PRACTICAL WIRELESS

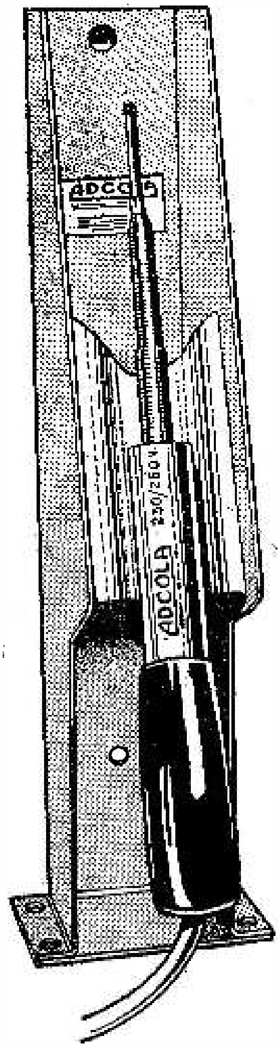
OCTOBER 1966

2/6

COMMUNICATIONS T.R.F.

ADCOLA
PRODUCTS LIMITED
(Regd Trade Mark)

SOLDERING INSTRUMENTS AND EQUIPMENT



DESIGNED FOR
THE AMATEUR'S
RADIO STATION

ILLUSTRATED
List No. 70 1/8" BIT
IN
PROTECTIVE
SHIELD
List No. 68

for catalogue apply direct to:—

Sales and Service Dept.
ADCOLA PRODUCTS LTD.,
ADCOLA HOUSE,
GAUDEN ROAD,
LONDON, S.W.4

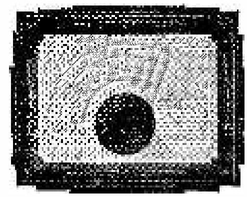
Telephones
MACaulay 0291/3

Telegrams
SOLJOINT LONDON SW4

JACKSON

the big name in PRECISION components

Precision built radio components are an important contribution to the radio and communications industry. Be sure of the best and buy Jackson Precision Built Components.



No. 6/36 DRIVE

Incorporating the Dual Ratio Ball Drive providing 36-1 Slow drive and 6-1 Fast drive under one knob with co-axial control. Scale is calibrated 0-100 and an extra blank scale is provided for individual calibration.

The unit consists of aluminium back plate, drive unit, scale, spare scale, transparent cover, hair-line pointer, escutcheon and knob.

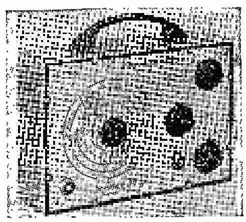
Fits in front of panel which may be any thickness up to 1/2" (or more by providing longer screws). Price 19/- each

MADE IN ENGLAND

JACKSON BROS. (LONDON) LTD.

(DEPT. P.W.) KINGSWAY-WADDON, CROYDON, SURREY.
Phone: Croydon 2754-5 Grams: Walfilco, Souphone, London.

NOMBREX INSTRUMENTATION



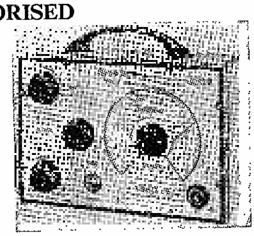
WIDE RANGE TRANSISTORISED SIGNAL GENERATOR MODEL 27

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

ALSO AVAILABLE

C. R. Bridge 62	..	£9.6.9
Inductance Bridge 66	..	£18.6.9
Power Supply Unit 61	..	£6.14.6

WIDE RANGE TRANSISTORISED AUDIO GENERATOR 63



★ Range 10c/s-100Kc/s
★ Sine or Square Wave
★ Accuracy & Low Dist.
★ Calibrated Output
£17.1.9

All prices include battery, post and packing

S.A.E. for Leaflet — Trade & Export Enquiries Invited — Prompt Delivery

NOMBREX LTD INSTRUMENTS DIVISION

Estuary House, Camperdown Ter., Exmouth, Devon

VALUE IN VALVES GUARANTEED 3 MONTHS BY RETURN OF POST

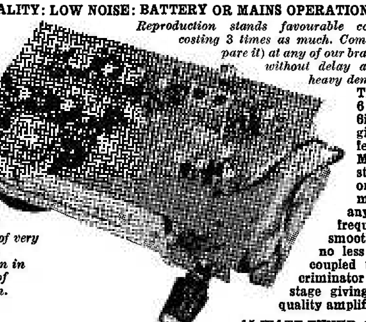
Satisfaction or Money Back Guarantee on goods if returned unused within 14 days. ALL VALVES ARE NEW UNLESS OTHERWISE INFORMED. FREE TRANSIT INSURANCE. POSTAGE 1 valve 9d., 2-11 6d. per valve. Free over 12.

1L4	2/3	6L6G	7/-	30F5	8/3	ECF80	7/6	KT61	11/-	TDD4	7/-
1R5	4/9	6L18	7/9	30FL1	9/6	ECF82	7/6	KT63	5/9	U18	7/6
1S4	4/9	6LD20	8/6	30L15	9/6	ECH21	10/-	KT66	14/-	U22	6/9
1S5	4/6	6P25	11/-	30P4	9/6	ECH35	11/-	KT88	21/-	U25	8/6
1T4	3/-	6P28	9/-	30P12	7/-	ECH42	8/6	KTW61	5/9	U26	8/9
2D21	5/6	6Q7G	5/6	30PL1	9/3	ECH81	6/9	KTW63	5/-	U35	12/6
3A5	6/-	6Q7GT	8/9	35C5	8/6	ECH83	7/3	KTZ63	7/-	U37	11/-
3Q4	5/3	6SL7GT	5/6	35L6GT	8/-	ECL80	5/9	MU14	7/-	U107	12/6
5U4G	4/6	6SN7GT	4/6	35W4	6/-	ECL82	7/6	N37	9/6	U191	9/6
5Y3GT	4/9	6U4GT	9/6	35Z4GT	5/6	ECL83	9/6	N78	13/-	U281	8/6
5Z4G	6/9	6V6G	4/6	50L6GT	8/6	ECL86	9/6	N108	13/-	U282	15/-
5Z4GT	9/6	6V6GT	5/9	80	5/-	EF36	3/3	PC86	10/-	U329	8/6
6/30L2	8/9	6X4	4/6	185BTA	19/6	EF39	5/-	PC97	7/6	U801	19/-
6A8G	7/9	6X5G	5/-	807	8/-	EF40	10/-	PCC84	6/6	UABC80	6/6
6AK5	4/9	6X5GT	6/-	955	2/6	EF41	8/-	PCC85	7/6	UAF42	7/9
6AQ5	5/-	7B6	9/6	956	2/-	EF50	3/3	PCC88	11/9	UB41	6/6
6AT6	5/-	7B7	6/6	AZ31	7/9	EF80	4/3	PCC89	9/9	UBC41	7/6
6BA6	5/6	7C5	7/9	CBL31	19/-	EF85	6/-	PCC189	11/-	UBC81	6/3
6BE6	5/6	7C6	6/9	CL33	9/-	EF86	7/6	PCF80	6/9	UBF80	7/6
6BH6	5/-	7H7	5/-	CY31	7/6	EF89	6/6	PCF82	6/-	UBF89	7/6
6BJ6	5/-	7S7	14/6	DAF96	7/3	EF91	3/-	PCF86	8/3	UBL21	9/9
6BR7	8/6	7Y4	5/-	DF92	3/-	EF92	3/-	PCL82	7/9	UC92	6/9
6BW6	7/6	10C1	11/-	DF96	7/3	EF183	8/-	PCL83	8/9	UCC85	7/3
6BW7	5/-	10C2	12/6	DK92	7/-	EF184	8/-	PCL84	8/3	UCF80	8/6
6C4	2/3	10F1	7/6	DK96	7/3	EL32	3/9	PCL85	8/6	UCH21	9/3
6C5	5/6	10LD11	14/6	DL92	5/-	EL33	11/-	PCL86	9/6	UCH42	8/6
6C6	4/-	10P13	8/6	DL94	6/6	EL34	11/-	PL33	8/6	UCH81	7/-
6C9	11/-	10P14	9/6	DL96	7/3	EL35	6/-	PL36	8/9	UCL82	8/-
6CD6G	17/-	12AT7	4/9	EABC80	6/6	EL38	15/-	PL38	12/6	UCL83	10/-
6D6	3/-	12AU7	4/9	EAF42	7/6	EL41	8/6	PL81	7/9	UF41	7/9
6F1	6/6	12AX7	6/-	EB41	4/-	EL42	8/6	PL82	5/9	UF42	6/9
6F6G	4/-	12J7GT	8/-	EB91	2/-	EL84	6/6	PL83	6/-	UF85	7/6
6F13	4/6	12K7GT	4/-	EBC33	6/-	EM80	7/-	PL84	7/-	UF89	5/9
6F14	5/-	12K8GT	9/6	EBC41	6/6	EM81	7/3	PY31	7/6	UL41	8/6
6F15	9/6	12Q7GT	5/-	EBC81	6/6	EM84	7/9	PY32	9/-	UL44	14/-
6F23	8/6	14S7	14/6	EBF80	7/6	EY51	7/6	PY33	9/-	UL46	8/3
6J5GT	4/6	19AQ5	5/-	EBF89	7/-	EY86	7/3	PY80	5/9	UL84	6/9
6J6	3/3	20D1	8/9	EBL21	10/6	EY88	8/6	PY81	5/9	UM80	9/6
6J7G	4/9	20F2	9/6	ECC40	6/9	EZ40	6/6	PY82	5/6	UY21	8/9
6J7GT	7/9	20L1	16/-	ECC81	4/9	EZ41	6/6	PY83	5/9	UY41	6/-
6K7G	1/6	20P1	9/6	ECC82	4/9	EZ80	5/6	PY88	8/6	UY85	5/6
6K7GT	4/9	20P3	9/6	ECC83	5/9	EZ81	6/-	PY800	6/6	VR105	5/-
6K8G	3/-	20P4	17/-	ECC84	7/-	FC4	8/-	PZ30	9/6	VR150	5/-
6K8GT	8/-	25L6GT	7/9	ECC85	5/6	GZ32	9/6	SP61	2/-	X66	7/9
6L1	9/6	25Z4G	6/6	ECC88	9/-	GZ34	10/6	T41	6/9		

Transistorised FM Tuner

HIGH QUALITY: LOW NOISE: BATTERY OR MAINS OPERATION

Reproduction stands favourable comparison with tuners costing 3 times as much. Come and hear it (and compare it) at any of our branches or send to Brighton without delay as we anticipate a very heavy demand.



This beautifully compact 6 transistor machine (size 6in. x 4in. 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 double-tuned discriminator terminating in an L.F. stage giving ample output for all quality amplifiers.

Note audio amplifiers of very interesting specification in the course of preparation.

15 WATT TUNER AMPLIFIER KIT
consisting of FMT41 tuner and the excellent Sinclair Z12 (built) together with complete integrated control kit consisting complete vol. on/off, treble and bass, component sets with complete connecting instructions and circuits.

£13.19.0 or complete with AC mains power pack £17.18.6. Complete control kit only with circuits 25/-.

avoid disappointment

ORDER NOW £8-10

100 HI-STABS 1% to 5% 100Ω to 5mΩ 9/6

CO-AX. low loss, 6d. yd., 25 yds. 11/6; 50 yds., 22/-; 100 yds. 42/6. Plugs, 1/3.

