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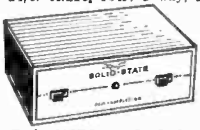
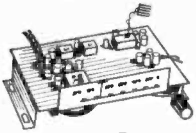


ALL TRANSISTOR MONO & STEREO PRE AMPLIFIERS

Provide extra stage of amplification for use with magnetic cartridges, tape and microphone inputs. Both models feature wide band pass range, 20-20,000 cps. As reviewed in *The Gramophone*, Dec. 1966.
PRE 301 MONO £4.12.6
PRE 302 STEREO £5.15.0

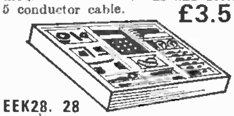


EAGLE FMT41. FM TUNER

Sub-miniature 6 transistor 3 diode F.M. Tuner. Covers 88-108 Mc. Operates from 9-volt battery, micro miniature circuit giving brilliant FM reception. Ready to use, simply connect to your Hi Fi amplifier. Instructions supplied. **£8.10.0**

REMOTE CONTROL STEREO HEADPHONE STATION LS.2.

A junction box for connecting stereo headphones to a stereo or monaural system. Separate controls for each channel. On/off switch. Stereo sockets allow two sets of headphones to be used. With instructions and 20ft. of 5 conductor cable. **£3.5.0**

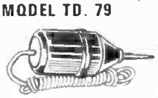


EEK28. 28 PROJECT CONSTRUCTIONAL KIT

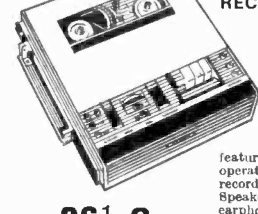
This advanced educational kit is excellent for beginners as well as the more advanced experimenter. Not even a soldering iron is needed. Complete with 60 page booklet giving full details of suggested circuits. **£6.10.0**

LA9P. AC ELIMINATOR with a double wound step down transformer to operate 9v Radios, etc., from AC Mains. **£1.8.6**

TAPE HEAD DEMAGNETIZER MODEL TD. 79



Compact, easy to handle. Will remove magnetism from tape heads permitting improved recordings. Reduces harmonic distortion and noise level, 35/6. Also Two Probe version TD 109, 38/6



AIWA TP.712 2-SPEED 5" REEL MAINS AND BATTERY TAPE RECORDER

Loaded with features hitherto only found in more expensive tape recorders: AVC system automatically adjusts recording volume level. TWO-WAY OPERATION: A.C. mains or batteries TWO HOURS OF RECORDING TIME: Using 1.5 mil 600 ft. tape. REMOTE CONTROL: TONE CONTROL: LEVEL METER: Indicates recording and battery levels. Other features include 1⅞ and 3¾ i.p.s. speeds, smooth operating push-button keyboard, input for radio, record player, TV, etc., socket for an external Speaker. Complete with Dynamic microphone, earphone, 5in. 600ft. tape, 5in. empty reel batteries and A.C. lead. Size: 12¼in. x 10⅜in. x 3⅜in.

26½ Gns.

EAGLE PRODUCTS

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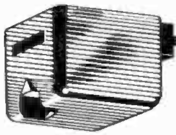
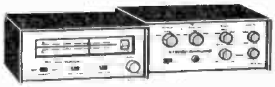


M1007G GOLD
Response: 20-20,000 cps
Output: 5MV at 1Kc/ 5cm/Sec.
Stylus: 0.5 Mil diamond
Tracking Pressure 1–2.5 grams.
£6.12.6

M1007F. SILVER
Response: 20-18,000 cps
Output: 10MV at 1Kc/ 5cm/Sec.
Stylus: 0.7 Mil diamond
Tracking Pressure 2–4 grams.
£5.14.6

As reviewed in *Hi Fi News* Sept. 1965.
Both feature singularly smooth reproduction and incisive separation of stereo channels

EAGLE SA100. 10W INTEGRATED STEREO AMPLIFIER

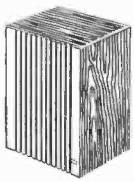


A compact, versatile integrated unit for monaural or stereophonic reproduction from record player, tape recorder and tuner. Power output 5 watts per channel. Frequency response 40–20,000 c.p.s. **£18.0.0**

EAGLE AFM100. AM-FM TUNER

Combines a host of advanced features that easily make it the finest AM-FM tuner in its class. A tuned RF stage on FM, AFC circuit and a heavy flywheel giving smooth but effortless tuning, built in AM Ferrite aerial. FM.88–108Mc. AM 535–1605 K/s. **£29.0.0**

MS80. 20W ROSEWOOD SPEAKER SYSTEM



The perfect answer for the music lover who wants full range fidelity in a compact system. Features an 8in. full range high compliance speaker with an output capacity of 20 watts RMS. Frequency response: 30–20,000 c.p.s. Resonant frequency: 30–40 c.p.s. Sensitivity: 97 db/w. Flux density: Over 12,000. Impedance: 16 ohm. Size 14¼in. high x 10⁵⁄₁₆in. wide x 8in. deep. **£14.14.0**

As well as this beautifully designed speaker there are two other models MS65. 10 watts RMS at £12.12.0 and MS40 5 watts RMS £8.10.0.
All three speakers are finished in magnificent rosewood and the entire cabinet filled with acoustic damping material.

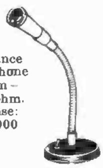
UD40H CARDOID DYNAMIC MICROPHONE

Features a pop-proof diaphragm and superior anti feed-back properties, reduces feed-back and room reverberation. O/p: —42 db. Response: 60–12,000 cps; 50K ohm impedance £6.6.

DM31C. CARDOID DYNAMIC MICROPHONE

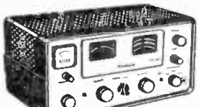
Superb quality with ball head for distributed cardoid frontal pick-up. Output: —52db. Response: 40–13,000 cps. Impedance 50 Kohm. £7.7.0.

DM24HL



A goose-neck dual impedance microphone 600 ohm – 50K ohm. Response: 50–11,000 cps. £6.6.0.

27 other microphones available.



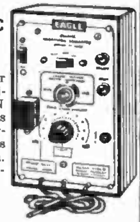
SR165. ALL BAND COMMUNICATION RECEIVER

This entirely new professional type communication receiver features frequency coverage of 535 Kc/s–30 Mc/s for complete general coverage. In particular ham bands are arranged in the same calibration scale, so that the band switching can be accomplished rapidly. **£48.0.0**

FOR FULL DETAILS OF THESE AND MANY OTHER ITEMS SEND FOR FREE COMPREHENSIVE CATALOGUE, EAGLE NEWS AND ORDER FORM. ALL ITEMS AVAILABLE POST FREE AND COVERED BY 12 MONTHS' GUARANTEE.

CALLERS WELCOME AT OUR HI-FI SHOWROOM

TT.144 DYNAMIC TRANSISTOR TESTER



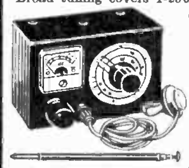
Tests in-circuit or out of circuit. Identifies PNP and NPN types. Indicates electrode open circuits, short circuits and current drain. Complete with instructions. **£4.10.0**

TT.145 DE-LUXE TRANSISTOR DIODE TESTER **£9.7.6**

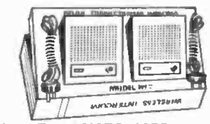
MULTI METERS

T.20A	1,000 o.p.v.	£2.15.6
TK.25	1,000 o.p.v.	£2.15.6
EP.10K	10,000 o.p.v.	£4.17.6
EP.10KN	10,000 o.p.v.	£5.8.0
EP.20K	20,000 o.p.v.	£5.19.6
EP.20KS	20,000 o.p.v.	£6.8.0
EP.30K	30,000 o.p.v.	£7.19.6
EP.30KN	30,000 o.p.v.	£9.0.0
EP.50KN	50,000 o.p.v.	£11.19.6
EP.100KN	100,000 o.p.v.	£14.19.6

RF. 40 RF FIELD INDICATOR



Broad tuning covers 1-250 Mc/s in five callibrated bands. Can also be used as frequency checker. Detects undesired radiation or spurious frequencies. RF is measured on an accurate 200 μA panel meter. **£4.10.0**

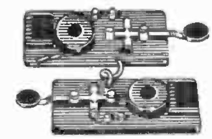


WI-2. TRANSISTORISED WIRELESS INTERCOM

No wires, no installation needed, simply plug them into AC power point and talk. Units have press-to-talk lock switch and on-off volume control. Ideal Intercom or Baby Alarm for home, office, factory. **£14.12.0** Complete.

DP303. DOOR PHONE INTERCOM

Ultra sensitive transistorized intercom designed so that you may answer the door from within for greater convenience and safety. **£4.12.6** Other intercoms available.



MCK.2. MORSE CODE KIT

Two station morse code kit supplied with instructions. 50ft. of connection wire and morse code charts. **£2.2.0**

WIRELESS MICROPHONES

WM909 (as illustrated) Pocket FM Wireless transmitter complete with tie-pin microphone. Transmits clearly up to 100 yds. and is fully tunable over the entire FM band. Simply used with an FM radio or tuner. **£14.0.0**

Also available WM808 **£21.0.0** Professional stick type FM Wireless Microphone. These cannot be operated in U.K.

RELDA RADIO LTD

(Dept. P.W.15) 87 Tottenham Court Road, London, W.1.

FUTURE BROADCASTING PLANS

THE Postmaster General, Mr. Edward Short, has at last presented Parliament with the long overdue White Paper dealing with broadcasting. Although the contents of this Paper (Cmmd. 3167, obtainable from Her Majesty's Stationery Office, price 1s. 6d.) will not affect many readers directly, it is interesting to note the Government's views on broadcasting.

"The Government have under review various major aspects of broadcasting policy," the White Paper states. "First among them was the question of the BBC's finances. Besides this, there were various proposals for the further extension of the broadcasting services; that there should be a fourth television service; that a service of local sound broadcasting should be introduced; and that there should be an extra service of sound broadcasting entirely given over to music . . .

"In reaching the conclusions announced in this review, it has of course been the Government's duty to consider both what purposes the proposals for further extending the broadcasting services should seek to serve, and what organisation would best promote those purposes. The Government have also had to consider to what extent it would be in the national economic interest to allow these extensions. It is not enough that they should be desirable in themselves. The overriding consideration is whether the country can afford them."

FINANCES OF THE BBC

The first thing the White Paper looks at in detail is the finances of the BBC. Reference is made to the fact that the BBC have already started another television service (BBC-2); that they are providing self-contained television services for Scotland and Wales; that they have greatly increased the number of hours of broadcasting on the Third Programme and in Network Three; that more time has been allocated to adult education on television; that a colour service is to start on BBC-2; and that the BBC are developing stereophonic broadcasts in the v.h.f. transmission of the Third Programme.

To carry out these improvements, it is recorded in the review that the BBC now receive the full proceeds of the £5 combined sound and television licence and of the sound only licence, which now costs £1 5s. In mentioning that the Government have completed their enquiry into the BBC's finances, the review continues, "Practically speaking, the only possible ways of providing finance for the BBC are: by direct Government subvention, by the sale of advertising time in the Corporation's services, or by the licence fee system.

"A Government subvention would be liable to expose the Corporation to financial control in such detail as would prove incompatible with the BBC's independence. The money would, of course, have to be found from general taxation.

"Under their Licence and Agreement (Cmmd. 2236) the BBC are not allowed to broadcast commercial advertisements without having sought and obtained the Postmaster General's permission. Because of the probable long-term effect on the character of their services, the BBC have never sought this permission. The BBC have reported that, by making special economies they will—on certain assumptions—be able to do so until 1968 when they would need an increase of £1.

"In order to make these special economies, the BBC will restrict activities which they have hitherto considered well justified but which, against the background of continued financial stringency, can be sacrificed to the overriding national need for economy. The Corporation have conducted a searching examination of all their ancillary services and operations, with a view to making the maximum retrenchment in detail. By itself, however, this will not suffice. Some larger scale projects, desirable in themselves, for enlarging and modernising the Corporation's programme production capacity, will be foregone for the present. But the BBC will be able to maintain their present level of programme output and to proceed with extensions and developments of their services already authorised or about to be authorised.

"One assumption on which the BBC have based their undertaking to manage without an immediate increase in the licence fee is that counter measures against licence evasion will prove effective. It has been reliably estimated that, of the gross revenue amounting to some £80M, payable in a full year, some £10M is lost through evasion. This is far too much to be tolerated. Honest viewers and listeners are, in effect, paying for the dishonesty of the evaders.

"Steps have already been taken by the Postmaster General to tighten up counter evasion measures, but, by themselves, they will not suffice. Further measures are required. The Government are reviewing the penalties which Magistrates may impose on convicted evaders, and are discussing with the associations representing retailers and the rental companies ways in which dealers could help in the enforcement of the licence system. The Government will announce their proposals as soon as these discussions have been completed; and legislation will be brought before Parliament in the current session. The Government recognise the effort which the Corporation are making . . . and are satisfied that no increase in the fee will be required before 1968."

A FOURTH TELEVISION SERVICE

Explaining the Government's decision not to alter the present number of television services, the White Paper suggests that there is room for only one more television service in the next ten years or so, since two of the allocations in the u.h.f. bands will be needed for the changeover of the two present 405-line television services to 625 lines. The review continues, "When the Television Act 1963 was before Parliament, the Government of the day stated their intention to allocate this service [the vacant channel in the u.h.f. bands] to a second programme of independent television during 1965 unless the financial or other obstacles were insurmountable. However it were allocated, a fourth television service would make large demands on resources. The three main services of television already provide a large volume of programmes of various kinds and the Government do not consider that another television service can be afforded a high place in the order of national priorities.

"Moreover, before deploying the last frequencies certainly available for television for many years to come, the Government would need to be satisfied that the case for committing them to any new service had been fully established. The Government have decided that no allocation of frequencies to a fourth television service will be authorised for the next three years at any rate.

"Besides the claim of independent television to the frequencies required for a fourth television service network, there is also the possibility that the network would be required for a specialised service of educational television, forming part of the structure of the Open University. The decision to reserve the fourth network would enable the requirements of the Open University to be appraised more closely in the light of practical experience."

COLOUR TELEVISION

The White Paper restates the Government's intentions to start a colour service on BBC-2 during 1967. "It is the Government's view that the cost of colour programmes, which are likely at the outset to be available only to a small minority of viewers because of the cost of the receivers, should not fall upon viewers in general. Accordingly a supplementary licence fee of £5 will be required from those equipped to receive colour programmes."

POPULAR MUSIC PROGRAMME

Introducing a new popular music programme, the White Paper claims the fact that there is a ready-made audience for continuous popular entertainment is not new. "What is new is that, by appropriating wavelengths allotted to other countries and by largely disregarding copyright in gramophone records, the pirate stations have been able to exploit the fact. Legislation to end the activities of these stations has been introduced. The Government recognise that there is, however, a need for a new service devoted to the provision of a continuous popular music programme. The question is how the need can legitimately be met: legitimately in that it would be broadcast only on wavelengths available under international agreement to this country, and in that it would respect the rights of performers, composers and others in the material broadcast.

"It is necessary to weigh also any implications for present services to the listening public generally; and, in particular, whether the need to provide frequencies on which to transmit a popular music programme would involve an unacceptable curtailment of the present services of sound broadcasting.

"Because a popular music programme does not need to differ from place to place, the most economical way of broadcasting it will be by relatively few stations, each with a large transmission area. The characteristics of wavelengths in the medium wave band suit them to this objective. But, as the medium wavelengths available to this country are already intensively used, room for an extra service can only be found by redeploying them. There is not room enough in them for all the present sound radio services and for a popular music programme with anything like sufficient coverage.

"The Government have therefore discussed with the BBC what rearrangement of their services they would need to make in order to find room for the additional service. In the past, the Corporation have considered that they could best serve their various audiences by providing the Light Programme on both long and medium wavelengths, in order to attain the widest possible coverage at an acceptable standard of reception. Now, however, that the long wave transmission of the Light Programme is reinforced by the BBC's v.h.f. transmissions, which have themselves attained virtually complete population coverage, and now that portable v.h.f. transistor sets, at reasonable cost, are available, the Corporation feel free to devote the medium wave channel of 247 metres to a popular music programme.

"The BBC have informed the Government that, on weekdays, the programme would broadcast popular music continuously from 5.30 a.m. to 7.30 p.m. and again from 10 p.m. to 2 a.m., and on Sundays, for most of the day's broadcasting. Over six hours of music each day would be played from gramophone records. The remainder would be either live broadcasts or BBC recordings of popular music especially made for the service. The programme would provide each day a blend of output to meet the needs of the audience for popular music.

"In the Government's view, the provision of a popular music programme on the medium wavelength, 247 metres, would, on an overall appraisal, provide an extension of choice to the listener. They will authorise the BBC to provide the new service at an early date."

LOCAL SOUND RADIO

"No general service of local sound broadcasting, which would be available during the hours of darkness as well as in daylight, can be provided only on medium wavelengths allotted to the United Kingdom," the White Paper states. "The only possibility for such a service lies in v.h.f. In practical terms, some 150 towns and cities could be served. Of the proposals put to the Government for the provision of a service, some advocate that it should be provided by commercial companies, others that it should be provided by the BBC.

"In a worthwhile service of broadcasting a local station should, the Pilkington Committee concluded, transmit *for a sufficient part of the broadcasting day (material) of particular interest to the community served by that station rather than to other localities.* In their White Paper of July 1962 (Cmmd. 1770) the Conservative administration agreed *that the justification for local sound broadcasting would be the provision of a service genuinely 'local' in character*. The Government share this view.

—*continued on page 854*

PSE QSL

A QSL card is a written confirmation of either a contact with, or the reception of, a Radio Station. On the Medium and Short Wave bands, broadcasting stations will often send their QSL cards on receipt of a report. This also applies to "Ham" Stations. However the reports received must be of some use to the station concerned, merely to inform briefly that "I heard you Thursday at 0745 hrs" is virtually useless. The following article is split into two sections. **Alan Thompson** *describes some techniques for the 'commercial' enthusiasts, and* **David Gibson, G3JDG** *writes from the amateur's point of view.*

Will You Please QSL . . .

MANY newcomers must have looked at John Guttridge's page and asked themselves, "How do they pick up so-and-so, when I only hear the same stations over and over again?" This article is not intended to teach old-hands new tricks or newcomers old tricks but is simply an account of one man's methods of receiving, and obtaining verification from some of the less common stations heard on the shortwave broadcasting bands.

First of all, it is necessary to have the kind of receiver and aerial which give one a sporting chance of receiving the less common station. The depth of one's pocket and personal choice influence the selection, as does the question whether one should build or buy. What *is* important is that the receiver should have adequate selectivity and sensitivity to enable the weak signal to be heard through the strident blasts of the major broadcasters on both sides of the Iron Curtain, and also it should have reasonably accurate tuning calibration.

Secondly, the idea should be laid to rest that one person hears all the DX that is going whilst another just does not have the luck. The real answer is that the "lucky" man is usually the one who sets a trap for the DX and then waits for his quarry to appear in it. This is the purpose of this article—to suggest a way in which the trap may be baited, without moving from the fireside, and even without the receiver being switched on. If the "shack" is in an uncomfortable location it makes a pleasant way of pursuing the hobby when the fireside, slippers and background tele are more inviting.

Another myth is that one must speak—or at least understand—a number of languages. This just is not so. What is important is that one should be able to recognise a number of languages, and this ability comes with practice. Very soon one finds that one has a working knowledge of the words which make up station identifications in a number of languages, and as this knowledge is gained it becomes easier to identify stations using languages other than English.

So far as reporting to DX stations is concerned, English is almost universally acceptable, and only a small number of stations ask for reports in other languages. Several short-wave clubs issue QSL report forms in a number of languages, and these help to overcome the language difficulty.

The first 20 or 30 overseas stations can be logged and reported without any difficulty—even if the receiver and aerial fall far short of the ideal. As the QSL cards for these begin to come in, you will begin to notice some significant—and surprising—gaps in your list. The answer is likely to be that they are countries—not necessarily difficult to receive in themselves—which either do not use English, use low-powered transmitters or only broadcast for a short time each day. It is now that the fireside work begins and perhaps an actual example of the writer's method will best illustrate what is involved.

An essential tool is the "World Radio TV Handbook". This is published in Denmark annually, but is written throughout in English. It can be obtained through all booksellers, but any good reference library should have a copy. The Handbook lists all the radio stations of the world and gives details of their programme schedules and frequencies.

Another invaluable publication is the "Kurzwellensender Frequenzliste" which is issued free by Sender Freies Berlin two or three times a year. This list is in German—with English notes—and gives, in frequency order, brief transmission details of the main radio stations heard in Europe (excluding Radio Moscow, Radio Pekin and Radio Free Europe). Armed with one, or preferably both, of these publications one can settle down and set the "trap".

Let us say that one is anxious to hear Saudi Arabia. A glance at the WRTH will show that the foreign service is carried in a group of Middle Eastern and Indian languages and is clearly not destined for the U.K. Since transmitters are normally beamed to the area in which reception is intended such services are not likely—as a general rule—to be heard or heard well in a totally different direction. (This is a dangerous generalisation, but the exceptions are outside the scope of this article).

There is, however, a Saudi Arabian General Service in Arabic which is clearly intended for the Middle East and North Africa—an area much nearer the U.K. Both the WRTH and the "Frequenzliste" publish tables showing the broadcast bands which are most likely to give good reception in a particular area at any time, and these show that the Middle East is likely to be best heard in the U.K. on the 9Mc/s band in the evening.

Reference back to the WRTH shows that Saudi Arabia uses two frequencies in the 9Mc/s

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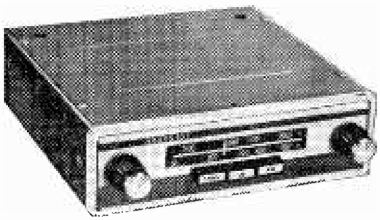

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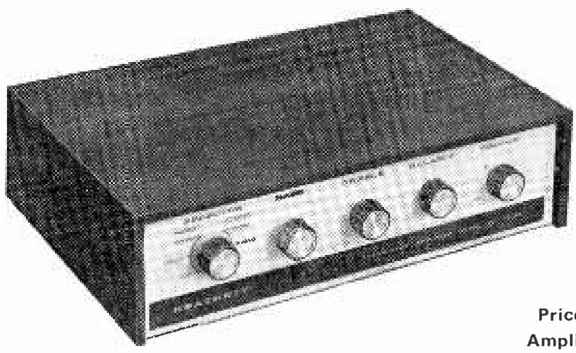

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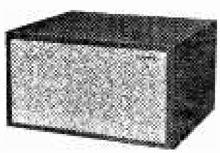

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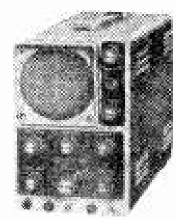

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20μF	6 volt	2·5μF	25 volt
25μF	6 volt	3μF	25 volt
30μF	6 volt	4μF	25 volt
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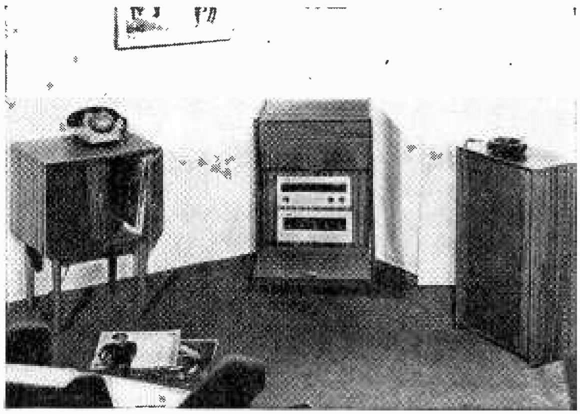

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BRITISH NATIONAL RADIO SCHOOL

band in the evening—9,670 and 9,720kc/s. The WRTH will also show that the Swiss Broadcasting Service utilises 9,665kc/s for its evening service to the U.K. from 1845 to 2015 G.M.T. in English.