100 RESISTORS SIZES ⅛–3 watt 6/6

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

100 CONDENSERS 9/6

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

BARGAIN 7lb. PARCELS

Including variable condensers, i.f. coils, loudspeaker plugs/sockets, knobs, pots, condensers, resistors, nuts, bolts, cabinet fittings, switches, transformer choke, rectifier, transistors. List value over £6. Carr. 5/-. Try one! **17/6**

DUNCI (VHF) FM TUNERS

MODEL FMT/5. Self powered 200/250 v. A.C. A.F.C. High sensitivity for fringe and long distance reception. Size 11¾ in. x 8⅝in. x 3¼in. high Weight 7½lb. In case finished in satin chrome and black. We can offer these high fidelity instruments. Normally £21.13.5. Limited number only at **15 Gns.**

LOUDSPEAKERS. 3Ω Top Makes.
6½in. **7/6** 5in. 7 x 4in. **8/6**

HITACHI PORTABLE TAPE RECORDER

STOCKS GOING FAST! Latest Hitachi. Fabulous quality reproduction of music, 6-transistor, 1⅞in. and 3¾in. speeds. Output 500 mW high quality speaker. Fast forward and rewind. Battery level and record level meter. Precision capstan drive. Size 8³⁄₁₆ x 3⅞ x 6⅞in. Genuine normal price of 35 gns. Unrepeatable. All spares available. With tape, tape reel, mike, etc. **19 Gns.**

CAR RADIOS

Latest Autolux fully transistorised complete with speaker and fittings. Large purchase enables us to sell these superb sets (normally approx. 14 gns.) at the amazing price of **8 Gns.**

RADIOGRAM CHASSIS

QUALITY BARGAINS

Heavy duty A.C. mains, complete with large dials.

Stereo Am. 6 valve, all wave (normally 17 gns.). **11 Gns.**
Mono AM/FM, 6 valve (normally 18 gns.). **12 Gns.**
Stereo AM/FM, 7 valve (normally 23 gns.). **17 Gns.**

HALF PRICE STEREOGRAMS

Large purchase well known portable Record Players with ingenious Split Cabinet giving two separate high quality loudspeakers, plus main unit with Garrard Deck and crystal clear amplifiers. Compact, powerful, amazing value. Autochanger Model complete Diamond Cartridge normally 39 gns., **19 gns.** Non-Autochange model with SRP72 Deck, normally 29 gns., **14 gns.** S.A.E. full description.

ENORMOUS PURCHASE GUARANTEED. APPROX. HALF PRICE. WORLD FAMOUS MAKE

★ TAPE ★

We offer you fully tensilised polyester/mylar and P.V.C. tapes of identical quality hi-fi, wide range recording characteristics as top grade tapes. Quality control manufacture. They are truly worth a few more coppers than acetate, sub-standard, jointed or cheap imports. TRY ONE AND PROVE IT YOURSELF.

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

Postage 1/- reel
Post Free less 5% on three reels.
Quantity and Trade enquiries invited.

ELPICO MONO PREAMPS

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 **5 Gns.**

TRANSISTORS

GUARANTEED TOP QUALITY

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

GERMANIUM DIODES

General Purpose miniature detector A.V.C. etc. 6/6 doz. **8d.**
Gold Bonded highest quality Individually tested 9/6 doz. **1/-**

SILICON RECTIFIERS

Guaranteed performance. Top makes. Tested 250v. working.
120 ma. (3 for 6/6) **2/9** 500 ma. (3 for 19/6) **7/6**

LATEST GARRARD

Stereo cartridge fitted for 17/6 extra.

SRP12 Mono (Single) Player	£4.19.0
SP25 Semi-Transcription	£11.19.0
AUTOSLIM Standard Auto.	£5.19.0
AT5 Slimline—similar to AT6	£7.15.0
Model 1,000—10 records	£6.19.0
Model 2,000—large turntable	£7.19.0
Model 3,000—wear	£10.10.0
AT60—Heavy Automatic	£11.19.0
A70—Automatic	£19.19.0
LAB80—Transcription Auto.	£27.10.0
401—Transcription	£29.19.0
Model 50—Automatic	£9.10.0

All Factory Fresh. All with cartridge.

B.S.R.

TU14—Single player Complete	59/-
GU17—Single Deck Complete	£4.5.0
UA14—Auto Changer	£4.17.6
UA16—Blue-silver	£5.10.0
UA25SS—Super Slim	£5.15.0

TUBES SATISFACTION GUARANTEED

Satisfaction Guaranteed or money refunded if returned unsoiled within 14 days

Carr. & Ins. 12/6

MOST MULLARD, MAZDA, COSSOR, EMITRON, EMISCOPE, BRIMAR, FERRANTI TYPES PROCESSED IN OUR OWN FACTORY

	6 months	12 Months
12in.	£2. 0.0	£3. 0.0
14in.	£2.10.0	£3.10.0
15-17in.	£3. 5.0	£4. 5.0
19in.	£3. 5.0	£4. 5.0
21in.	£3.15.0	£5.15.0
23in.	£3.15.0	£5.15.0

NEW TYPES
AW47-91 £5.15.0
AW59-91 £7.10.0
AW43-80 £5.5.0

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

TECHNICAL TRADING

Post: 1lb. 1/6, 1½lb. 2/6, 2lb 2/9, 4lb 3/3, 6lb. 4/-, 14lb 5/6

All Mail Orders:—DEPT. E7, Devonian Court

★ **BRIGHTON** Park Crescent Place. Tel. 680722
★ **LONDON** 10 Tottenham Court Road. Tel. MUSeum 2639.
★ **PORTSMOUTH** 350-352 Fratton Road, Tel. 22034.
★ **SOUTHAMPTON** 72 East Street, Tel. 25851.

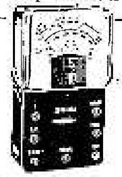
All Branches—E.C. Weds.

BSR MONARCH UA16 with FULL-FI HEAD

4-speed, plays 10 records, 12in., 10in. or 7in. at 16, 33, 45 or 78 r.p.m. Intermixes 7in., 10in., and 12in. records of the same speed. Has manual play position: colour, brown. Dimensions: $12\frac{1}{2}$ x $10\frac{1}{4}$in. Space required above baseboard $4\frac{3}{4}$in., below baseboard $2\frac{3}{4}$in. Fitted with Ful-Fi-turn-over crystal head. P. & P. 7/6. **£4.19.6**

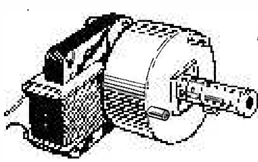
Complete Amplifier Kit comprising E.C.L. 82 Mains transformer, metal rectifier, volume control, smoothing condenser, metal chassis, speaker, etc. To the purchasers of the above changer only **19/6** plus 3/- P. & P.

POCKET MULTI-METER



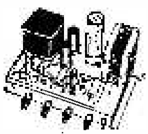
Size $3\frac{7}{8}$ x $2\frac{1}{8}$ x $1\frac{3}{8}$in. Meter size $2\frac{1}{8}$ x $1\frac{3}{8}$in. Sensitivity 1,000 O.P.V. on both A.C. and D.C. volts. 0-15, 0-150 0-1,000. D.C. current 0-150mA. Resistance 0-100kΩ. Complete with test prods, battery and full instructions, **42/6.** P. & P. 3/6. **FREE GIFT** for limited period only. 30 watt Electric Soldering Iron value **15/-** to every purchaser of the Pocket Multi-Meter.

Type E MOTOR



Small A.C. mains motor 230/250 volts complete with gearbox. **6 r.p.m.** Price **15/-** plus 3/- P. & P. Similar to above motor but without gearbox. Price **9/6** plus 2/- P. & P.

8-WATT 5-VALVE PUSH-PULL AMPLIFIER & Metal RECTIFIER



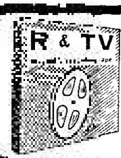
Size: 9 x 6 x $1\frac{1}{4}$in. A.C. Mains, 200-250v. 5 valves. For use with Std. or L.P. records, musical instruments, all makes of pick-ups and mikes. Output 8 watts at 5 per cent of total distortion. Separate bass and treble lift control. Two inputs, with controls for gram. and mike. Output transformer tapped for 3 and 15 ohm speech coils. Built and tested, **£3.19.6**, P. & P. 10/-.

"MAYFAIR" 5-Transistor TAPE RECORDER

Capstan-driven, battery operated. $7\frac{1}{2}$ and $3\frac{3}{4}$ i.p.s. Precision made. Push-button controls. High quality $2\frac{3}{4}$in. speaker. Push-pull circuit. Output 400mW. Frequency response: 200-7,000 k/s. Fast rewind. Up to 1 hour twin track playing time. Automatic erasing for re-recording. Dimensions: 8in. x 11in. x $3\frac{7}{8}$in. Weighs only 7lb. Takes 5in. spools.

£11.11.0 plus 7/6. P. & P.

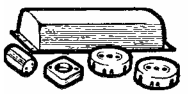
FIRST QUALITY P.V.C. TAPE



$5\frac{3}{4}$in.	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
$5\frac{3}{4}$in.	L.P.	1200ft.	.. 11/6	$5\frac{3}{4}$in.	T.P. 2400ft.	.. 32/6
7in.	L.P.	1800ft.	.. 18/6	7in.	T.P. 3600ft.	.. 42/6
$5\frac{3}{4}$in.	D.P.	1800ft.	.. 18/6	4in.	T.P. 900ft.	.. 15/-

P. & P. on each 1/6, 4 or more post free.

40W FLUORESCENT LIGHT KIT

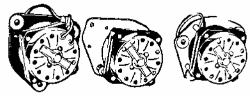


Incorporating **GEC** Choke size $8\frac{1}{4}$in. x $1\frac{3}{4}$in. x $1\frac{3}{4}$in., 2 bi-pin holders, starter and starter-holder. P. & P. 4/6. **11/6**

Similar to above: 80W. Fluorescent Light Kit incorporating **GEC** choke size $11\frac{3}{4}$in. x $1\frac{3}{4}$in. x $1\frac{3}{4}$in. 2 bi-pin holders, starter and starter holder. P. & P. 5/6 **17/6**

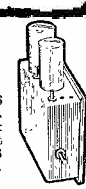
Twin 40W Choke instant start for 2 x 2ft. tubes **17/6.** P. & P. 5/6.

MAGNAVOX COLLARO



Set of three Tape Deck Motors. These are made for 110 v. but suitable auto. transformer is supplied. Three motors **39/6**, P. & P. 6/-.

CYLDON U.H.F. TUNER

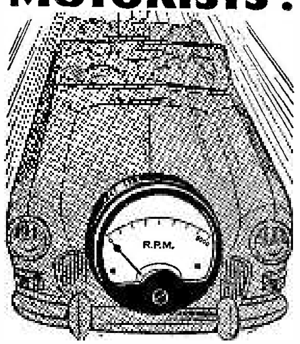


Complete with PC.88 and PC.86 Valves. Full variable tuning. New and unused. Size $4\frac{1}{2}$ x $5\frac{1}{2}$ x $1\frac{1}{2}$in. Complete with circuit diagram. **35/-** plus 2/6 P. & P.

SILICON RECTIFIERS

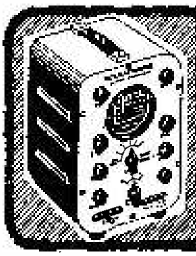
250 v. P.I.V. 750 milliamps. Six for **7/6**, post paid.

MOTORISTS! — it's so easy to build your own REV COUNTER Fully Transistorised for only 19/6



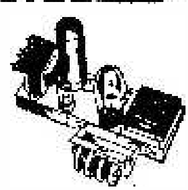
Can be used for 4 or 6 cyl. engines. It would cost you at least £8 to buy one new, at today's prices, but with a few simple tools you can make one at a fraction of the price! This kit makes a modern efficient rev-counter that is essential to your engine's welfare: it contains moving coil movement and all parts including transistors and a circuit diagram. Maximum reading 8000 r.p.m. for 12 volt operation negative or positive earth. Send for your kit today, enclosing a P.O. 21/6 which includes 2/- postage—it will save you £'s and your engine.