This transmission can hardly be missed and it then becomes a question of finding the Swiss programme, waiting for the close down and then listening for a station using Arabic as its main language on a channel only 5kc/s away. With the bandwidth of the average receiver, as S.B.C. leaves the air so Jeddah will (one hopes) be heard, and the tuning knob will only need to be moved a fraction to bring it in at maximum strength.

It should be mentioned that S.B.C. uses the same channel again at 2030 G.M.T. for its Spanish and Portuguese service, so one must look snappy and get the pencil recording details of the Saudi Arabian programme if one is to submit a report and ask for a QSL.

The instance mentioned is an actual case history, and the same method has been used on numerous occasions to locate the less familiar countries. At the time this article was written the frequencies mentioned were in use by the stations concerned but they may, of course, be changed when this article appears.

A "scientific approach often pays off, but luck can also play a part. The author, while on holiday, was determined to find four elusive countries. The approved method produced not a flicker of the "S"-meter, not a sound. A fortnight later, idly tuning the bands, not looking for anything in particular, three of the countries concerned were logged and the fourth followed, on a similar occasion, a week later. The best laid schemes of DX listeners often fail to trap the quarry, but when they do succeed (or even if it is just luck) it is nice to write "Will you please QSL?"

Finally a word regarding reception reports. Most of the world's broadcasting stations require a minimum of 10 minutes programme details before they will verify a report, and some require longer. Essential information in a report is:

(a) the date and time (in G.M.T.).

(b) the frequency or wavelength of the broadcast.

(c) details of the receiver and aerial used and

(d) a report in the SINPO code, or else a general indication of the strength of the signal, the interference and noise level (identifying the source of interference, if possible) together with an estimate of the overall quality of reception.

In addition brief programme details should be given together with the times of the various items—for example:

1955 G.M.T.: Station identification in French and News (give items if possible).

2000 G.M.T.: Time signal (pips) and station identification.

2001 G.M.T.: Announcement—Frank Sinatra song (give titles of musical items if possible).

Before sending off a report—indeed, before even writing it, if only to save the cost of Air letters—it is essential to consider whether you have given all the information one can to enable the station to be certain that you have received their programme. You must provide sufficient definite data to permit a check against the station log.

Making SWL Reports . . .

OVER the past years, the writer has received a large number of s.w.l. reports. It is an unhappy fact that out of every hundred received only about two are of any real use and warrant the sending of a QSL card. This startling figure (2%) is borne out in conversations with other amateurs who also appear to be inundated with useless scraps of paper.

If a station receives a useful report from an s.w.l., it is highly probable that a QSL card will be sent. The following notes are intended as a general guide for those s.w.l's. who don't get replies, or for those just starting to listen on the amateur bands and short-waves.

1. First, the report should be legible. About 10% fail on this count. Remember that amateurs in other countries may not speak or read fluent English, so legibility is of paramount importance.

2. The time should be specified in G.M.T. using the 24-hour system and the letters G.M.T. written after to avoid any misunderstanding.

3. Your QTH or locality. If you live in a small village, then a reference to the nearest large town should be included i.e. Harpenden—6 miles N.W. of St. Albans. Also if possible the height a.s.l.

4. Equipment in use. Don't just put "superhet" for the receiver. It might be a simple 3 valve job or a 16 valve triple-conversion unit.

5. Aerials are very important. The type of aerial, and the length in the case of a longwire should be noted. Also, most important, the direction it points, that is looking straight down the wire. The height is also a useful item to put down, too. An example of this, for a longwire might be—68ft. end fed running N.E./S.W., 30ft. high. Again if a dipole is used this fires broadside to the direction of the wire, i.e., 90° to it and this should be remembered when giving a report.

6. The following are the standard items and are usually the only things put down. Those s.w.l's. who only include these items and nothing else can be congratulated on producing a near useless report in most cases. By themselves they aren't much use, but with all the other information referred to they are vital.

(a) RST. Readability, Signal strength, and (in the case of c.w.) Tone.

(b) QRM. Interference.

(c) QRN. Atmospherics.

(d) QSB. Fading.

(e) QRG Frequency.

Relevant reports on other signals received during the same period are very useful too, especially from the same area if the station happens to be either very strong, very weak, or perhaps fading compared with the other signals on the band.

7. The frequency should be given accurately. If possible a simple crystal frequency standard should be fitted to the station and the receiver dial calibrated against it. At each session of listening, after the receiver has warmed up, the dial should be checked and adjusted to ensure that the receiver dial reads accurately.

8. S-Meter readings should be qualified. Many S-meters are included in the receiver in such a

way that they are affected by different settings of the various controls. Perhaps the best way is to set the controls to a particular setting and feed in a signal of known strength, i.e. so many microvolts and mark this on the meter as say S9 plus 40dB.

Or perhaps a signal with an S9 carrier could be used to make some form of calibration. This reference, however the meter is set up, should be put in the report. The signal level of the other station in the QSO together with callsign should also be included, if it can be heard.

The above notes are not rigid. However a report based on these would stand a very much greater chance of a QSL than the more usual "Heard you 5 and 7 here on a superhet, please QSL".

An example report is given below in order to show the general pattern. Compare this with the classic "Heard you here 5 and 7" etc.

M. Jenkins, 38 Malsen Road, Menton, Bedfordshire, England. Six miles S.W. Bedford. Latitude ..... Longitude ..... Approximately 300 ft. a.s.l.

Equipment.
Seven valve single conversion superhet. One r.f., f.c., two i.f., two a.f., b.f.o. Headphone reception.

Antenna.
Half wave dipole co-ax fed plus balun, 40ft. high running N.E./S.W.

Date/Time/Frequency.
Monday 28th March, 1966. 0022 G.M.T. 14155 kc/s.

Signal Report.
W6ZZZ/P. Your a.m. signals RST 58. In QSO with—AP2XXX. His a.m. signals RST 55.

QRN/QRM/QSB.
QRN: Nil. **QRM:** Slight/moderate from local G 5 kc/s h.f. **QSB:** Slight from 57/58.

S-Meter.
S-Meter calibration, 1μV in reads S9.

Remarks.
Also heard W6XXX/M at 5 and 5 but no QSB. W1/W2's received 0001-0130 all average 5 and 7, no QSB. Heard you on March 20th, 1966 in QSO with ZL9XXX when you were 559, conditions about the same as above.

Would very much appreciate a QSL card. Stamps/IRC's enclosed.

FUTURE BROADCASTING PLANS

—continued from page 849

"They consider that this objective would prove incompatible with the commercial objectives of companies engaging in local sound broadcasting; and that, in result, the former would be likely to suffer. While the Government do not, in principle, rule out advertising as a means of financing broadcasting stations in public ownership, it is in their view of first importance to maintain public service principles in the further development of the broadcasting services; and accordingly they reject the view that a service of local sound radio should be provided by commercial companies.

"Evidence of the expertise and professional enthusiasm which the BBC could bring to local sound broadcasting is to be found in the 'trial programmes' they have prepared. They lend much support to the view that, properly organised, local radio would provide a valuable service to the local community; and, by giving a new means of expression to its particular interest and aspirations, serve to reinforce its distinctive character and sense of identity.

"The Government believe that local radio organised and produced as a public service, would be most likely to realise those social purposes to the full; and would at its best prove an integrating and educative force in the life of the local community. But it is, they consider, important to establish how far the claim for a local station is likely to rest on genuinely local initiative having these purposes as its objectives; and how far local sources of finances are likely to be available to meet the expenditure required by such an initiative. In sum, not only is it important to establish that a local service of high quality could be maintained, month-in, month-out. There is also the question whether it would command enough support, including financial support, to justify the development of a service on a widespread and permanent footing . . .

"In considering how an experiment should be conducted, the Government have had regard not only to the need to avoid an excessive diversion of resources for the purpose but also the undesirability of entering into a commitment at this stage to any permanent form of constitution and organisation. They conclude that these various requirements will best be met if the experiment is conducted by the BBC as a venture in co-operation with local interests; and they have therefore decided to authorise the BBC to go ahead with a nine-station project in v.h.f. The stations would offer a full-scale local service. They would come into operation after about a year; and after a year or so of operation, should have provided the information on which to found the final solution . . .

"The Government reserve until the conclusion of the experiment any decision on the question whether a general and permanent service should be authorised, and, if so, how it should be constituted, organised and by whom provided, as well as how it should be financed. The decision that the BBC should conduct the experiment implies no commitment that the Corporation should provide a permanent service; if it were decided to authorise one." ■

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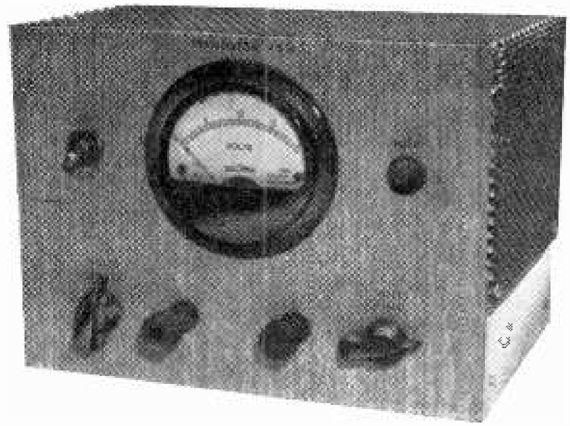


IN professional laboratories, considerable use is made of stabilised power supply units for experimental and development work, since these units have a low output impedance and give a constant output voltage over a very wide range of current demands.

To be really useful, a variable voltage power supply unit should have an output impedance, or effective internal resistance, that is comparable to that of a conventional battery, and should be reasonably well stabilised against changes in mains supply voltage, etc. The unit that forms the basis of this article has been designed with these points in mind.

Simplest form

The simplest way of obtaining a variable voltage power supply is to wire a variable resistor across a normal power supply, and take the output from across the slider, as shown in Fig. 1a. This, however, is rather wasteful of power, gives a high effective internal resistance, and does not guard against changes in the supply voltage. An improvement over this basic system is shown in Fig. 1b. Here Tr1 is wired as an emitter follower, with its base connected to the slider of VR1, and the output voltage is taken from across R1 in the emitter line of Tr1. The emitter voltage of this transistor "follows" very closely the voltage on the base. Taking very little power from VR1, the transistor presents a high input impedance while at the same time giving a low output impedancy, and thus presenting a low effective internal resistance.

A further improvement which is shown in Fig. 1c, increases the effective gain of the transistor. Here, Tr1 and Tr2 are connected as a Darlington (or Super-Alpha) pair, the emitter current of one transistor feeding directly into the base of the other, with a current gain equal to the product of the individual gains of Tr1 and Tr2. For example, if both transistors have current gains of 50, the effective current gain of the combination "transistor" will be 2,500 and the output impedance of the circuit will be correspondingly low.