OSCILLOSCOPE for D.C. & A.C. Applications



Push-pull X amplifier: Flyback suppression: Internal Time-base Scan Wave form available for external use; pulse output available for checking TV line O/P Transformers, etc. Provision for external—I/P and C.R.T. Brightness Modulation. A.C. mains 200/250 v., **£18/18/-**. P. & P. 10/-.

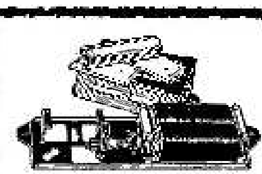
3 to 4 WATT AMPLIFIER KIT



Comprising chassis $8\frac{3}{4}$in. x $2\frac{1}{2}$in. x 1in. Double wound mains transformer, output transformer. Volume and tone controls, resistors, condensers, etc. 6V6. ECC81 and metal rectifier. Circuit 1/6, free with kit. **29/6** plus 4/6 P. & P. The above Amplifier built and tested. **10/6** extra.

POWER SUPPLY KIT

A.C. MAINS 200/250V



Incorporating "C" core type mains transformer, full wave metal rectification and smoothing condenser. Smooth output 250 v. 250 ma and 6.3 v. 4 amp. for Heaters.

25/- P. & P. 7/6

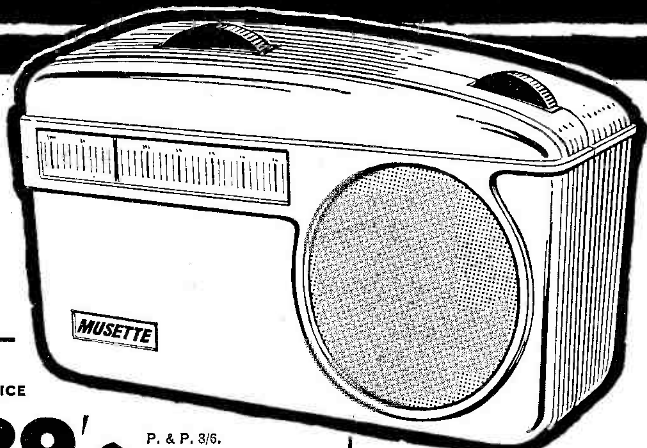
RADIO & T.V. COMPONENTS (ACTON) LTD.

21B HIGH STREET, ACTON, LONDON W.3

SHOP HOURS 9 a.m. to 6 p.m. EARLY CLOSING WEDNESDAY

Goods not despatched outside U.K. All enquiries stamped addressed envelope. Terms C.W.O.

MUSETTE 6 TRANSISTOR SUPERHET PORTABLE RADIO

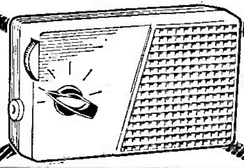


PRICE **39/6** P. & P. 3/6.
Circuit diagram 2/6. Free with parts.

INCLUDING CARRYING STRAP

- 2¼″ Speaker.
- 6 Transistors Superhet Output 200mw.
- Plastic Cabinet in red, size 4¾″ x 3″ x 1⅜″ and gold speaker louvre.
- Horizontal Tuning Scale.
- Ferrite Rod Internal Aerial.
- IF 470 Kc.
- All components, Ferrite Rod and Tuning Assembly mount on printed board.
- Operated from PP3 Battery.
- Full comprehensive instructions and point-to-point wiring diagram.
- Printed Circuit Board.
- Tunable over medium and long wave band. Car aerial and ear piece socket.

NEW TRANSISTORISED SIGNAL GENERATOR



Size 5½″ x 3¼″ 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

Elegant Seven Mk II

COMBINED PORTABLE *and* CAR RADIO

The Radio with the STAR features

- ★ 4in. Speaker.
- ★ 7-transistor superhet. Output 350mW.
- ★ Wooden cabinet, fitted handle with silver coloured fittings. Size 12¼ x 8½ x 3½in.
- ★ Horizontal tuning scale, size 11¼ x 2⅝in. in silver with black lettering.
- ★ All stations clearly marked.
- ★ Ferrite-rod internal aerial.
- ★ I.F. neutralisation on each stage 460 kc/s.
- ★ D.C. coupled output stage with separate A.C. negative feed back.
- ★ All components: ferrite rod and tuning assembly mount on printed board.
- ★ Operated from PP9 battery.
- ★ Full comprehensive instructions and point-to-point wiring diagrams.
- ★ Printed circuit board, back printed with all component values.
- ★ Fully tunable over medium and long waveband.
- ★ Car aerial socket. Full after-sale service.

ONLY **£4.4.0**
Plus 6/6 P. & P. Parts List and circuit diagram 2/6 FREE with parts.

POWER SUPPLY KIT
To purchasers of "Elegant Seven" parts. Incorporating mains transformer, etc. A.C. mains 200-250v. Output 9v. 50mA. 7/6 extra.

ALL ENQUIRIES STAMPED ADDRESSED ENVELOPE

RADIO & TV COMPONENTS (ACTON) LTD
21C HIGH STREET · ACTON · LONDON · W.3

OPEN 9 a.m.—6 p.m. INCLUDING SATS. EARLY CLOSING WED. GOODS NOT DESPATCHED OUTSIDE U.K. TERMS C.W.O.

INCREASE YOUR KNOWLEDGE

ICS

RADIO • TELEVISION • ELECTRONIC ENGINEERING

MEMBER OF THE ASSOCIATION
OF BRITISH CORRESPONDENCE COLLEGES

CHOOSE THE RIGHT COURSE FROM

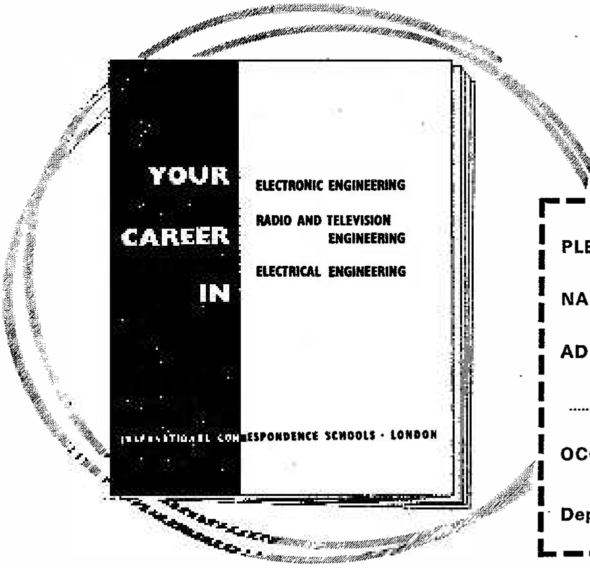
RADIO AND TELEVISION ENGINEERING, INDUSTRIAL TELEVISION, RADIO AND TELEVISION SERVICING, ELECTRONICS, COMPUTERS AND PROGRAMMING, ELECTRONIC TECHNICIANS, SERVOMECHANISMS, TELEMETRY, CLOSED CIRCUIT TV, INSTRUMENTATION, AND PRINCIPLES OF AUTOMATION.

ALSO EXAMINATION COURSES FOR:

Inst. of Electronic and Radio Engineers
C. & G. Telecommunication Techns'. Cert.
C. & G. Supplementary Studies
R.T.E.B. Radio/TV Servicing Cert.
P.M.G. Certificates. Radio Amateurs' Exam.

LEARN AS YOU BUILD

Practical Radio Courses: Gain a sound knowledge of Radio as you build YOUR OWN 5-valve superhet Receiver and Transistor, Portable Signal Generator and High Quality Multitester. At the end of the course you have invaluable practical equipment and a fund of personal knowledge and skill. ICS Practical Radio Courses open a new world to the keen amateur.



THERE IS AN ICS COURSE FOR YOU

Whether you need a basic grounding, tuition to complete your technical qualifications, or further specialised knowledge, ICS can help you with a course individually adapted to your requirements.

There is a place for you among the fully-trained men. They are the highly paid men—the men of the future. If you want to get to the top, or to succeed in your own business, put your technical training in our experienced hands.

ICS Courses are written in clear, simple and direct language, fully illustrated and specially edited to facilitate individual home study. You will learn in the comfort of your own home—at your own speed. The unique ICS teaching method embodies the teacher in the text; it combines expert practical experience with clearly explained theoretical training. Let ICS help you to develop your ambitions and ensure a successful future. Invest in your own capabilities.

FILL IN AND POST THIS COUPON TODAY

You will receive the FREE ICS Prospectus listing the examinations and ICS technical courses in radio, television and electronics. PLUS details of over 150 specialised subjects.

PLEASE SEND FREE BOOK ON ....

NAME ....

ADDRESS ....

....

OCCUPATION .... AGE ....

INTERNATIONAL CORRESPONDENCE SCHOOLS

Dept. 170, INTERTEXT HOUSE, PARKGATE ROAD, London, SW11

10/66

SURBITON PARK RADIO

MARTIN RECORDAKITS

NEW MAGNAVOX 363 DECK, Two Track .... Cash £11.19.6
6 Valve amplifier complete 2 EL84 .... Cash £14.19.6
Complete recorder, Case, Tape, Mic .... Cash £36.0.0
*Or dep.*180/- *and* 12 *m. pymts.* 49/6 .... (*H.P. Price* £38.14.0)
FOUR TRACK MAGNAVOX 363 DECK .... Cash £14.14.0
FOUR TRACK AMPLIFIER as above .... Cash £15.19.6
Complete recorder, Case, Tape, Mic. .... Cash £40.0.0
Or Dep. 200/- *and* 12 *m. pymts.* 55/- .... (*H.P. Price* £43.0.0)
These recorders are very well made, The amplifier is on a printed circuit and all components are mounted and tested. Can be built in 2 to 3 hours.

MOTORS·PICK-UPS Selection

GARRARD Model 1000 Mono .... Cash £7.10.0
Or Dep. 37/6 *and* 8 *m. pymts.* 16/3 .... (*H.P. Price* £8.7.6)
GARRARD Model 2000 Mono. Large table .... Cash £8.10.0
Or Dep. 42/6 *and* 8 *m. pymts.* 18/6 .... (*H.P. Price* £9.10.6)
GARRARD Model 3000 Stereo 9TA/HC .... Cash £11.11.0
Or Dep. 58/6 *and* 9 *m. pymts.* 21/5 .... (*H.P. Price* £12.11.3)
GARRARD Model AT60 Less cart. .... Cash £13.0.0
Or Dep. 65/- *and* 9 *m. pymts.* 23/11 .... (*H.P. Price* £14.0.3)
GARRARD Model SP25 Single player, less cart. .... Cash £12.10.0
Or Dep. 62/6 *and* 9 *m. pymts.* 23/1 .... (*H.P. Price* £13.10.3)

AMPLIFIERS·TUNERS Selection

ARMSTRONG 221 10-10 watts Stereo Mag PU and Filter .... Cash £35.10.0
Or dep. 177/6 *and* 12 *m. pymts.* 48/10 .... (*H.P. Price* £38.3.6)
ARMSTRONG 222 10-10 watt Stereo Deram .... Cash £28.15.0
Or Dep. 147/6 *and* 12 *m. pymts.* 39/3 .... (*H.P. Price* £30.18.6)
ARMSTRONG 224 FM Tuner Powered .... Cash £24.15.0
Or Dep. 135/- *and* 12 *m. pymts.* 33/7 .... (*H.P. Price* £26.18.0)
ARMSTRONG 223 AM/FM Tuner Powered .... Cash £31.0.0
Or Dep. 155/- *and* 12 *m. pymts.* 42/8 .... (*H.P. Price* £33.7.0)
ARMSTRONG 127 Mono 5W with AM/FM .... Cash £29.10.0
Or Dep. 147/6 *and* 12 *m. pymts.* 40/7 .... (*H.P. Price* £31.14.6)
ARMSTRONG 127 Stereo as above Stereo amp. .... Cash £39.10.0
Or Dep. 197/6 *and* 12 *m. pymts.* 54/4 .... (*H.P. Price* £42.9.6)
ARMSTRONG 227 Mono 10 watt with AM/FM .... Cash £39.10.0
Or Dep. 197/6 *and* 12 *m. pymts.* 54/4 .... (*H.P. Price* £42.9.6)
Teak Cases for all Armstrong Units £3.10.0
TERMS: C.W.O. or C.O.D. **ALL ITEMS CARRIAGE FREE**
Leaflets available upon receipt of 6d. stamp

48-50 Surbiton Road, Kingston-on-Thames, Surrey
Phone KIN. 5549 Hours 9 a.m. to 6 p.m. daily (1 p.m. Weds.)