Both of these transistor circuits give a variable voltage output with little power wastage and have reasonably low effective internal resistance, but neither circuit is stabilised against changes in supply voltage. This problem can be overcome by modifying the circuit as shown in Fig. 1d. Here, the voltage that is used to feed VR1 and the base of Tr1, is stabilised by the Zener diode, D1, the actual supply that is connected across the transistor circuit is not. However, the output voltage is approximately the same value as that at the slider of VR1 and is thus stabilised against changes in the mains voltage. This circuit (shown in Fig. 1d) is very useful, but its power handling requirements are limited by the output transistor, Tr2. If the unit is to give output voltages up to 18 volts, it is necessary to use an unstabilised input supply of at least 22 volts. If an output of 6 volts is required, 16 volts must be dropped across the output transistor. This means Tr2 will have to dissipate 16 watts with a 1A output current.

Finalised circuit

These problems are overcome in the circuit of the finished power supply unit, as shown in Fig. 2. Here, the output voltage is varied in three ranges, and the unstabilised input voltage is varied to suit the range in use, thus ensuring that a minimum of power is lost across the output transistor Tr3. A complete description of the circuit follows:

The mains supply is connected to transformer T1 via switch S1. Switch S2a selects either the 5, 11, or

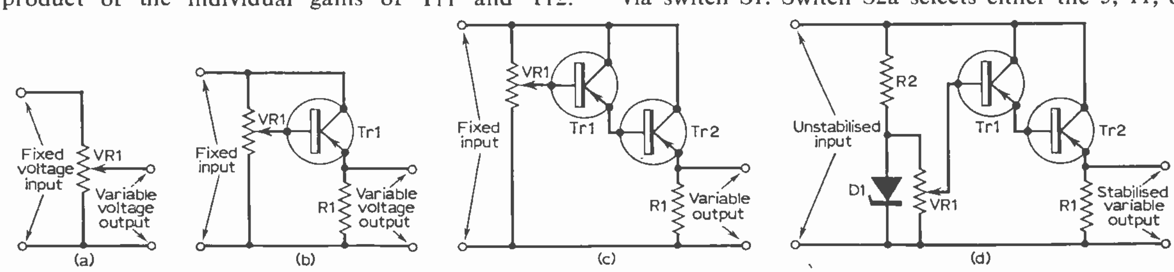


Fig. 1: (a) Basic circuit, (b) improvement by the addition of an emitter follower, (c) replaced by super-alpha pair emitter follower, (d) the Zener diode stabilises the circuit against changes in the supply voltage.

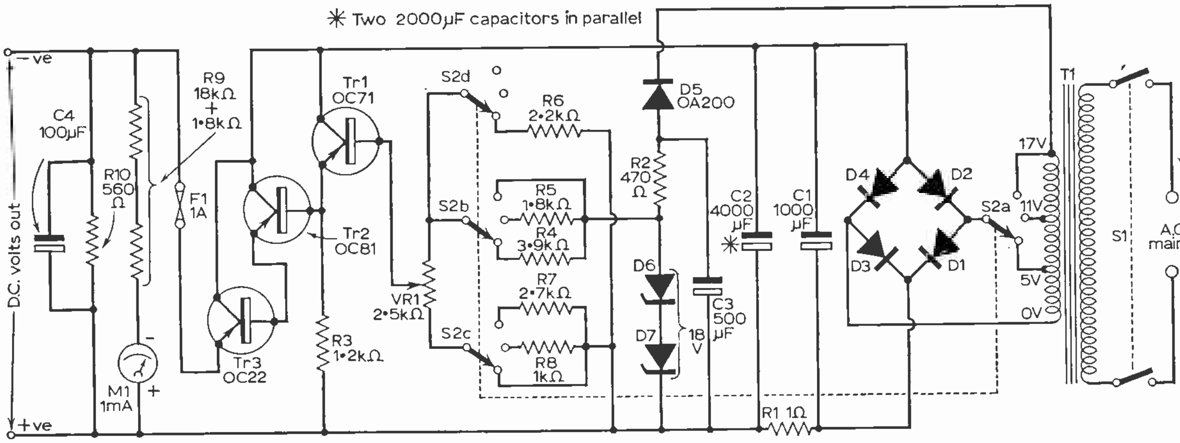


Fig. 2 (above): Complete circuit of the power supply unit. S2 is a four-pole, three-way wafer switch. D6-D7 could be a single 18V ½W Zener diode.

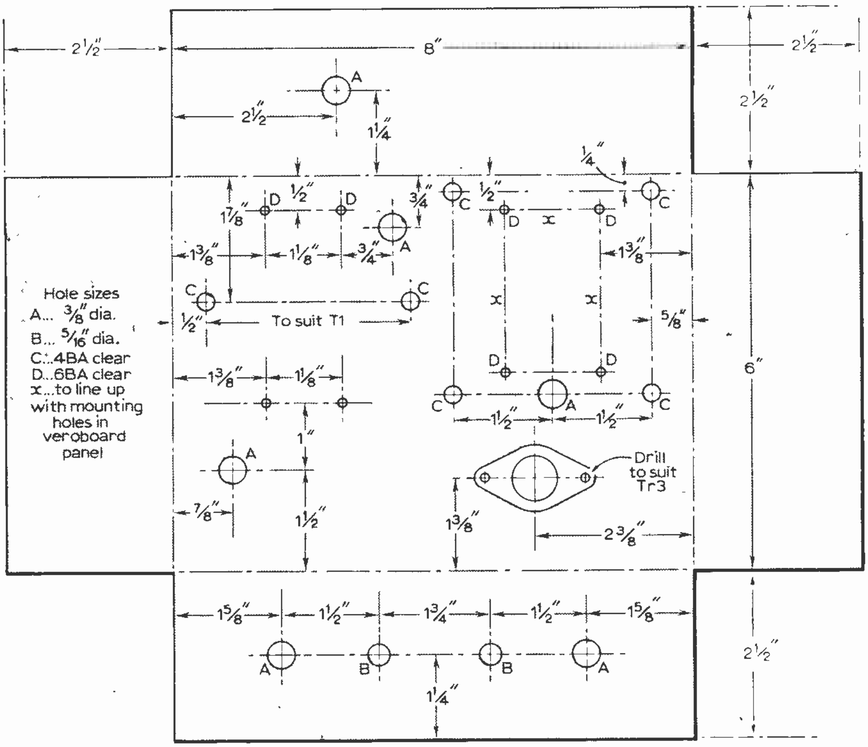
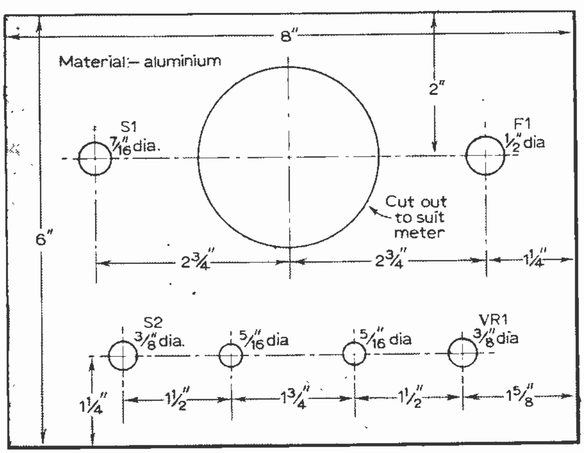


Fig. 3 (left): The main chassis dimensions. Note that Tr3 is insulated from the chassis by the use of insulated washer and spacers.

Fig. 4 (bottom left): The front panel dimensions.



17 volt tapping on the secondary of T1 and connects it to the bridge rectifier, which comprises D1—D4. The rectified output is smoothed by the C1-R1-C2 filter network and passed to the control circuitry.

An additional line is taken from the 17V tap on the secondary of T1 to D5, and the resulting rectified a.c. is smoothed by C3 and fed to the R2-D6-D7 network, to give a final stabilised reference voltage across the Zener diodes. This stabilised voltage is applied across VR1, making a variable stabilised output available at the slider; the available voltage swing of VR1 is limited on each range by the R4—R8 series resistors.

The voltage from the slider of VR1 is fed to the base of Tr1, which is wired as an emitter follower with emitter load R3. The voltage at Tr1 emitter is fed to the Super-Alpha pair, Tr2—Tr3;

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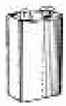

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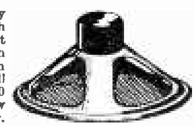

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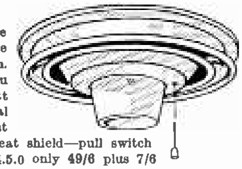

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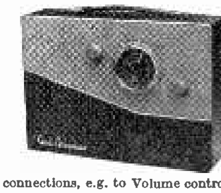

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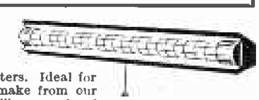

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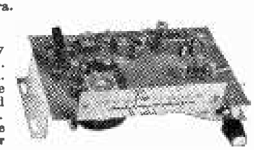

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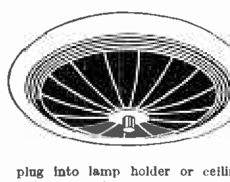


Brings sunshine into your home. 150 watts of light but uses only 40 w. Beautiful fittings with glass, non-plastic centre, fluorescent tube and choke control. Made by Philips. Regular price £4.15.0. Special budget price **65/-**, plus 8/6 c. and ins. Please state colour of glass centre, white, pink, blue, red, black, yellow or cream. Also whether plug into lamp holder or ceiling mounting model. 80 watt model **99/6.** 10/- carr. & ins.

FINE RECORD PLAYERS ARE GARRARDS

and because they have been making record players for so long, GARRARD are your best choice—big range always in stock.

7/6 for post and ins.

2000	£6 9 6	LAB80	£25 0 0
3000	£7 19 6	SRP12	£3 9 0
AT60	£11 11 0		
SP25	£10 9 0		

Complete with service sheet and template.

MAINS TRANSISTOR POWER PACK

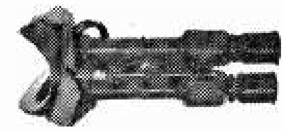
Designed to operate transistor sets and amplifiers. Adjustable output 6 v. 9 v. 12 volts for up to 500 mA (class B working). Takes the place of any of the following batteries: PP1, PP3, PP4, PP6, PP7, PP9, and others. Kit comprises: mains transformer-rectifier, smoothing and load resistor, 5,000 and 500 mfd. condensers, Zener diode and instructions. Real snip at only **14/6**, plus 3/6 post.

BATTERY CHARGER — FREE

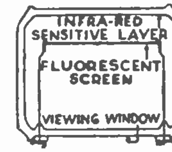
9v. Nickel Cadmium Battery type PP3 (fits all popular pocket transistors.) *Can be recharged 800 times.* Price with battery charger, only **37/6**, p. & i. 3/-. Chargeable replacements also in stock for U7 **12/6**; U11 **23/-**; U2 **32/-**.

See in the Dark
INFRA-RED BINOCULARS

These infra-red from a high voltage source will enable objects to be seen in the dark, providing the objects are in the rays of an infra-red beam. Each eye tube contains a complete optical lens system as well as the infra-red cell. These optical systems can be used as lenses for T.V. cameras—light cells, etc. (details supplied). The binoculars form part of the Army night driving (Tabby) equipment. They are unused and believed to be in good working order, but sold without a guarantee. Price **£2.17.6**, plus 10/- carr. and ins. Handbook 2/6.



SNIPERSCOPE



Famous war-time "cat's eye" used for seeing in the dark this is an infra-red image converter cell with a silver caesium screen which lights up (like a cathode ray tube) when the electrons released by the infra-red strike it. A golden opportunity for some interesting experiments. **5/-** each, post 2/-. Data will be supplied with cells, if requested.