Any holes in your knowledge of TRANSISTORS?

Whatever your interest in transistor circuitry, you will find the Mullard "Reference Manual of Transistor Circuits" a valuable source of reference.

The manual describes more than sixty circuits for both domestic and industrial applications.

REFERENCE MANUAL OF TRANSISTOR CIRCUITS
U.K. PRICE 12/6 Post extra 1/-

Mullard *Get your copies from your radio dealer, or send remittance with order to:*

MULLARD LTD · MULLARD HOUSE · TORRINGTON PLACE · LONDON WC1

CALLING ALL SKILLED TECHNICIANS!

If you're aged 23-30, this could be just the opportunity you're looking for.

The Army needs men trained in the following skills, and who have the appropriate Ordinary National Certificate or City & Guilds qualifications.

ELECTRONIC TECHNICIANS AIRCRAFT TECHNICIANS
MOTOR MECHANIC/AUTOMOBILE ENGINEER

PROMOTION TO SERGEANT SIX WEEKS AFTER YOU JOIN!

Here's your chance to train as one of the Army's top class technicians—an Artificer in the Royal Electrical and Mechanical Engineers—specializing in vehicles, aircraft, electronics or radio.

Today's Army is equipped with all the most modern technical equipment—radio transmitters, closed circuit TV, gunfire control equipment, radio transceivers, helicopters. That's the kind of exciting equipment *you* could be working on as a R.E.M.E. Artificer.

EARN £987 A YEAR AND MORE!

This year every soldier in the Army is better off. As a sergeant, you will earn £987 a year—and all your food and lodging are free. Married men get an additional £236. Staff Sergeants earn more and you'll be given every chance to work for still further promotion and still better pay.

WANT TO KNOW MORE?
SEND OFF THE COUPON TODAY!

TO: ARMY CAREERS MP6(A), LANSDOWNE HOUSE, LONDON W.1
Please send me full details of how to become an Artificer

NAME ....

ADDRESS ....

TOWN ....

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

M221501 (*You must be resident in the UK*)

R.S.C HI-FI CENTRES LTD.

MAIL ORDERS TO: 102 Henconner Lane Bramley, Leeds 13

Terms: C.W.O. or C.O.D. No C.O.D. under £1. Postage 3/6 extra under £2. 5/6 extra under £5. Trade Supplied. S.A.E. with all enquiries please. — **Personal shoppers welcome at the following branches. Open all day Sats.**

BRADFORD 10 North Parade. Tel. (Half-day Wed.) 25349

BRISTOL 14 Lower Castle St. Tel. (Half-day Wed.) 22904

BIRMINGHAM 30/31 Gt. Western Arcade, opp. Snow Hill Station. CENtral 1279. No half-day

DERBY 26 Osmaston Rd., The Spot (Half-day Wed.) Tel.: 41361

DARLINGTON 13 Post House Wynd (Half-day Wednesday) Tel.: 68043

EDINBURGH 133 Leith Street (Half-day Wed.)

GLASGOW 326 Argyle St. Tel.: (No half-day) CITy 4158

HULL 51 Savile Street (Half-day Thursday) Tel.: 20505

LEICESTER 32 High Street (Half-day Thurs.) Tel.: 56420

LEEDS 5-7 County (Mecca) Arcade (No Half-day) Tel.: 28252

LIVERPOOL 73 Dale St. (No half-day) Tel.: CENtral 3573

LONDON 238 Edgware Road, W2 (Half-day Thursday) Tel.: PADdington 1629 **96 High Holborn, WC1**

MANCHESTER New large store. (No half-day) 60A-60B Oldham St. Tel.: CENtral 2778

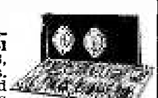
MIDDLESBROUGH (Half-day) Wednesday) 106 Newport Road. Tel.: 47096

NEWCASTLE 39 Blackett Street Eldon Square Half day Wed.

SHEFFIELD 13 Exchange Street Castle Market Bldgs. Tel.: 20716 (Half-day Thursday)

ALL LEADING MAKES OF HI-FI EQUIPMENT STOCKED Cash or Terms

15 watt HI-FI TRANSISTOR AMPLIFIER



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 Mullard or Newmarket latest type semi-conductors **£6.19.9** Post 5/-. Heat sink and full wiring instructions or with printed circuit fully wired and tested 30/- extra. **Frequency Response:** ± 1dB 20-20,000 cps. **Harmonic Distortion:** 0.1% measured at 1000 c.p.s. **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. Suitable Power Pack Kit 39/6 or ready built 59/6.

LONDON-NEWCASTLE

New branches now open — see addresses

HI-FI LOUDSPEAKER ENCLOSURES

All types of pleasing modern "slimline" design acoustically lined and ported and in alternative finishes of light Teak or medium Walnut.

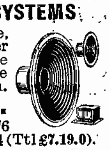
SE8. For optimum performance with any Hi-Fi 8in. speaker. Size 22 x 15 x 7in. Carr. 7/6 **£5.15.0**

SE10. For 10in. Hi-Fi speaker with provision for tweeter. Size 24 x 15 x 7½in. Or Deposit 21/- and 9 mthly pmts of 15/4 (Total £7.19.0) **£6.19.9**

SE12. For outstanding performance with any 12in. Hi-Fi speaker. Cut for tweeter. Size 24 x 20 x 7½in. Or Deposit 27/- and 9 monthly payments of 18/2 (Total £9.10.6.) Carr. 10/- **8 Gns.**

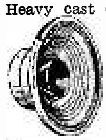
FHE8. Folded Horn type. Size 27 x 16 x 10in. Designed for high flux 8in. speaker with which exceptional quality can be obtained. Terms Deposit 21/- and 9 monthly payments 21/-. (Total 10 Gns). Carr. 10/- **9 Gns.**

AUDIOTRINE HI-FI SPEAKER SYSTEMS



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 £6.19.9. Carr. 7/6. Or Dep. 21/- and 9 mthly pmts of 15/4 (Ttl £7.19.0). Carr. 5/6 **5 Gns.**

AUDIOTRINE HI-FI LOUDSPEAKERS



Heavy cast construction. Latest high efficency ceramic magnets. Dual Cone for extended frequency range. Plastic treated surround giving low fundamental resonance. Response 30-20,000 c.p.s., Impedance 3 or 15 ohms. Carr. 5/6.

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

TWEETERS R.A. 3 ohm 25/9. 15 ohm 25/9

HIGH FIDELITY LOUDSPEAKER UNITS

Cabinets of latest styling finished Satin Teak or Walnut, acoustically lined and ported where appropriate.

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. 10½ x 6½ x 7½in. Carr. 7/6 **£6/19/6**

THE 'PETITE' Really astounding performance. Size only 10½ x 6½ x 7½in. **Rating 10 watts.** Frequency range 45-20,000 c.p.s. Fitted specially designed Heavy cast 5in. speaker with large pole pieces, extra long voice coil and rubber cone surround. Impedance 3 ohms or 15 ohms. Or Deposit 36/- and 9 monthly payments of 25/- (Total £13.1.0). **11 Gns.** Carr. 7/6

The GLOUCESTER Handsome "slimline" cabinet. Size 24 x 20 x 6½in. 12 in. high flux 12,000 line speaker. Cross-over unit and Tweeter. Rating 10 watts. Smooth response 40-20,000 c.p.s. Impedance 15 ohms. Or Deposit 36/- and 9 monthly payments 25/- (Total £13.1.0). **11 Gns.** Carr. 15/-

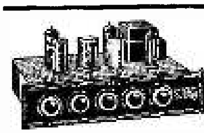
The BRONTE Size 22 x 15 x 7½in. Fitted Wharfedale Super 8 RSDD Speaker, with Roll surround and dual cone. Rating 6 watts. Impedance 15 ohms. Or Deposit 39/- and 9 monthly payments 27/3 (Total £14.4.3.). Carr. 15/- **12 Gns.**

AUDIOTRINE PLINTHS

for Record Playing units. Teak finish for Garrard 1000, 2000, 3000, AT60, SP25 or Goldring GL68, or with clear Perspex cover as illustrated £5.19.6. **66/-**

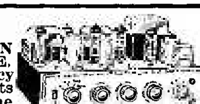
LINEAR TAPE PRE-AMPLIFIER. Type LP/1 Switched Equalisation. Positions for Recording at 1⅞in., 3¾in., 7½in. per sec., and Playback. EM84 Recording Level Indicator. Designed primarily as the link between a Magnavox Tape Deck and Hi-Fi amplifier, suitable most Tape Decks. Terms available. **10½ Gns.**

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. Terms:** Dep. 36/- and 9 monthly payments 25/5 (Total £13.4.9). Carr. 11/6 **£8.15.0**

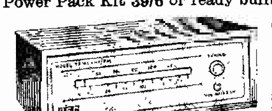
R.S.C. STEREO/20 HIGH FIDELITY AMPLIFIER



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 speakers on each channel. Complete set of parts with point-to-point wiring diagrams and instructions. Send s.a.e. for leaflet. 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). Carr. 12/6 **19 Gns.**

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



Total cost of parts with detailed wiring diagrams and instructions. **12½ Gns.** Or factory built 15½ Gns. Or in Teak finished cabinet Carr. 10/- as illustrated 19½ Gns. Terms: Deposit £5 and 9 mthly 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. 500m.v.). ★ Simple alignment instructions. ★ Output available for feeding tuning meter. ★ Output for feeding Stereo Multi-plexer. ★ Tuner head using Silicon Planar Transistors. ★ Designed for standard 80 ohm co-axial input. Designed 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.

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

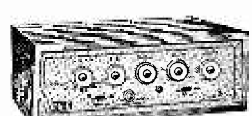
FULLY TRANSISTORISED 200/250v. A.C. Mains.
OUTPUT 10 WATTS R.M.S. cont. into 15 ohms.
15 WATTS R.M.S. cont. into 3-4 ohms.
Maximum instantaneous Peak power output 28 watts.
PRINTED CIRCUIT CONSTRUCTION.
LATEST MULLARD TRANSISTORS. AD149, AD149, OC127Z, OC81Z, OC44, OC44, OC81Z, OC44, AC107.
5 POSITION 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. 0.3%.
NEGATIVE FEEDBACK: 52dB.

Complete Kit of parts with full constructional details and point to point wiring diagrams. Unit factory built, 14½ Gns. Or fitted in beautiful Walnut or Teak veneered cabinet as illustrated. 18½ Gns. Carr. 10/- **10½ Gns.**

Or Deposit £3.9.0 and 9 mthly pmts 40/6 (Total £21.13.6). Carr. 12/6.

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

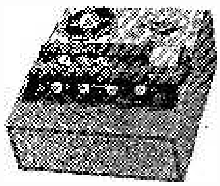
A DUAL CHANNEL VERSION OF THE SUPER 15. Employing Twin Printed Circuits. Close tolerance Ganged Pots. Matched Components.
CROSS TALK: —52dB at 1,000 c.p.s.
CONTROLS: 5 position Input Selector, Bass Control, Treble Control, Volume Control, Balance Control, Stereo/Mono Switch, Tape Monitor Switch, Mains 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. 12/6 **18 Gns.**

Unit factory built 25 Gns. or deposit 81/- and 9 monthly payments 55/9 (Total £29.2.9). Fitted cabinet as Super 15 29 Gns. Carr. 15/- or Deposit £4.12.0 and 9 mthly paymts 64/10 (Total £33.15.6). *Send S.A.E. for leaflet.*

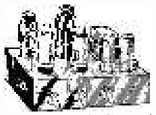
AUDIOTRINE HI-FI TAPE RECORDER KIT

REALISM AT INCREDIBLY LOW COST. CAN BE ASSEMBLED IN AN HOUR. ONLY 4 PAIRS OF SOLDERED JOINTS PLUS MAINS. Incorporating the latest Magnavox Tapedeck. The Audiotrine High Quality Tape Amplifier with switched equalisation for each of 3 speeds. High Flux P.M. Speaker, empty Tape Spool, a Reel of Best Quality Tape and a handsome Portable Cabinet of latest styling finished dark grey leathercloth. Size 14½ x 17 x 8½in. and circuit. Purchased separately would total approx. **£34.** Performance equal to units in the £50-£60 class.



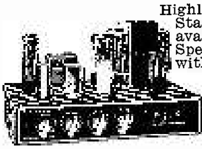
26½ Gns. Carr. 19/6. S.A.E. for leaflets. **TERMS: Deposit 4 gns.** and 9 monthly payments of **59/6** (Total 29½ gns.). 4 Track Model 3 gns. extra.

R.S.C. 4/5 watt A5 HIGH GAIN AMPLIFIER



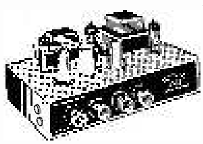
A highly-sensitive 4-valve quality amplifier for the home, small club, etc. Suitable for all crystal or ceramic P.U. heads and practically all "mikes". Separate Bass and Treble controls giving "lift" and "cut". Hum level 71dB down. Negative Feedback 15dB. Reserve power supply 300v 25 m.a., 6.3v 1.5 a. for Radio Tuner or Tape Preamp. For A.C. mains 200-250v. Speaker output 3 ohms. Complete in every detail with fully punched enamelled chassis, point-to-point wiring diagrams and instructions. Or assembled ready for use 6 gns. plus 5/6 carr. **£4.17.9**

R.S.C. A10 30 WATT ULTRA LINEAR HI-FI AMPLIFIER



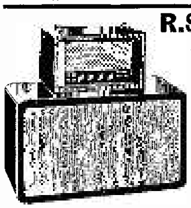
Highly sensitive. Push-Pull high output, with Pre-amp./Tone Control Stages. Performance figures equal to most expensive amplifiers available. Hum level—70dB. Frequency response ±3dB 30-20,000 c/s. Specially designed sectionally wound ultra linear output transformer with 807 output valves. All first grade components. Valves EF86, EF86, ECC83, 807, 807, GZ34. Separate Bass and Treble Controls. Sensitivity 12 millivolts so that **any kind of Microphone or Pick-up is suitable.** Designed for **Clubs, Schools, Theatres, Dance Halls** or **Outdoor Functions,** etc. For use with **Electronic Organ, Guitar, String Bass,** etc. Gram, Radio or Tape. Reserve L.T. and H.T. for **Radio Tuner.** Two inputs with associated volume controls so that two separate inputs such as Gram and "Mike" can be mixed. 200-250v. 50 c/s A.C. mains. For 3 and 15 ohm speakers. Complete kit of parts fully punched chassis, point to point wiring diagrams and instructions. **12 Gns.** Carr. 12/6. Supplied factory built with EL34 output valves, 12 months guarantee for **15 gns.** If required perforated cover with carrying handles can be supplied for **21/-.** Send s.a.e. for leaflet. **TERMS: Deposit 48/-** and 9 monthly payments of **33/7** (Total **£17.10.3**).

R.S.C. A11 HIGH FIDELITY 12-14 WATT AMPLIFIER



PUSH-PULL ULTRA LINEAR OUTPUT "BUILT-IN" TONE CONTROL PRE-AMP Two input sockets with associated controls allow mixing of "mike" and gram. etc., etc. High sensitivity. Valves ECC83, ECC83, EL84, EL84, EZ81. High quality sectionally wound output transformer specially designed for Ultra Linear operation and reliable small condensers of current manufacture. INDIVIDUAL CONTROLS FOR BASS AND TREBLE. Frequency response ±3dB 30-20,000 c/s. Six negative feedback loops. Hum level —60dB. SENSITIVITY 23 millivolts. Suitable for Crystal or Ceramic P.Us, all types "mikes". Comparable with the very best designs. For **Musical Instruments** such as **String Bass, Electronic Guitars,** etc. **Reserve Power** provides 300v. 30mA, and 6.3v. 1.5a. for **Radio Tuner** or **Tape Pre-amp.** Size approx. 12 x 9 x 7in. For A.C. mains 200-250v. 50 c.p.s. Output for 3 and 15 ohm speakers. Kit complete to last nut. Chassis fully punched. Full instructions and point-to-point wiring diagrams (or factory built **£11.15.0**). ONLY **£8.15.0** Carr. 11/6. Metal covers with 2 carrying handles can be supplied for **21/-. TERMS ON ASSEMBLED UNITS: Deposit 36/6** and 9 monthly payments of **25/9** (Total **£13.8.3**). Send S.A.E. for illustrated leaflet detailing Cabinets, Speakers, Mikes, etc.

R.S.C. BASS-REGENT 50 WATT AMPLIFIER

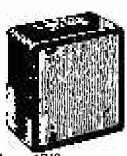


AN EXCEPTIONALLY POWERFUL HIGH QUALITY ALL-PURPOSE UNIT For lead, rhythm, bass guitar and all other musical instruments. For vocalists, gram, radio, tape and general public address

★ UNUSUALLY POWERFUL LOUDSPEAKER COMBINATION consisting of a FANE HIGH FLUX 15in. 30 watt unit PLUS a FANE 12in. 20 watt unit with extended frequency response. ★ 4 Jack Inputs and two Volume Controls for simultaneous use of up to 4 pick-ups or "mikes". ★ Cabinets covered in two-tone Rexine/Vynair with gold trimming. Fitted carrying handles. ★ Separate Bass and Treble Controls giving "lift" and "cut".

49½ Gns. Carr. 30/-. Send S.A.E. for leaflet. Or call at one of our many branches and compare the Bass-Regent with units at three times the cost. Or deposit **£7.17.6** and 9 monthly payments of **£5.10.10.** (Total **55 gns.**)

B20 MULTI-PURPOSE AMPLIFIER especially suitable for Bass Guitar



Incorporating massive 15in. high flux loudspeaker. Rating 25 watts. Individual bass and treble controls. Two jack inputs separately controlled. Substantial cabinet attractively finished in Rexine and Vynair. Size approx. 24 x 21 x 11in. Send S.A.E. for leaflet. Or Deposit **£4.14.6** and 9 monthly payments of **66/-** (Total **£34.8.6**) **29½ Gns.** Carr. 17/6

G15 15 WATT AMPLIFIER for Lead or Rhythm Guitar, Mike, Gram or Radio

High-fidelity output. Separate bass and treble controls. Twin separately controlled inputs so that two instruments or "mike" and pick-ups can be used at the same time. Heavy Duty 12in. 20 watt Speaker. Cabinet covered in attractive Rexine/Vynair. Size 18 x 18 x 18in. **19½ Gns.** Carr. 15/-. Or deposit **3 gns.** and 9 monthly payments of **43/7** (Total **£22.15.3**). S.A.E. for leaflet.

LINEAR TREMOLO PRE-AMP UNIT

Suitable for use with any of our Amplifiers. Controls are Speed (frequency of interruptions). Depth (for heavy or light effect). Volume and Switch. **4½ Gns.**

POWER PACK KIT 22/9

Consisting of Mains Transformer, Metal Rectifier, Electrolytics, smoothing choke, chassis and circuit. 200/250v. A.C. mains. Output 250v. 60mA, 6.3v. 2a or with case in lieu of chassis **26/9.**

R.S.C. BATTERY/MAINS CONVERSION UNITS

Type BM1. An all-dry battery eliminator. Size 5½ x 4½ x 2in. approx. Completely replaces batteries supplying 1.5v. and 90v. where A.C. mains 200/250v. 50 c/s is available. Complete kit with diagram **44/9** or ready for use **59/6.**

15in. LOUDSPEAKER SCOOP £9.19.9

Heavy duty 15 ohm. Rated 30 watts peak. Famous make. Terms available. Carr. 10/-

G20 SUPER TWIN AMPLIFIER

Rating 20 watts (max.) for Lead or Rhythm Guitar etc. Twin separately controlled inputs. Two 12in. High Flux Speakers (Total rating 30 watts). Attractive Rexine/Vynair covered cabinet. Terms: Deposit £4.6.8 and 9 monthly payments 50/- (Total £26.16.8). **23 Gns.** Carr. 17/6

TRANSISTORISED SOUND MIXER

Enables mixing of up to 4 standard jack inputs, i.e., microphone, tape, gram, tuner, etc., into single output. Compact and completely self-contained. Uses standard 9v. battery. **49/9**

SPECIAL PURCHASE! 12in. 30 WATT HEAVY DUTY 15 ohm LOUDSPEAKERS 7 GNS.

Carr. 12/6. Flux Density 17,000 lines. Fully Guaranteed. Outstanding value at normal price of approx. £12. Or deposit **23/10** and 9 monthly payments of **15/6** (Total **£8.3.4**).

HEAVY DUTY SELENIUM RECTIFIERS 19/9

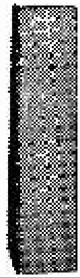
12v. 15 amps. F.W. (Bridge). Only

FANE HEAVY DUTY HI-FI SPEAKERS

12in. 20 watt. Type 122/10. **5 GNS.** Post 5/6.

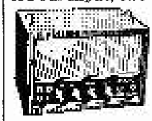
R·S·C HI-FI CENTRES LTD.

R.S.C. COLUMN SPEAKERS



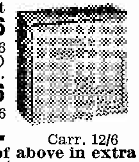
Covered in two-tone Rexine/Vynair. Ideal for vocalists and Public Address. 15 ohm matching. **Type C58, 15-20 watts.** Fitted five 8in. high flux speakers. Overall size approx. 42 x 10 x 5in. Or Deposit **£2** and 9 mthly pymts **28/-** (Total **£14.12.0**) **12½ Gns.** Carr. 10/-. **Type C412, 40 watts.** Fitted four 12in. 12,000 line 10 watt speakers. Overall size 56 x 14 x 9in. approx. Carr. 15/- **19½ Gns.** Or Deposit **3 gns.** and 9 monthly payments of **43/7** (Total **£22.15.3**).

30 WATT HI-FI AMPLIFIER for Guitar, Vocal or Instrumental Group



A Four Input, two volume control Hi-Fi unit with separate Bass and Treble "cut" and "boost" controls. Latest type valves. Housed in strong Rexine covered cabinet with twin carrying handles. Attractive black and gold perspex facia plate. For 200-250v. A.C. mains. Output for 3 or 15 ohm speakers. Send S.A.E. for leaflet. Deposit **£3** and 9 monthly payments of **37/5** (Total **£19.16.9**). **17 Gns.** Carr. 12/6

12in. HIGH QUALITY LOUDSPEAKERS



In walnut veneered cabinet. **10 Watt Model.** Gauss 12,000 lines. Speech coil 3 or 15 ohms. **£4.19.6** **Terms:** Deposit **15/-** and 9 monthly payments of **11/2** (Total **£5.15.6**) Carr. 7/6. **20 Watt Model.** 15 ohm. Size 18x18x10in. **Terms:** Deposit **24/6** and 9 monthly payments of **17/3** (Total **£8.19.9**). **£7.19.6** Carr. 10/6. **30 Watt Model.** 15 ohms. Or Deposit **32/-** and 9 monthly payments of **22/4** (Total **£11.13.0**). **10 Gns.** Carr. 12/6. **Any of above in extra heavy Rexine covered Cabinets, £1 extra.**

R.S.C. GRAM AMPLIFIER KIT. 3 watts output. Negative feedback. Controls: Vol., Tone and Switch. Mains operation 200-250v. A.C. Fully isolated chassis. Circuit, etc. supplied. Only **44/9.** Carr. 3/9.