TUBULAR HEATERS

New and unused made by G.E.C. rated at 60 watts per ft.—these are ideal in airing cupboards, bedrooms, offices, stores, greenhouses, etc., curtains or papers can touch them without fear of scorching or fire. Supplied complete with fixing brackets and available in the following sizes. Prices which are about ½ of list price includes carriage by B.R.S. 8ft. **30/-**; 10ft. **36/-**; 12ft. **42/-**.

Also in twin assemblies (one pipe above the other) 4ft. **40/-**; 5ft. **46/-**; 6ft. **52/-**.

THERMOSTATS

Type "A" 15 amp. for controlling room heaters, greenhouse, airing cupboard. Has spindle for pointer knob quickly adjustable from 30-80°F., **9/6**, plus 1/- post. Suitable box for wall mounting, **5/-**. P. & P. 1/-.

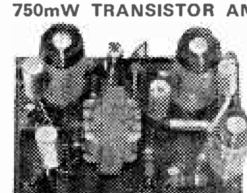
Type "B" 15 amp. This is a 17in. long rod type made by the famous Sunvic Co. Spindle adjusts this from 50-550°F. Internal screw alters the setting so this could be adjustable over 30° to 1000°F. Suitable for controlling furnace, oven kiln, immersion heater or to make flame-start or fire alarm. **8/6** plus 2/6 post and insurance.

Type "D". We call this the Ice-stat as it cuts in and out at around freezing point. 2/3 amps. Has many uses, one of which would be to keep the loft pipes from freezing, if a length of our blanket wire (16 yds. **10/-**) is wound round the pipes, **7/6**. P. & P. 1/1.

Type "E". This is standard refrigerator themostat. Spindle adjustments cover normal refrigerator temperatures, **7/6**, plus 1/- post.

Type "F". Glass encased for controlling the temp. of liquid—particularly those in glass tanks, vats or sinks—thermostat is held (half submerged) by rubber sucker or wire clip—ideal for fish tanks—developers and chemical baths of all types. Adjustable over range 50° to 150°F. Price **18/-**, plus 2/- post and insurance.

750mW TRANSISTOR AMPLIFIER



4 transistors including two in push-pull input for crystal or magnetic microphone or pick-up—feed back loops—sensitivity 5 m/v.

Price 19/6

Post and insurance 2/6. Speakers 3in. **12/6**; 5in. **13/6**; 6 x 4 in. **14/6**.

PHOTO ELECTRIC KIT

All parts to make light operated switch/burglar alarm/counter, etc. Kit comprises printed circuit, Laminated Boards and chemicals, Latching relay, Infra-red sensitive Photocell and Hood. 2 Transistors, cond., Terminal block. Plastic case. Essential data, circuits and P.C. chassis plans of 10 photo electric devices including auto. car parking light, modulated light alarm. Simple invisible ray switch—counter—stray light alarm—warbling tone electronic alarm—projector lamp stabiliser, etc., etc. Only **39/6** plus 2/- post. and insurance.

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D1	1/6
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DA30	12/6
DAF96	6/-
DD41	4/-
DET5	8/-
DET20	2/-
DET25	15/-
EF73	5/-
DF91	3/-
DF92	3/-
DF96	6/-
DH63	5/-
DK92	8/-
DK96	6/6
DL92	4/-
DL93	4/-
DL94	5/9
DL96	7/-

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EA50	1/-
E173	7/-
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EAC91	3/6
EAF42	8/-
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EB91	3/-
EBC23	6/-
EBC41	8/6
EBC81	5/-
EBF80	6/6
EBF83	7/6
EBF89	6/9
EBL31	20/-
EC52	4/-
EC53	12/6
EC70	4/-
EC90	2/-
EC91	3/-
ECC81	4/-
ECC82	5/-
ECC83	6/-
ECC84	5/6
ECC85	6/6
ECC88	9/-
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ECC189	9/6
ECF80	7/-
ECF82	7/-
ECH42	9/-
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ECH83	7/6
ECL80	6/-
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ECL83	10/-
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EF36	3/4
EF37A	7/-
EF40	8/-
EF50	2/6
EF52	6/-
EF53	4/6
EF55	8/-
EF71	7/6
EF72	5/-
EF73	5/-
EF74	4/-
EF80	5/-

EF81	6/-
EF85	4/6
EF86	6/6
EF89	5/-
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EF92	2/-
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EF184	6/6
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EL34	10/-
EL36	5/-
EL38	17/6
EL41	8/-
EL42	8/-
EL50	8/-
EL81	8/-
EL84	4/3
EL85	7/6
EL91	4/6
EL95	5/-
EL360	20/-
EM80	6/-
EM81	7/-
EM84	6/3
EN31	10/-
ESU74	80/-
ESU208	6/-
EY51	5/6
EY86	6/6
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EZ41	6/6
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F/6057	5/-
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HL23	6/-
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K3A	60/-
KT8C	22/-
KT32	8/-
KT44	5/9
KT33	4/-
KT66	16/-
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KT76	8/6
KT88	22/-
KTW61	4/6
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M8100	9/-
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PC88	9/-
PC97	9/6
PC900	12/-
PCC84	5/6
PCC89	10/-
PCC189	9/6
PCF80	6/3
PCF82	6/6
PCF84	6/-
PCF86	8/-
PCF802	9/6
PCF805	11/-
PCF808	12/6
PCL81	9/-
PCL82	7/-
PCL83	8/6
PCL84	7/-
PCL85	8/6
PCL86	8/-
PEN25	4/6
PEN46	3/-
PEN200A	3/-
PFL200	17/6
PL36	9/-
PL38	16/-
PL81	7/-
PL82	6/6
PL83	6/-
PL84	6/6
PL500	13/6
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PT25H	7/6
PT25M	7/6
PX4	14/-
PX25	12/6
PY33	8/6
PY80	5/6

PY81	5/6
PY82	5/6
PY83	6/-
PY800	8/-
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R3	8/-
RG1/240A	25/-
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RK72	6/-
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SP2	8/6
SP41	1/6

U27	8/-
U52	4/6
U191	11/6
U801	17/-
UABC80	6/-
UAF42	9/-
UBC41	6/-
UBF80	5/6
UBF89	6/6
UBL21	10/-
UCC85	6/6
UCF80	9/6
UCH42	8/-
UCH81	6/-
UCL82	8/-
UCL83	9/-
UF41	8/6
UF89	6/-
UL41	7/6
UL84	5/6
UU5	7/-
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UY21	7/6
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Y63	5/-
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1LA6	6/-
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1N21B	4/-
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U18	6/-
U25	13/-
U26	13/-

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X145	8/-

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2C26	7/-
2C26A	3/-
2C34	7/-
2C45	22/6
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2C51	12/-
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6J5	6/-
6J5G	2/-
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6J6W	6/-
6J7G	5/-
6J7M	8/-
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6K7G	2/-
6KJGT	4/9
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6SK7	5/6
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6Z5GT	5/3
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6Z4	5/-
7B7	7/6
7C5	10/-
7C6	7/-
7C7	6/-
7H7	7/3
7Q7	7/-
7S7	18/-
7V7	5/-
7Y4	8/-
7Z4	4/6
8D2	2/6
9D2	3/-
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10F9	9/-
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12BE6	7/-
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12C8	3/-
12E1	17/6
12H6	2/-
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12SH7	3/-
12S7J	5/-
12SK7	5/-
12SN7GT	5/9
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25Y5	6/-
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25Z5	7/6
25Z6GT	8/6
25D7	6/-
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30C18	11/-
30F5	8/6
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30PL1	15/-
30PL13	15/-
30PL14	15/-
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35T	17/6
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35Z3	10/-
35Z4GT	6/-
35Z5GT	6/-
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38	4/-
215SG	6/-
50CD6G	27/6
50L6GT	8/-
53A	7/6
57	6/-
58	6/-
59	6/-
75	5/6
76	5/-
77	6/6
78	5/-
80	5/6
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368A	5/-
368AS	30/-
393A	27/6
408C	80/-
446A	8/-
703A	30/-
705A	10/-
715B	60/-
717A	3/-
724A	15/-
801	6/-
803	22/6
807	8/-
808	8/-
813	65/-
815	35/-
829B	50/-

830B	4/-
832A	45/-
843	5/-
866A	14/-
884	10/-
954	4/7
955	2/6
956	2/-
957	5/-
958A	4/-
1612	5/-
1616	3/-
1619	5/-
1625	6/-
1626	3/-
1629	4/6
2051	5/-
4043C	35/-
4063	8/-
4313C	20/-
5704	9/-
5726	7/-
6060	5/-
6064	7/-
6065	6/-
6080	22/-
6146	25/-
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H.R.O. SENIOR TABLE MODEL TYPE M. 50 kc/s-30 Mc/s with "S" meter and crystal filter in excellent fully checked and tested condition together with set of 8 general coverage coils and mains P.S.U. 110-220 v. **£25.10.0.** Carriage and packing 30/-.
RACK MODEL also available at the same price.

"S" Meter for H.R.O. Receivers. Brand new **£2.10.0.** Carriage paid U.K.

CRYSTALS for H.R.O. in original National Union Housing, 25/-. P. & P. 2/-.

VARIOMETER for No. 19 sets, **17/6.** P. & P. 3/-.

TELEPHONE HANDSET. Standard G.P.O. type; new 12/-. P. & P. 2/-.

INSET MICROPHONE for telephone handset **2/6.** P. & P. 2/-.

2KW ULTRASONIC GENERATOR together with power supply unit for 200-250 v. A.C. Complete two chassis with interconnecting cables. Frequency 37 to 43 kc/s adjusted by fine control. Peak output 12 kw, average output 500 w. Completely new with valves and manual, **£65,** carriage paid U.K.

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(c) 260-350 v. stabilised, adjustable, approx. 45 mA.
(d) 450 v. approx. 30 mA.
(e) 50 v. approx. 150 mA.
(f) 4.5 v. A.C., 4.5 amp. common earth.
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32/44FT. AERIALS each consisting of ten 3ft., $\frac{7}{8}$in. dia. tubular screw-in sections. 14ft. (7 section) whip aerial with adaptor to fit the $\frac{7}{8}$in. rod, insulated base, stay plate and stay assemblies, pegs, reamer, hammer, etc. Absolutely brand new and complete ready to erect, in canvas bag, **£3.9.6.** P. & P. 10/6.

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the final output voltage is taken from Tr3 emitter to the output terminals via fuse F1. R10 is a small permanent load resistor connected across the output terminals.

A voltmeter, comprising M1 and R9, is built into the unit and permanently wired across the output terminals for monitoring purposes. Although the prototype unit was found to give output voltages from zero to 18V in three ranges, at currents up to 1A, the maximum output voltage and available current can be increased simply by changing component values.

Construction

The prototype unit was built up on a standard 8in. × 6in. chassis, with angled corner brackets. Construction should be started by drilling this chassis as shown in Fig. 3. Next, drill and cut the front panel, as indicated in Fig. 4. The hole for the meter is best cut by first marking the panel and then cutting away the unwanted metal with the aid of a fret-saw fitted with a metal-cutting blade.

When the front panel is complete, it can be covered with one of the decorative self-adhesive plastic materials before it is secured to the main chassis. It should be noted that the actual front panel controls, VR1, S2, and the two output terminals, can be used to secure the front panel to the chassis, thereby eliminating unsightly bolt heads, etc. Grommets should now be fitted in all suitable holes in the chassis, and transformer T1 and all tag strips should be bolted in place.