HIGH QUALITY 12in. 10 WATT SPEAKERS 59/6

Flux Density 12,000 lines. 3 or 15 ohms.

TRANSISTOR SALE

Mullard OC71 **2/11,** OC45 **3/11,** OC44 **3/11,** OC72 **2/11,** OC75 **7/9,** OC81 **2/11,** OC171 **8/9.** AF117 **6/9.** Ediswan XA101 **3/9,** XA112 **3/9,** XC101A **3/9.** Postage 6d. for up to 3 transistors.

INTEREST CHARGES REFUNDED on H.P. and Credit Sale Accounts settled in 3 months.

R.S.C. MAINS TRANSFORMERS

FULLY GUARANTEED, Interleaved and Impregnated. Primaries 200-250v. 50 c/s. Screened.

MIDGET CLAMPED TYPE 2⅝ × 2⅝ × 2¼in.

250v., 60mA, 6.3v. 2a	14/11
250-0-250v., 60mA, 6.3v. 2a	15/11

FULLY SHROUDED UPRIGHT MOUNTING

250-0-250v. 60mA, 6.3v. 2a, 0-5-6.3v. 2a, 2½ × 3 × 3in.	19/9
250-0-250v. 100mA, 6.3v. 4a, 0-5-6.3v. 3a.	33/9
300-0-300v. 100mA, 6.3v. 4a, 0-5-6.3v. 3a.	33/9
300-0-300v. 130mA, 6.3v. 4a c.t., 6.3v. 1a. For Mullard 510 Amplifier	41/9
350-0-350v. 100mA, 6.3v. 4a, 0-5-6.3v. 3a.	33/9
350-0-350v. 150mA, 6.3v. 4a, 0-5-6.3v. 3a.	42/9
425-0-425v. 200mA, 6.3v. 4a, c.t., 5v. 3a	63/9
425-0-425v. 200mA, 6.3v. 4a, 6.3v. 4a, 5v. 3a	65/9
450-0-450v. 250mA, 6.3v. 4a, c.t., 5v. 3a	79/9

TOP SHROUDED DROP-THROUGH TYPE

250-0-250v. 70mA, 6.3v. 2a., 0-5-6.3v. 2a	19/9
250-0-250v. 100mA, 6.3v. 3.5a	21/9
250-0-250v. 100mA, 6.3v. 2a, 6.3v. 1a	22/9
350-0-350v. 80mA, 6.3v. 2a, 0-5-6.3v. 2a	23/9
250-0-250v. 100mA, 6.3v. 4a, 0-5-6.3v. 3a	32/9
300-0-300v. 100mA, 6.3v. 4a, 0-5-6.3v. 3a	32/9
300-0-300v. 130mA, 6.3v. 4a, 0-5-6.3v. 1a. Suitable for Mullard 510 Amplifier	39/9
350-0-350v. 100mA, 6.3v. 4a, 0-5-6.3v. 3a	32/9
350-0-350v. 150mA, 6.3v. 4a, 0-5-6.3v. 3a	39/11

FILAMENT or TRANSISTOR POWER PACK Types 6.3v. 1.5a **6/9,** 6.3v. 2a **7/9,** 6.3v. 3a **9/9,** 6.3v. 6a **19/9,** 12v. 1a **8/9,** 12v. 3a or 24v. 1.5a **19/9,** 0-25-35-42v. 2a **27/9.**

CHARGER TRANSFORMERS 0-9-15v. 1¼a, **13/9,** 0-9-15v. 2½a, **16/9,** 0-9-15v. 3a, **18/9,** 0-9-15v. 5a, **21/9,** 0-9-15v. 6a, **25/11,** 0-9-15v. 8a, **31/9.**

AUTO (Step UP/Step DOWN) TRANSFORMERS 0-110/120v.-200-230-250v.

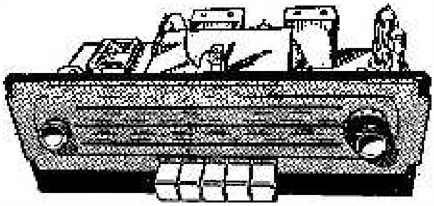
50-80 watts	14/9	250 watts	49/9
150 watts	29/11	500 watts	99/9

OUTPUT TRANSFORMERS

Standard Pentode 5,000Ω to 3Ω or 7,000Ω to 3Ω	7/9
Push-Pull 8 watts EL84 to 3Ω or 15Ω	11/9
Push-pull 10-12 watts 6V6 to 3Ω or 15Ω	19/9
Push-pull 10-12 watts to match 6V6 to 3, 5, 8 or 15Ω	21/9
Push-pull EL84 to 3 or 15Ω 10-12 watts	19/9
Push-pull Ultra Linear for Mullard 510, etc.	35/9
Push-pull 15-18 watts, sectionally wound 6L6, KT66, etc., for 3 or 15Ω	22/9
Push-pull 20 watt high quality sectionally wound, EL34, 6L6, KT66, etc., to 3 or 15Ω fully shrouded	55/9

SMOOTHING CHOKES 150 mA, 7-10H, 250Ω **12/9.** 80mA, 10H, 350Ω **7/9.** 100mA, 10H, 200Ω **9/11.** 60mA, 10H, 400Ω **4/11.**

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

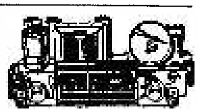


Chassis size 15 x 6¾ x 5¾in. high. New manufacture. Dial 14½ x 4in. in 2 colours, predominantly cream. 200-250v. A.C. only.
Pick-up Ext. Speaker. Ae., E., and Dipole Sockets. Five push-buttons—LW, MW, SW, FM and Gram. Aligned and tested. O.P. Transformer Tone control 1000-1900M; 200-550M; 88-98 Mc/s. 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 m/cs. 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.

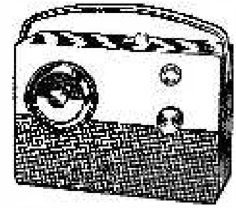
TAPE AMPLIFIER FOR COLLARO OR MAGNAVOX TAPE DECKS — 2 or 4 TRACK (4 TRACK 25/- EXTRA)
Chassis 12¾ x 5½ x 4¾in. high. Plastic front panel "gold" finish—12½ x 4¾in. 200-250 A.C. Record/Playback amp. switch; Off/On-Tone; Vol/Mic; Vol/Gram; Mic. Input; Gram. Input; Monitor; Speaker Sockets. Valves 6BR7; 12AX7; EM84; EL84; 6X4 Separate power pack. Complete amp. and power pack, £8.19.6. (6/- P. & P.). Rexine covered cabinet fitted to take amplifier and Collaro Deck. 15½ x 17 x 9½in. high Sloping front for amp.; complete with two tweeter speakers; Tan, 75/- (plus 8/- rail charge). Cabinet and special brackets for adapting cabinet for Magnavox Deck 85/- (plus 8/- carr.), including tweeters. Deck prices next column.

SELF-POWERED VHF TUNER CHASSIS



Covering 88-95 Mc/s, Dims. 8 x 6 x 6in. high, Valves ECC85, EABC80 and 2-EF89 with metal rectifier. Mains transformer. Fully wired and tested ONLY £8.17.6 (carr. paid). Room dipole. 12/6. Feeder 6d. per yard.

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 £12.12.0 commercial model.
★ All new parts. ★ 6 transistors and diode. ★ 350mW output. ★ Superhet circuit ★ Ferrite rod aerial. ★ Weymouth Radio printed circuit board. ★ Component positions and references printed on back of board. ★ Nicely styled wooden cabinet 11 x 7½ x 3½in. ★ Vinyl covered in various colours. ★ 6 x 4in. speaker giving good bass and treble response. ★ Full instruction booklet, 2/-. Free with kit. ★ I.f. frequency 470 kc/s. ★ Lining up service if required. ★ All parts supplied separately.

Write for list, S.A.E. **COMPLETE KIT ONLY** *OR FULLY BUILT* £6.7.6. *Tax and Carr. Paid.* **£4.0.0** P. & P. 5/-

TRANSISTORS AND DIODES
OC26, 7/6; OC44, 3/6; OC45, 3/6; OC71, 3/-; OC72, 4/-; OC81, 3/6; OC81D, 3/6; OC82, 6/-; OC83, 3/6; OC169, 3/-; OC170, 7/-; OC171, 8/-; OC172, 8/6; AC127, 7/6; AF115, 8/6; AF116, 8/-; AF117, 5/-; AF118, 7/6; AF119, 7/6; WG4B, 9d.; OA81, 2/6; OA79, 2/6; OA85, 2/6; BY100, 4/-. *Post* 4d. any quantity.

BATTERY ELIMINATOR for Transistor Radios requiring 9v. Fully smoothed (5000+1000mfd). 5 x 3¾ x 1¾in. overall. Tapped input for 200/10, 220/30, 240/50v. Output 9v. at 100ma. Good Regulation. Price 25/-. (3/- P. & P.).

MAGNAVOX 2-TRACK TAPE DECK £10.17.6
4-TRACK TAPE DECK £12.15.0

GLADSTONE RADIO
66 ELMS ROAD, ALDERSHOT, Hants.
(2 mins. from Station and Buses). Aldershot 22240
CLOSED WEDNESDAY AFTERNOON
CATALOGUE 6d.
Bulk enquiries invited for Export.

FREE TO AMBITIOUS ENGINEERS
—THE LATEST EDITION OF ENGINEERING OPPORTUNITIES

Have you sent for your copy?
ENGINEERING OPPORTUNITIES is a highly informative 156-page guide to the best paid engineering posts. It tells you how you can quickly prepare at home for a recognised engineering qualification and outlines a wonderful range of modern Home Study Courses in all branches of Engineering. This unique book also gives full details of the Practical Radio and Electronic Courses, administered by our Specialist Electronics Training Division—the *B.I.E.T. School of Electronics*, explains the benefits of our Employment Dept. and shows you how to qualify for five years promotion in one year.

SATISFACTION OR REFUND OF FEE
Whatever your age or experience, you cannot afford to miss reading this famous book. If you are earning less than £30 a week, send for your copy of "ENGINEERING OPPORTUNITIES" today—FREE

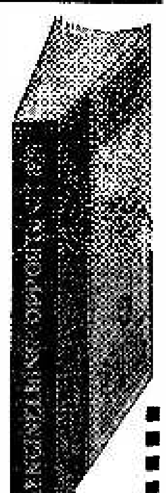
BRITISH INSTITUTE OF ENGINEERING TECHNOLOGY
344B, Aldermaston Court, Aldermaston, Berks.

WHICH IS YOUR PET SUBJECT?
Mechanical Eng.,
Electrical Eng.,
Civil Engineering,
Radio Engineering,
Automobile Eng.,
Aeronautical Eng.,
Production Eng.,
Building, Plastics,
Draughtsmanship,
Television, etc.

GET SOME LETTERS AFTER YOUR NAME
A.M.I.Mech.E.
A.M.I.C.E.
A.M.I.Prod.E.
A.M.I.M.I.
A.I.O.B.
B.Sc.
A.M.I.E.R.E.
City & Guilds
Gen. Cert. of Education
Etc., etc.