★ components list

Resistors: (all 5%, ½W except where otherwise stated)

R1	1Ω, 3W	R6	2·2kΩ
R2	470Ω, 10%	R7	2·7kΩ
R3	1·2kΩ, 10%	R8	1kΩ
R4	3·9kΩ	R9	18kΩ + 1·8kΩ, 1%
R5	1·8kΩ	R10	560Ω, 10%, 1W
VR1	2·5kΩ, wire-wound, linear		

Capacitors: (all electrolytic, 30VW)

C1	1000μF	C3	500μF
C2	2000μF+2000μF	C4	100μF

Semiconductors:

Tr1	OC71 or OC75	D5	OA200 or OA202
Tr2	OC81 or OC72	D6	9V, ¼W, 10%, Zener
Tr3	OC22 or OC23	D7	9V, ¼W, 10%, Zener
D1—4	1A, 50 p-i-v, silicon		

Miscellaneous:

Battery charger transformer with 1·5A output at 5V, 11V and 17V; two-way, two-pole on/off switch; 1A fuse and holder; 1mA meter movement (see text); two output terminals; 8in. × 6in. chassis; strip of Veroboard (see Fig. 5); tag strips; rubber grommets; control knobs; wire; sleeving; and expanded metal speaker gauze.

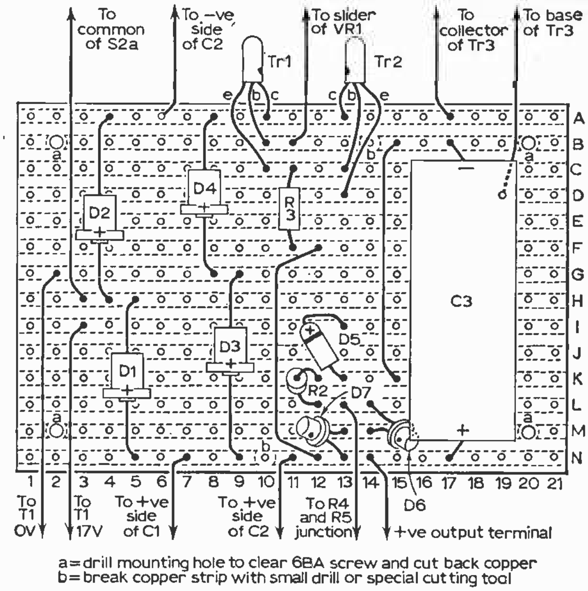


Fig. 5: Veroboard assembly details.

Cut the small Veroboard sub-panel to size as shown in Fig. 5, and break the copper strips where indicated with the aid of a small drill or the special cutting tool that is available. Now assemble all components and leads to the board as indicated. It should be noted that on the prototype two Zener diodes have been used, but these can in fact be replaced by a single 18V Zener diode, if available. When complete, the Veroboard sub-panel should be bolted in place on the underside

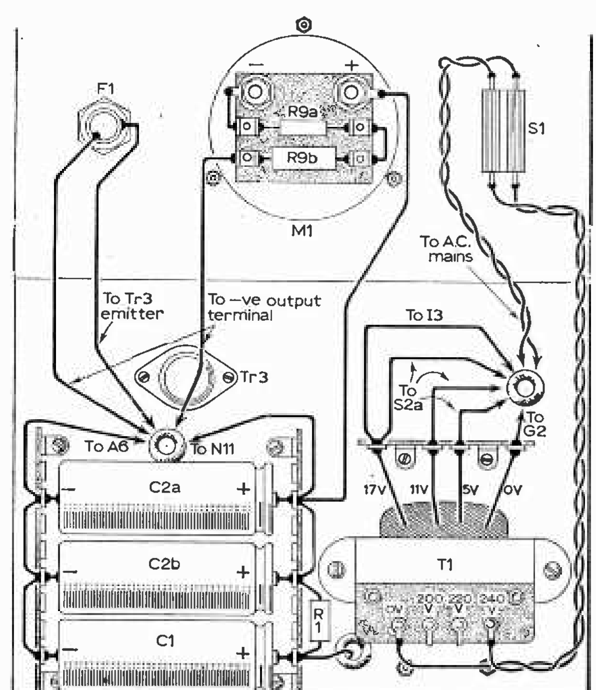


Fig. 6: Above-chassis wiring.

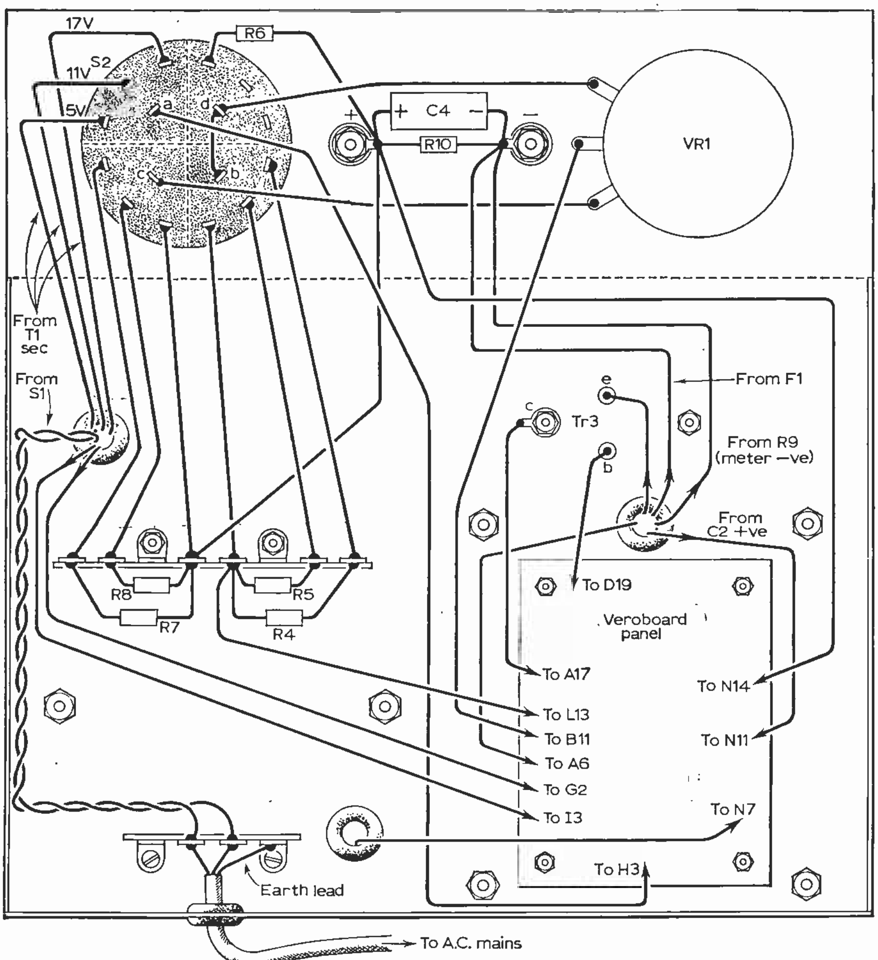


Fig. 7: Wiring of the under chassis.

of the chassis with the aid of small 6BA screws, taking care to use rubber grommets as spacers between the Veroboard and the main chassis to prevent short circuits occurring.

Now, using insulated washers and spacers, bolt transistor Tr3 in place on the top of the chassis, and complete the under-chassis wiring as shown in Fig. 7. Secure the F1 fuse holder, switch S1, and the moving coil meter to the front panel, and complete the wiring of the top of the chassis as shown in Fig. 6. When complete, double check all wiring and then carry out a functional test, checking the output voltages and currents on all ranges. With the component values shown, the voltage swings should be as follows: Range 1, 0·5—3·5V, Range 2, 3—10·5V, Range 3, 9—18V. These voltages are without external load.

The meter circuit

On the prototype, a 1mA moving coil meter was used as the monitor, wired as a 20V (f.s.d.) d.c. voltmeter. It is not essential to use a 1mA meter movement and in fact almost any meter may be used for this job, but one must know the sensitivity of the movement. If it is not marked on the face of the instrument in ohms-per-volt, but the internal resistance is given, it is a simple matter of Ohm's law: $E = I \times R$. For example, a 1mA movement with an internal resistance of 1,000Ω, will drop 1V and, thus, have a sensitivity of 1,000Ω per volt. To increase the voltage range of the movement to 20V f.s.d. the total series resistance has to be increased by the same factor—twenty. Thus an external series resistor of 19,000Ω is required (20,000Ω less the 1,000Ω internal resistance).

Usually, the internal meter resistance will be indicated on the face of the meter, but if it is not it can be determined by connecting the meter in series with a 4·5 to 12V battery and a high value series resistor and variable resistor, and adjusting the values of these two resistors until the meter reads f.s.d. A variable resistor should now be connected in parallel with the actual meter and adjusted until the meter pointer falls to half f.s.d., at which point the values of the internal meter resistance and the parallel resistance will be equal. Thus, the internal meter resistance can now be determined by removing the parallel variable resistor and measuring its resistance on an ohmmeter. It should be noted that, if any attempt is made to measure the internal meter resistance directly with the aid of the ohmmeter, severe damage may result.

The specified transformer is capable of supplying currents up to 1·5A. If higher currents are required, an alternative transformer should be used, and the four rectifiers, D1—D4, should have suitably increased ratings.

The transistor types used are not critical. Tr1 may be any small a.f. transistor capable of working with a collector voltage of approx. 25V or greater, but should preferably be a fairly high gain type. Tr2 may be any type capable of working with a collector voltage of approx. 25V, and able to handle powers of at least 100mW. Tr3 may be any power type capable of working at collector voltages of approx. 25V or greater, able to handle emitter currents of at least 1A, and dissipating powers of 16W or more on a large heat sink. If larger currents are required, the ratings of Tr3 should be suitably increased, or, alternatively, two or more power transistors wired in parallel. ■

new books

NEWNES RADIO AND TELEVISION SERVICING (1965-66 Models) By J. P. Hawker and J. Reddihough. 496 pages, 9 × 6in. Now published by Buckingham Press Ltd. Price 85s.

EVERY year a new edition of Newnes well-known Radio and Television Servicing is published. Always in great demand, these annual volumes contain a wealth of circuits, data and repair hints for popular television and radio receivers, tape recorders and record reproducers. The new 1966 edition has just been published and deals with 1965-66 models, nearly 50 principal makes.

The publishers, Buckingham Press Ltd. who are **the successors to S.B. Division of George Newnes Ltd.** have asked us to mention that their address has not changed, it remains—15-17 Long Acre, London, W.C.2. Copies of Radio and Television Servicing are available on free trial, direct from Buckingham Press Ltd.—*PEM.*

THE LAW AND YOUR TAPE RECORDER By Andrew Phelan. Published by Print and Press Services Ltd. 30 pages. 7 × 5in. Paperback. Price 3s. 6d.

IN these days of rules and regulations it is almost impossible to draw breath without breaking some law or other; and ignorance is no excuse. Practically every time the enthusiast uses his tape recorder he is inviting prosecution—or so it would appear after a perusal of this interesting little booklet.

The author is a barrister-at-law, and the text occasionally betrays this, but otherwise, a lucid account of the pitfalls of the laws of copyright as related to tape recording will be found here.

It is perhaps unfortunate that amid all this frightening legal stricture we find no hint of aid. **"This is the law"**—says Mr. Phelan, in effect, without adding that application to the Performing Rights Society, or Phonographic Performances Ltd., would solve many of the immediate problems of the local impresario.

For the ordinary user, the problem seldom arises: one can take down broadcast material for one's private enjoyment so long as it is not covered by a separate copyright, but as this permission *does not* extend to gramophone records, whether broadcast or not, Junior is contravening the Acts of 1956, 1958 and 1963 every time he tapes down "Top of the Pops". Replaying his recording to someone else compounds the felony and accepting payment for the privilege is so reprehensible that we shudder to think of the consequences!