PRACTICAL EQUIPMENT
Basic Practical and Theoretic Courses for beginners in Radio, T.V., Electronics, etc., A.M.I.E.R.E., City & Guilds
Radio Amateur's Exam
R.T.E.B. Certificate
P.M.G. Certificate
Practical Radio
Radio & Television Servicing
Practical Electronics
Electronics Engineering
Automation

INCLUDING TOOLS!
The specialist Electronics Division of B.I.E.T. NOW offers you a real laboratory training at home with practical equipment. Ask for details.
B.I.E.T. SCHOOL OF ELECTRONICS

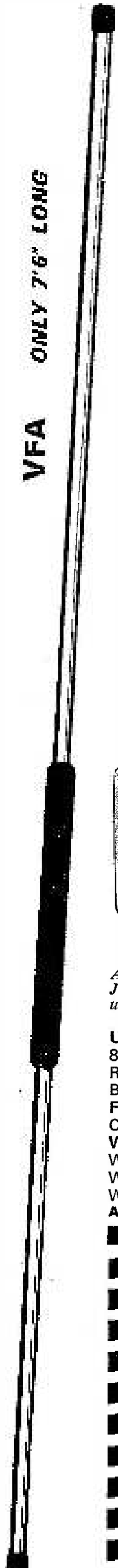


POST COUPON NOW!
Please send me your FREE 156-page "ENGINEERING OPPORTUNITIES"
(Write if you prefer not to cut page)
NAME..
ADDRESS..
....
....
SUBJECT OR EXAM THAT INTERESTS ME.. 344B

THE B.I.E.T. IS THE LEADING INSTITUTE OF ITS KIND IN THE WORLD

JOYSTICK

VFA *ONLY 7'6" LONG*

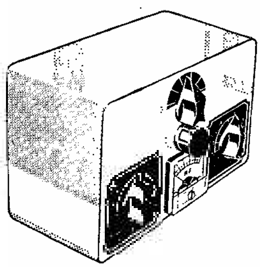


GUARANTEES

A SOLUTION TO ANTENNA PROBLEMS

The revolutionary JOYSTICK ANTENNA SYSTEMS now guarantee a satisfactory solution to all the problems of restricted space transmission and reception antennae. A completely new range of tuning units have been designed to allow the maximum possible efficiency with absolute simplicity of tuning and operation. For transmission on all amateur bands from 1·8 Mc/s to 30 Mc/s, for general short wave and broadcast reception and for commercial application (static and mobile). This *variable frequency antenna* system has been acknowledged as the most successful solution to a host of aerial problems. Over 5,500 are in use all over the world (as at July 1966).

Hundreds and hundreds of terrific testimonials may be seen at the Joystick Office—the selection shown here will prove the point.



Above: One of the new JOYMATCH 'EASY-TO-USE' units with built-in RF indicator

JOYSTICK VFA CAN BE HEARD ON THE BANDS EVERY DAY. START THE NEW SEASON WITH A POTENT SIGNAL. ORDER YOURS TODAY!

James C. Cox—Hull "I find it successful in all ways . . . am an avid SWL."

John Cramb—Eastbourne "Have indoor Joystick . . . am getting excellent results on my Codar CR45."

B.B. St. V. Moullin—Guernsey "Truly satisfied . . . GC-1U Mohican Rx performs with greater selectivity."

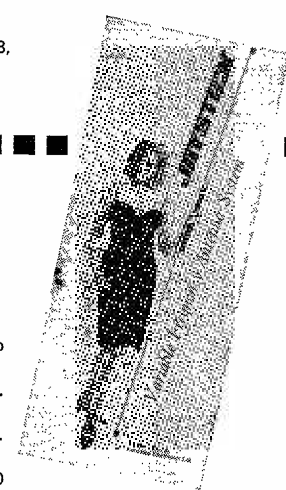
Raymond F. Bence—Cardiff "Joystick system certainly does its stuff."

UK AGENTS: G. W. Smith & Co. (Radio) Ltd., 3 Lisle Street, London, W.C.2; Brian J Ayres & Co., 8 Hartfield Road, Wimbledon, London, S.W.19; Stephens-James Ltd., 70 Priory Road, Liverpool, 4; Chas. H. Young Ltd., 170/172 Corporation Street, Birmingham, 4; or ask your local dealer.
France: Vareduc-Comimex, 2 Rue Joseph-Riviere, Paris. Courbevoie, France.
West Germany: Ing. Hannes Bauer, 86 Bamberg, Hornthalstrasse 8, West Germany; Dressing GmbH, 45 Osnabruck, Bohmter Str. 32, West Germany; Stotz & Goessl. 8 Munchen 15, Bayerstrasse 3, West Germany.
AND WORLD WIDE AGENCIES

THIS BROCHURE GIVES YOU THE FACTS AND ONLY THE FACTS!

SEND TODAY

PARTRIDGE ELECTRONICS LTD.
CAISTER HOUSE, PROSPECT ROAD, BROADSTAIRS, KENT



NAME.. CALL/BRS No

ADDRESS..

....

....10

Fully guaranteed Individually packed

VALVES

AC/HL 4/6	DK96 6/6	EF50 2/6	G1/236G 9/-	PEN200A3/-	TZ0520 4/-	Y65 4/-	5R4GY 9/-	6F6G 4/-	7H7 7/3	30P12 10/-	1616 3/-
ACP4 6/-	DL92 4/-	EF52 6/-	G1/370K 20/-	PFL200 17/6	TZ20 16/-	Y66 8/-	5T4 7/-	6F7 6/-	7Q7 7/-	30P19 15/-	1619 5/-
AC6PEN 5/-	DL93 4/-	EF53 4/6	G50/2G 5/-	PL36 9/-	U81 18/-	Z800U 20/-	5U4G 4/6	6F8G 6/6	7S7 18/-	30PL1 8/-	1625 6/-
AL60 5/-	DL94 5/9	EF55 8/-	G180/2M 15/-	PL38 16/-	U12/4 8/-	Z801U 10/-	5V4G 8/-	6F12 4/6	7V7 5/-	30PL13 27/6	1626 3/-
ARP3 3/-	DL96 7/-	EF71 7/6	GM4 45/-	PL81 7/-	U17 5/-	1A3 8/-	5X4G 8/6	6F13 5/-	7Y4 8/-	3516GT 7/-	1629 4/6
ARP12 2/6	DLS10 8/-	EF72 5/-	GZ32 10/-	PL82 6/6	U18 6/-	1A5GT 5/-	5Y3G 4/6	6F14 5/-	7Z4 4/6	35T 17/6	2051 5/-
ARP24 3/6	DY86 7/6	EF73 5/-	GZ34 10/-	PL83 6/-	U25 11/-	1B22 30/-	5Y3GT 5/-	6F32 4/-	8D2 2/6	35W4 5/-	4043C 13/6
AR8 5/-	E80F 23/-	EF74 4/-	HK54 22/6	PL84 6/6	U26 11/-	1C5GT 6/-	5Y3WGTB 9/-	6F33 3/-	9D2 3/-	35Z3 10/-	4063 8/-
ARTP1 6/-	E88CC 12/-	EF80 5/-	HL2K 2/6	PL500 15/-	U27 8/-	1D8GT 6/-	5Z4G 6/6	6G6G 2/6	9D6 3/6	35Z4GT 6/-	4313C 30/-
ATP4 2/3	E90CC 10/-	EF81 6/-	HL23 6/-	PM24A 5/-	U50 4/6	1E7G 7/6	5Z4GT 8/-	6H6M 1/6	10F9 9/-	35Z5GT 6/-	5704 9/-
ATP7 5/6	E1148 2/6	EF85 4/6	HL23DD 5/-	PT15 10/-	U52 4/6	1F2 3/-	6AB6 4/-	6J4WA 10/-	12A6 2/6	37 4/-	5726 6/-
AU7 55/-	E1266 50/-	EF86 6/6	HL41 4/-	PT25H 7/6	U191 11/6	1G6GT 6/-	6AC7 2/-	6J5 6/-	12AH7 5/-	38 4/-	6060 5/-
AZ31 9/-	E1415 30/-	EF89 5/-	HVR2 9/-	PT25M 7/6	U801 17/-	1L4 2/6	6AG5 2/6	6J5G 2/-	12AT6 5/-	215SG 6/-	6064 7/-
B6H 15/-	E1524 12/6	EF91 3/6	K3A 60/-	PX4 14/-	UABC80 6/-	1LA6 6/-	6AG7 6/-	6J6 3/6	12AT7 4/-	50CD6G 27/6	6065 6/-
BD78 40/-	EA50 1/-	EF92 2/-	KT8C 22/-	PX25 9/-	UAF42 9/-	1LC6 7/-	6AH6 10/-	6J6W 6/-	12AV6 5/6	50L6GT 8/-	6080 22/-
BL63 10/-	E173 7/-	EF95 5/-	KT32 8/-	PY33 6/-	UBC41 6/-	1LH4 4/-	6AJ7 2/-	6J7G 5/-	12AU7 5/-	53A 7/6	6146 25/-
BS4 8/-	EABC80 5/9	EF183 8/-	KT44 5/9	PY80 5/6	UBF80 5/6	1N21B 4/-	6AK5 5/-	6J7M 8/-	12AT7WA 5/6	57 6/-	7193 1/9
BS5 20/-	EA91 3/6	EF184 8/-	KT33 4/-	PY81 5/6	UBF89 6/6	1N43 4/-	6AK7 6/-	6K6GT 5/6	12AX7 6/-	58 6/-	7475 2/-
BS84 37/6	EAF42 8/-	EH90 7/6	KT66 16/-	PY82 5/6	UBL21 10/-	1N70 4/-	6AL5 3/-	6K7G 2/-	12AY7 10/-	59 6/-	8013A 25/-
B2134 16/-	EB34 1/6	EHT1 300/-	KT67 15/-	PY83 6/-	UCC85 6/6	1R4 5/-	6AL5W 7/-	6KJGT 4/9	12BA6 5/-	75 5/6	8020 8/-
BT19 25/-	EB91 3/-	EL32 3/9	KY76 8/6	PY800 8/-	UCH42 8/-	1R5 3/6	6AM5 2/6	6K8G 3/-	12BE6 7/-	76 5/-	9001 3/-
BT35 25/-	EBC23 6/-	EL34 10/-	KT88 22/-	PZ1-35 9/-	UCH81 6/-	1S4 5/-	6AM6 4/-	6K8GT 8/3	12BH7 7/-	77 6/6	9002 4/6
BT45 150/-	EBC41 8/6	EL36 5/-	KTW61 4/6	PZ1-75 12/-	UCL82 8/-	1S5 4/6	6AQ5 7/-	6K8M 6/6	12C8 3/-	78 5/-	9003 6/-
BT83 35/-	EBC81 5/-	EL38 17/6	KTW63 2/-	QP21 6/-	UCL83 9/-	1T4 3/-	6AQ5W 9/-	6L5G 6/-	12H6 2/-	80 5/6	9004 2/6
CC3L 2/-	EBF80 6/6	EL41 8/-	KTZ41 6/-	QP25 5/-	UF41 8/6	2A3 5/-	6AS6 4/-	6L6GA 7/6	12J5GT 2/6	81 9/-	9006 2/6
CF23 10/6	EBF83 7/6	EL42 8/-	KTZ63 5/-	QP230 5/-	UF89 6/-	2C26 7/-	6AS6W 9/-	6L6M 11/-	12J7GT 6/6	84 8/-	C.R. Tubes
CV71 3/-	EBF89 6/9	EL50 8/-	M8100 9/-	QS95/10 5/6	UL41 7/6	2C26A 3/-	6AS7G 20/-	6L7G 4/-	12K7GT 2/-	85A2 8/-	E4504/B/16 28/-
CV77 5/-	EBL31 20/-	EL81 8/-	M8141 12/-	QS150/15 10/-	UL84 5/6	2C34 2/6	6AT6 4/-	6L34 4/6	12K8M 10/-	210VPT 7-pin 2/6	VCR97 28/-
CV102 1/-	EC52 4/-	EL84 5/-	M8161 7/-	QS1202 8/-	UU5 7/-	2C45 22/6	6AU6 7/-	6LD20 5/9	12Q7GT 3/3	220PA 7/-	VCR138A 40/-
CV103 4/-	EC53 12/6	EL85 8/-	MH4 5/-	QV04/7 8/2	UU9 8/6	2C46 30/-	6AX4 8/-	6N7 6/-	12SA7 7/-	220TH 4/-	VCR517 35/-
CV4004 7/-	EC70 4/-	EL91 4/6	MHLD6 10/-	R3 8/-	UY21 7/6	2C51 12/-	6B4G 16/-	6N7G 5/9	12SC7 4/-	225DU 9/-	VCR517B 40/-
CV4014 7/-	EC90 2/-	EL95 5/-	ML6 6/-	R10 9/-	UY41 6/6	2D21 5/-	6B7 6/-	6P25 12/6	12SG7 3/-	307A 5/6	VCR517C 40/-
CV4015 5/-	EC91 3/-	EL360 20/-	N78 15/-	RG4/1250 60/-	UY85 5/-	3A4 4/-	6B8G 2/6	6Q7G 5/-	12SH7 3/-	310C 25/-	3FP7 45/-
CV4025 10/-	ECC81 4/-	EM80 6/-	NE17 7/-	RK72 6/-	V1120 4/-	3A/108A 20/-	6BA6 5/-	6R7 5/6	12S7J 5/-	350B 8/-	3EG1 40/-
CV4049 6/-	ECC82 5/-	EM81 7/6	OA2 5/9	SL30P 15/-	V1507 5/-	3A/46J 35/-	6BA7 5/-	6SA7 7/-	12SK7 5/-	357A 7/-	5PC1 30/-
CY31 6/6	ECC83 6/-	EM84 6/3	OB2 6/-	SL30 12/6	V1924 20/-	3A/167/M 25/-	6BE6 6/-	6SA7GT 6/6	12SN7GT 5/9	368A 5/-	5FP7 12/6
D1 1/6	ECC84 5/6	EN31 10/-	OB3 7/-	SP2 8/6	VP23 3/-	3B7 5/-	6BJ6 7/6	6SC7 7/-	12SR7 5/-	393A 15/-	88D 44/-
D41 6/-	ECC85 6/6	ESU74 80/-	OC3 5/-	SP41 1/6	VP133 9/-	3B24 5/-	6BJ7 7/-	6SG7GT 5/-	12Y4 2/-	446A 8/-	Photo Tubes
D61 6/-	ECC88 9/-	ESU208 6/-	OD3 5/-	SP61 1/6	VR99 8/-	3D6 4/-	6BQ7A 8/-	6SFGT 5/6	12L7 7/-	703A 30/-	GS16 12/6
D77 3/3	ECC91 4/-	EY51 5/6	OZ4A 5/-	SP210 6/6	VR105/30 5/-	3E29 50/-	6BR7 9/-	6SH7 6/-	14S7 18/-	705A 10/-	931A 55/-
DA30 12/6	ECC189 9/6	EY86 6/6	PC86 9/-	STV280/40 12/6	VR150/30 5/-	3Q4 6/-	6BW6 8/-	6SJ7 5/-	15D2 6/-	715B 60/-	6097 350/-
DAF96 6/-	ECF82 7/-	EY91 3/-	PC88 9/-	SU2150A 10/-	VU33A 4/-	3Q5GT 7/-	6C4 2/-	6SJ7G 6/6	19E2 15/-	717A 3/-	Special Valves
DD41 4/-	ECH42 9/-	EZ40 6/6	PC97 9/6	S11E12 10/-	VU39 6/-	3S4 5/-	6C5G 2/6	6SK7GT 4/-	19G3 20/-	724A 15/-	ACT6 £8
DET5 8/-	ECH81 5/-	EZ41 6/6	PC900 12/-	T41 10/-	VX3208 5/-	3V4 5/9	6C5GT 6/-	6SK7 4/6	19G7 5/-	801 6/-	K301 £4
DET20 2/-	ECH83 7/6	EZ80 5/6	PCC84 6/-	TDOX-20 70/-	VX3256 4/-	3X2 3/-	6C6 4/-	6SL7GT 5/6	19H1 6/-	803 22/6	KRN2A £3.10.0
DET25 15/-	ECL80 6/-	EZ81 4/6	PCC89 10/-	TP22 5/-	VX8122 5/-	4C27 35/-	6C6G 3/-	6SN7 3/6	19M1 5/-	807 8/-	1B24 25/-
EF73 5/-	ECL82 7/6	F/6057 5/-	PCC189 9/6	TP25 15/-	VX8124 5/-	4D1 4/-	6C8G 3/-	6SQ7GT 6/-	20P4 12/6	808 8/-	2J22 £2.10.0
DF91 3/-	ECL83 10/-	F/6061 5/-	PCF80 7/-	TT11 5/-	W21 5/-	5A173G 5/-	6CH6 4/6	6SS7 2/-	21B6 9/-	813 65/-	2J54 £3
DF92 3/-	ECL86 9/-	F/6063 4/-	PCF82 6/6	TT15 35/-	W118 10/-	5A174G 5/-	6C21 80/-	6U4GT 9/6	25L6GT 5/-	815 35/-	417A 30/-
DF96 6/-	EF36 3/4	FW4/500 6/6	PCF84 6/-	TTR31 45/-	W119 8/-	5B251M 40/-	6CL6 9/-	6V6G 5/-	25Y5 6/-	829B 50/-	3J/92/E £37.10.0
DH63 5/-	EF37A 7/-	FW4/800 8/6	PCF86 8/-		X66 7/6	5B/253M 15/-	6CW4 12/-	6V6GT 7/6	25Z4G 6/6	830B 4/-	714AY £4
DK92 8/-	EF40 8/-		PCF802 11/-		X81M 18/-	5B254M 40/-	6D6 3/-	6V6M 8/-	25Z5 7/6	832A 45/-	725A 30/-
			PCF805 11/-		X118 8/-	5B255M 35/-	6E5 6/-	6X4 3/6	25Z6GT 8/6	843 5/-	726A 19/-
			PCL81 9/-		X145 8/-		6F5GT 5/9	6X5G 5/-	25D7 6/-	866A 14/-	
			PCL82 7/-		Y63 5/-			6Z5GT 5/3	30 5/-	884 10/-	
			PCL83 8/6					6Y6G 6/-	30C15 9/6	954 4/6	
			PCL84 7/-					6-30L2 10/-	30C18 11/-	955 2/6	
			PCL85 8/6					6Z4 5/-	30F5 8/6	956 2/-	
			PCL86 8/-					7B7 7/6	30FL1 10/6	957 5/-	
			PEN25 4/6					7C5 10/-	30L15 11/-	958A 4/-	
			PEN46 3/-					7C6 7/-		1612 5/-	
								7C7 6/-			