Whether one intends to make a business of tape recording or simply indulges in the hobby for pleasure, it is wise to know the legal limitations and this pocket book is a cheap and easy introduction.—*MAQ.*

SHORT WAVE LISTENING By J Vastenhoud. Published by Iliffe Books Ltd. 107 pages. Size 8½in. x 5½in. Price 12s. 6d.

IF the PRACTICAL WIRELESS feature "On the Short Waves" has given you an appetite for listening to foreign radio stations this book will provide a meaty dish. All the beginners' questions—What frequency bands should I listen to and when? What is a QSL card? How do I send a reception report? Can I join the DX Club?—are well answered. Established DXers will not be surprised for the author is Jim Vastenhoud, regularly heard on Radio Nederland's DX programme.

As well as the chapters dealing with the practical side of DXing the book contains chapters on the principles of short wave transmission, the aerial and the correct choice of receiver, which seems to be a standard in any book dealing with radio these days. Other useful selections include comprehensive frequency prediction tables, an English-French-Spanish dictionary of commonly used DX terms, and DXing with a tape recorder.

I started by saying that this was the book for the newcomer. Old hands shouldn't be put off by this as they will find new ideas here. I certainly did. —*JMG.*

SILICON CONTROLLED RECTIFIERS By Allan Lytel. Published by W. Foulsham & Co. Ltd. 128 pages. Size 8½ × 5in. Price 16s.

THOSE who are not aware of the importance of silicon controlled rectifiers in power switching and control applications should find this book most rewarding. SCR's, or thyristors, operate in much the same way as gas filled thyratrons, but are much simpler to use and have many more applications. In fact, it is possible to control kilowatts of power with these four-layered semiconductor devices from extremely small signals—i.e., the output of a photocell or a thermocouple.

Silicon controlled rectifiers are comparatively new in this country—outside the professional and industrial fields—and it will not be too long before the majority of domestic electrical appliances and electronic equipment make use of them. They are ideal for controlling electric motors.

This book first deals with the theoretical aspects of SCR's, then goes on to explain in detail how they work, with various types of triggering circuits necessary.

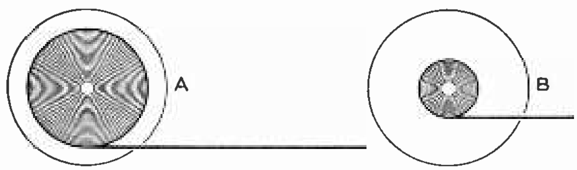
As the book originates from the United States, the publishers have thought it necessary to include a specially written chapter for the English reader. It states, in three pages, that the mains supplies are different and that American components are used throughout. It also gives an incomplete list of British suppliers to the home constructor.—*JRC.*

MAKING THE MOST OF

TAPE POSITION INDICATORS

By J. LOWRIE Grad I.E.E.

MOST tape recording enthusiasts keep a detailed record of each tape with a list of the material recorded on it. In order to spot individual items some method of cataloguing must be used. Coloured indicators can be attached to the tape or note taken of the scale reading on the tape usually marked from 0 to 10. Most modern tape recorders are, however, fitted with a rev. counter



After one revolution the tape unwound at A is much longer than that at B. Length unwound = $2\pi R$ where R is radius from centre of tape spindle to outer layer of tape.

Dial reading	0	45	92	145	208	279	370	420
Time (minutes)	0	5	10	15	20	25	30	32

Fig. 1: Diagram and Table showing why the relationship between dial reading and footage is not linear.

which is geared to the tape spindle and automatically records the number of revolutions. The disadvantage of this method is that dial readings do not correspond directly to the footage of tape which has passed the head. Why this is so can be seen from Fig. 1. As the tape runs off the spool the length of tape which unwinds gets less—length of tape unwinding$=2\pi$ x radius of outside of tape.

The person using the tape then faces an obvious difficulty: if the rev. counter shows a reading of say 400 at the end of the tape and after a recording has been made the reading is 200, how much recording time is left? At first sight it would appear that only half of the tape has been used whereas more than half has been run off as can be seen when the situation represented in Fig. 1 is considered. It is possible to time the first recording and subtract this from the total playing time but it becomes tedious if this has to be done for each tape; it is much better to compile a graph relating tape footage to dial reading and reference to this will show at a glance the time difference between various dial readings.

The procedure for making a graph is as follows;

Take a full spool of tape and set it into position for playback.

Set dial readings to zero.

Start playing back at fastest speed on machine.

Note time at start and take dial readings every five minutes.

Note the time when all the tape has been used.

The results obtained will form a table similar to the table, Fig. 1, which was obtained using 1,200ft. of L.P. tape on a $5\frac{3}{4}$in. spool running at $7\frac{1}{2}$in./sec. The results of Table 1 are plotted on a graph to give Fig. 2. It is easy to see at a glance the recording time represented by various dial readings. Thus for example, if recording started at 180 and ended at 310 the recording time would be 27-18=9 minutes.

If the relationship between recording time and dial reading had been direct the graph would have been straight as shown by the dotted line. Thus after reading 100 serious errors would arise if the correction supplied by the graph were not applied. The graph can be adapted for other speeds simply by multiplying the time scale by the correct factor (e.g. $3\frac{3}{4}$in./sec. would require scale to be doubled) leaving the dial reading unchanged. The exact figures on the graph are affected by the spool size and whether L.P. or standard tape is used. Thus graphs should be drawn up for each spool size used, one for standard tape and one for L.P. tape.

Once armed with these graphs the enthusiast can

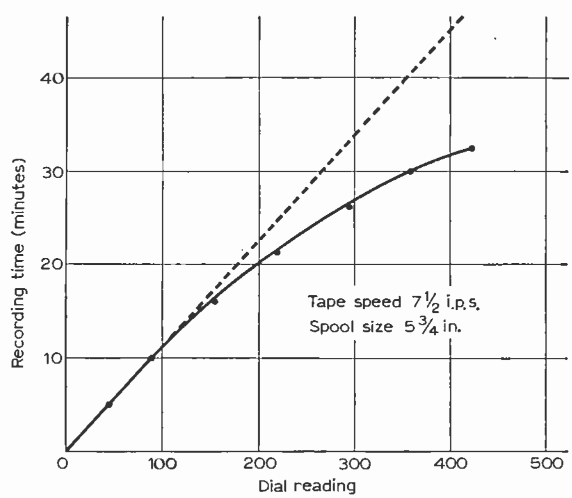


Fig. 2: Graph showing variation of recording time with dial reading.

safely record new material in between two sections which he wishes to preserve knowing exactly how much recording time is available and being certain that there is no danger of inadvertently erasing material which he wants to keep. ■

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This makes the perfect personal radio, ready to serve wherever and whenever required.

Its minutely proportioned case houses transistors, ferrite rod aerial and batteries and yet is considerably smaller than an ordinary matchbox. The MICROMATIC has an elegantly designed aluminium front panel with matching calibrated slow motion dial. New circuitry assures reception from a wide range of stations over the medium waveband, with excellent selectivity and quality. Here is a new set you will be proud to be seen using. You will also find it an ideal gift to give anyone. YET THIS BRILLIANT NEW DESIGN IS THE EASIEST OF ALL SINCLAIR RADIO SETS TO BUILD— AND IT IS BRITISH!

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Performance figures obtained using Stereo 25, two Z.12s and a PZ.3.

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NO ALIGNING
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This unique, superbly engineered FM superhet is the only set in the world which can be used both as an FM tuner and an independent FM pocket receiver just whenever you wish. Problems of alignment have been completely eliminated making the Micro-FM ready for use the moment you have built it. The pulse counting discriminator ensures best possible audio quality; sensitivity is such that the telescopic aerial included with the kit assures good reception in all but the very poorest reception areas. The Sinclair Micro-FM will give you all you want in FM reception and the satisfaction of building a unique design that will save you pounds.

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Complete kit, including transistors, case, aerial, earpiece, etc.

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"Far more sensitive (Micro-FM) than many commercial models."
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"Z.12 received in perfect order. It is wonderful to hear records properly."
J. de H.S., London, N.2

"I consider your after sales service is excellent. I wish very much that other suppliers treated their customers in the way you do. I have tried out the Micro-FM with the Z.12 and my Quad speaker and am very pleased with the results."
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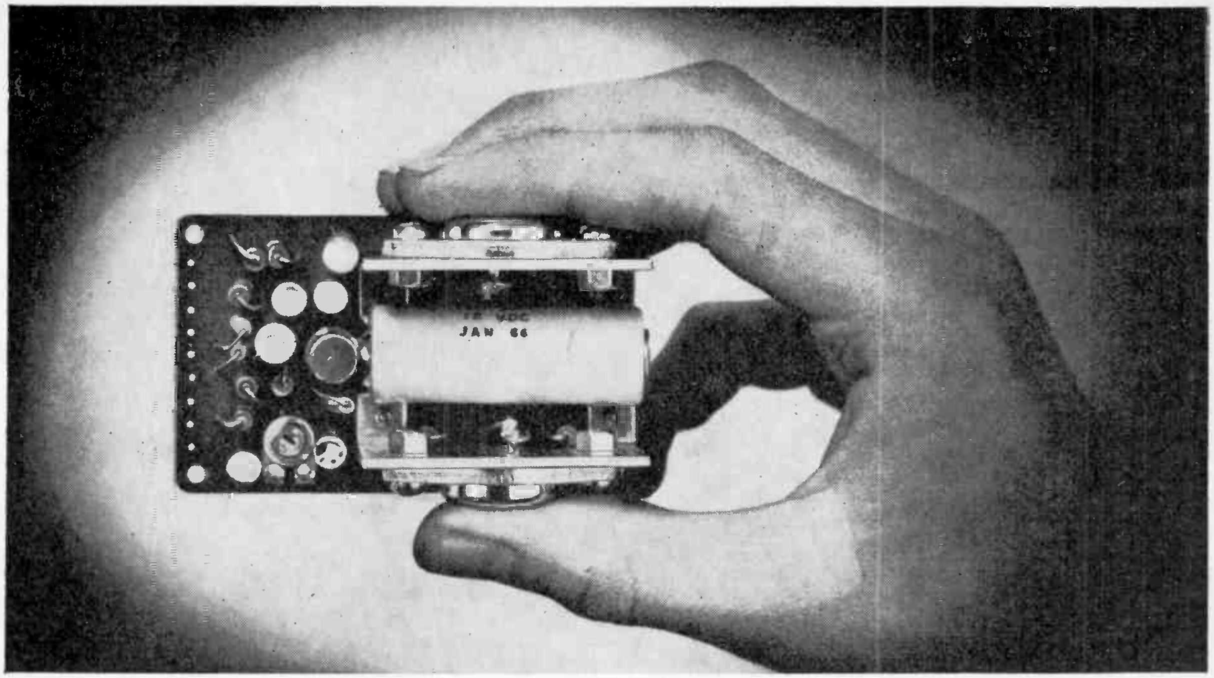

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12 WATTS R.M.S. OUTPUT
CONTINUOUS SINE WAVE (24W. PEAK)

8 TRANSISTOR CIRCUIT WITH CLASS B ULTRALINEAR OUTPUT

IDEAL FOR HI-FI (STEREO OR MONO) CAR RADIO, ELECTRIC GUITAR, P.A., INTERCOM, ETC.

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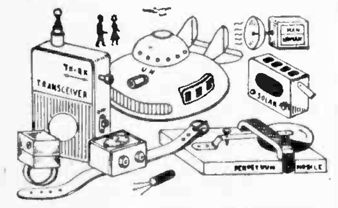

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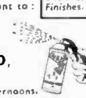

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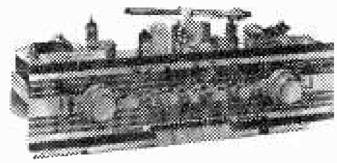

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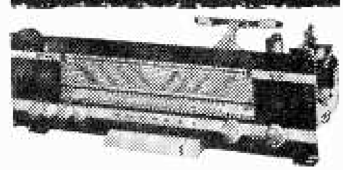

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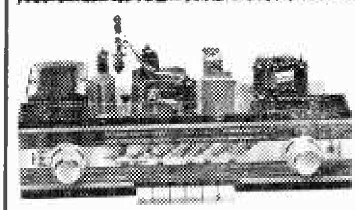

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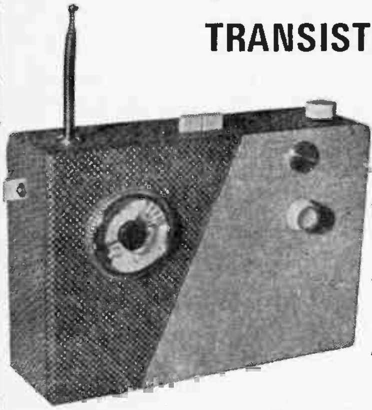

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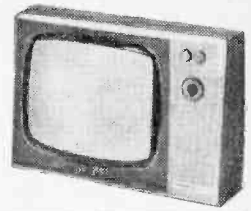

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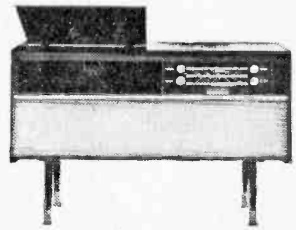

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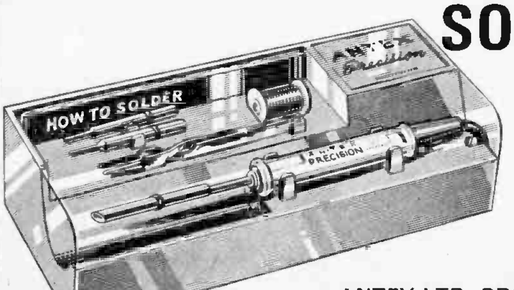

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42	6/-
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50A5	12/-
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50C5	6/-
50CD6G	27/6
50L6GT	6/-
52KU	7/-
55CG	30/-
58CG	45/-
75C1	13/-
80	6/-
83A1	12/-
85A1	25/-
85A2	7/6
85A3	5/6
90AG	46/-
90AV	46/-
90C1	12/-
90CG	25/-
90CV	25/-
117N7	30/-
150B2	10/-
150B3	8/-
211	30/-
310A	25/-
311A	35/-
807	9/-
811	40/-
812A	57/6
815	35/-
832	20/-
866A	14/-

872A	40/-
884	15/-
955	3/-
956	2/-
957	5/-
958A	4/-
959	8/-
991	7/-
1267	20/-
2050	12/-
4313C	20/-
5651	7/6
5654	8/-
5670	10/-
5718	10/-
5749	10/-
5751	12/-
5763	10/-
5814A	10/-
5965	5/-
6060	5/-
6080	25/-
6146	25/-
6159	32/-
6293	60/-
6360	30/-
6939	45/-
7551	30/-
9002	5/6
9003	9/-
A1820	20/-
AC/HL/DD	8/-
AC/HL/DDD	10/-
AC/TH1	8/-
AC/VP2	15/-
AR8	6/-
ARP12	3/6
AT825	9/-
AW6	5/-
AZ11	6/-
AZ12	9/-
AZ31	9/-
AZ41	7/-
CBL31	15/-
DA90	4/-
DAC32	7/6
DAF40	10/-
DAF91	4/6
DAF92	6/-
DAF96	6/6
DC90	7/-
DCC90	7/-

DF33	8/-
DF64	5/-
DF91	3/-
DF92	2/6
DF96	7/-
DH63	6/-
DK32	8/-
DK40	11/-
DK91	6/-
DK92	8/-
DK96	7/-
DL33	6/6
DL35	5/-
DL68	10/-
DL69	12/6
DL91	5/-
DL92	5/-
DL93	4/-
DL94	6/-
DL95	7/-
DL96	7/-
DM70	5/6
DY30	8/-
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E88CC	12/6
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E180F	17/6
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EABC80	6/6
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EBC33	7/-
EBC41	8/6
EBC81	6/3
EBC90	4/6
EBC91	5/-
EBF80	7/6
EBF83	8/-
EBF89	7/-
EBL31	20/-
EC86	12/-
EC88	11/-
EC90	2/6
EC91	5/-
EC92	6/6
ECC35	17/-
ECC40	9/6
ECC70	15/-
ECC81	4/-
ECC82	5/-
ECC83	6/-

ECC84	6/6
ECC85	5/-
ECC86	7/-
ECC88	8/-
ECC91	3/6
ECC189	11/-
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ECF80	7/-
ECF82	7/6
ECF82	12/-
ECF86	9/6
ECH35	11/-
ECH42	9/6
ECH81	5/3
ECH83	7/6
ECH84	9/-
ECL80	7/-
ECL81	7/6
ECL82	6/3
ECL83	9/6
ECL84	12/-
ECL85	11/6
ECL86	9/-
EF36	5/-
EF37A	8/-
EF39	6/-
EF40	9/-
EF41	8/6
EF42	11/-
EF52	8/-
EF54	6/-
EF55	8/-
EF80	5/-
EF83	10/-
EF85	6/6
EF86	6/3
EF89	5/6
EF91	4/-
EF93	4/6
EF94	5/6
EF95	5/-
EF96	2/6
EF97	10/-
EF98	10/-
EF183	6/6
EF184	6/6
EF800	8/-
EF804	21/-
EF811	12/-
EF812	10/-
EF814	12/-
EH90	7/6
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EL22	15/-
EL33	12/6
EL34	9/6
EL35	5/-
EL36	8/6
EL38	17/6
EL41	8/6
EL42	7/6
EL81	9/-
EL82	8/-
EL83	7/-
EL84	4/3
EL85	7/6
EL86	8/-
EL90	5/6
EL91	2/6
EL95	5/-
EL360	22/-
EL821	6/-
EL822	16/-
EM34	13/-
EM35	8/-
EM80	7/-
EM81	7/-
EM84	7/-
EM85	11/-
EN31	15/-
EN91	6/-
EN92	6/-
EY51	7/-
EY81	7/-
EY83	9/-
EY84	7/6
EY86	6/6
EY87	8/-
EZ22	6/-
EZ35	5/6
EZ40	7/6
EZ41	8/-
EZ80	5/-
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HL132D	4/-
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KT32	6/6
KT36	17/6
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KT44	5/-
KT45	15/-
KT66	16/-
KT67	45/-
KT76	8/-
KT88	23/-
LP2	7/-
MH4	5/-
MH41	9/-
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MS/PEN	8/-
MS/PENT	10/-
PABC80	7/6
PC86	11/-
PC88	11/-
PC97	7/6
PC900	9/-
PCC84	5/6
PCC85	7/-
PCC89	11/-
PCC189	11/-
PCC805	11/-
PCC806	11/-
PCE800	10/6
PCF80	6/3
PCF82	6/6
PCF87	11/6
PCF800	10/-
PCF801	9/6
PCF802	9/6
PCF805	11/-
PCF806	12/-
PCF808	12/-
PCL80	10/6
PCL81	9/-
PCL82	7/-
PCL83	8/6
PCL84	7/6
PCL85	9/-
PCL86	8/6
PCL88	10/6
PCL800	12/-
PCL801	10/6
PEN25	5/-
PEN45	7/-
PEN45DD	12/-
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PF86	7/6
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PFL200	14/-
PL36	9/-
PL38	16/-
PL81	6/-
PL82	7/-
PL83	6/6
PL84	6/6

PL302	13/-
PL500	13/6
PT15	15/-
PX4	20/-
PX25	15/-
PY32	8/6
PY33	8/6
PY80	5/6
PY81	6/-
PY82	5/6
PY83	6/-
PY88	8/-
PY301	11/-
PY800	6/-
PY801	6/-
PZ30	8/6
QP21	5/-
QP25	5/-
QP230	5/-
QQVO2-6	45/-
QQVO3-10	30/-
QQVO6-40	90/-
QS83/3	7/6
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QS150/15	8/-
QS1200	10/-
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QS1203	8/6
QS1215	12/-
QVO3-12	10/-
QVO5-25	9/-
R1	8/-
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R10	15/-
R18	7/6
SP2	4/-
SP41	5/-
SP61	4/-
SU45	15/-
SU2150A	12/-
TP22	7/-
TP25	5/-
TP2620	7/6
TT21	35/-
TZ40	40/-
U10	8/-
U12/14	8/-
U17	5/-
U18/20	8/6
U21	7/-
U22	6/-
U25	12/6
U26	12/6
U27	7/6
U37	20/-
U50	5/-
U52	6/6
U70	4/6
U76	4/-
U78	4/-
U191	11/-
U193	7/-

U251	6/-
U281	12/-
U282	12/-
U301	11/-
U403	7/-
U404	5/-
U801	17/-
UABC80	5/3
UAF42	9/-
UB41	10/-
UBC41	8/-
UBC81	8/-
UBF80	6/6
UBF89	7/-
UBL21	10/-
UC92	6/-
UCC84	9/-
UCC85	6/6
UCF80	9/6
UCH21	9/6
UCH42	9/-
UCH43	8/-
UCH81	6/3
UCL81	9/-
UCL82	7/3
UCL83	9/-
UF9	10/-
UF41	8/-
UF42	9/-
UF43	8/-
UF80	7/-
UF85	7/6
UF86	9/-
UF89	7/-
UL41	9/-
UL84	6/6
UM4	10/-
UM80	5/-
UM81	10/-
UU5	8/-
UU7	10/-
UU8	7/-
UU9	7/-
UU10	8/-
UY1N	9/-
UY21	9/-
UY41	6/6
UY82	9/6
UY85	6/-
VP23	3/6
VP41	5/-
VU39	8/-
W81M	6/-
W729	10/-
X76M	7/6
XC12	6/6
XC15	4/6
XC16	7/-
Y63	8/-
Y65	5/-
Z22	5/6
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Z63	9/-
Z66	10/-
Z759	23/-
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OC24	17/6
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OC26	8/-
OC28	12/6
OC29	14/9
OC35	12/6
OC36	12/6
OC42	5/-
OC43	9/-
OC44	5/-
OC45	4/6
OC70	5/-
OC71	5/-
OC72	5/-
OC73	9/-
OC75	6/-
OC76	6/-
OC77	8/-
OC78	5/-
OC78D	5/-
OC81M	5/-

OC81DM	5/-
OC83	5/-
OC84	5/-
OC122	14/-
OC139	8/-
OC140	10/-
OC141	22/6
OC170	6/-
OC171	6/-
OC200	7/6
OC201	17/6
OC202	13/6
OC203	10/6
OC204	15/-
OC205	15/-
OC206	22/6
AC107	10/-
AC127	7/6
AC128	8/-
AC176	7/6
ACY17	8/6
ACY18	5/6

ACY19	6/6
ACY20	5/-
ACY21	6/-
ACY22	5/-
AD140	16/-
AD149	16/-
AF102	18/-
AF114	8/-
AF115	7/-
AF116	7/-
AF117	6/-
AF118	14/-
AF124	9/-
AF125	8/6
AF126	8/-
AF127	8/-
AFY10	22/6
AFZ11	17/-
AFZ12	12/6
ASY26	6/6
ASY28	6/6
ASZ20	7/6

ASZ21	15/-
GET103	5/6
GET113	5/-
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GET116	12/-
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PRACTICAL WIRELESS, MARCH 1967

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