MANY OTHERS IN STOCK include Cathode Ray Tubes and Special Valves. U.K. Orders below £1 P. & P. 1/-; over £1, 2/-; over £3, P. & P. free C.O.D. 3/6 extra. Overseas Postage extra at cost.

PANEL METERS

0-3 amp RF	2in. square	20/-
100mA AC	$3\frac{1}{2}$in. round	25/-
15v AC	$2\frac{1}{2}$in. round	20/-
150v AC	$2\frac{1}{2}$in. sq. (black dial)	25/-

2 KW 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 2 kw., average output 500 w Completely new with valves and manual £65, carriage paid U.K.

LARGE SELECTION of mains and Heavy Duty L.F. TRANSFORMERS.

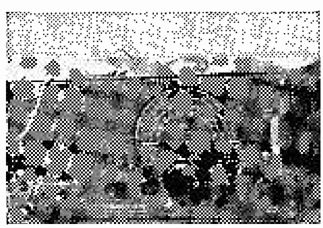
VARIOMETER for No. 19 sets, **17/6.** P. & P. 3/-.

MARCONI SIGNAL GENERATOR TYPE TF 801B/3/S. Frequency range 12-485 Mc/s. in five ranges. Directly calibrated frequency dial. Output waveform: C.W. sinewave A.M., pulse A.M. (from ext. source only). Internal modulation frequency 1,000 c/s. Output: a, normal—continuously variable directly calibrated from 0.1μ v.—0.5 v. b, high: up to 1 v. modulated or 2 v. unmodulated, output impedance 50 ohms. Fine frequency tuning control, carrier on/off switch, built-in crystal calibration for 2 Mc/s and 10 Mc/s. Stabilised voltage supply. In excellent "as new" condition. Fully checked and guaranteed. **£115.** Carr. 30/-. Including necessary connectors, plugs and instruction manual.

C.R. 100 RECEIVER. 60kc—420kc,—500kc—13mc. In 6 bands, 2 HF stages, 3 IF stages, AVC on both phone and CW. Excellent condition, correctly tuned and guaranteed, **£31.** Carr. 30/-.

MARCONI VALVE VOLT METER TYPE TF 428-B. 1.5v to 150v RMS in five ranges. A.C. and D.C. stabilised power supply. Complete with probe unit for RF measurements. In new condition and Laboratory tested **£12.10.0.** Carriage 10/-.

WELL PROVEN RELIABLE COMMUNICATION RECEIVER P.C.R.3



(Made by Pye). 3 bands, 1: medium wave, 2: 120-43m 3: 43-13m. Overall sensitivity 1-2μV. S/Noise ratio 10 dB at 6μV. Circuit incorporates an RF stage, two I.F. stages, tone control, A.V.C. antenna trimmer. 6V6 output. Set in new condition together with headphones and speaker plug, **£9.5.6.** With vibratory supply unit, 12v, **£10.4.0.** With specially built-in P.S.U. for 210-250v. A.C., **£11.17.6.** Carriage either set 10/-.

SPARES FOR AR 88 D RECEIVERS

Ask for your needs from our huge selection.

P. C. RADIO LTD.

170 GOLDHAWK RD., W.12

SHEpherd's Bush 4946

Open 9 - 5.30 p.m. except Thursday 9 - 1 p.m.

PERSONAL CALLERS WELCOME

TRANSISTORS

OC16 20/-	OC81D 5/-	OC201 12/6	XC141 10/-
OC22 23/-	OC81M 7/-	OC202 15/-	XC142 15/-
OC25 12/-	OC82 10/-	OC203 12/6	XC155 20/-
OC35 12/6	OC82DM 5/-	OC204 17/6	XC156 22/6
OC44 6/-	OC83 5/-	OC206 22/6	2N247 9/6
OC45 5/-			2N412 7/6
OC71 4/6	OC83B 5/-	AAZ12 6/-	2N502 47/-
OC72 6/-	OC122 16/-	AC128 7/6	2N585 10/6
OC73 10/-	OC170 6/-	BCZ11 7/6	2N1090 20/6
OC81 5/-	OC200 10/6	BY38 7/6	2N1091 29/-

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

A.R.88D. RECEIVERS. Fully reconditioned, **£55.** Rebuilt model, **£85.** Carriage paid U.K.

ULTRA MODERN POWER SUPPLY UNIT. Supply voltage A.C.: 105, 110, 115, 200, 205, 210, 220, 225, 230, 240, 245, 250 v. Available voltages D.C.:
(a) 1700-1900 v. Stabilised, adjustable approx. 1 mA.
(b) HT2 approx. 45mA.
(c) 260-350 v. stabilised, adjustable, approx. 45 m.
(d) 450 v. approx. 30 mA.
(e) 50 v. approx. 150 mA.
(f) 4.5 v. A.C. amp. common earth.
(g) 6.3 v. A.C., 4.5 amp. common earth.
5 valves, 7 silicon rectifiers, 4 Selenium HV rectifiers. Brand new, **£9.10.0.** Carriage 12/-.

PHASE MONITOR ME-63/U. Manufactured recently by Control Electronics Inc. Measures directly and displays on a panel meter the phase angle between two applied audio frequency signals within the range from 20-20,000 cps to an accuracy of $\pm 1.0°$. Input signals can be sinusoidal or non-sinusoidal between 2 and 30v peak. In excellent condition together with handbook and necessary connector **£45.** Carriage 30/-

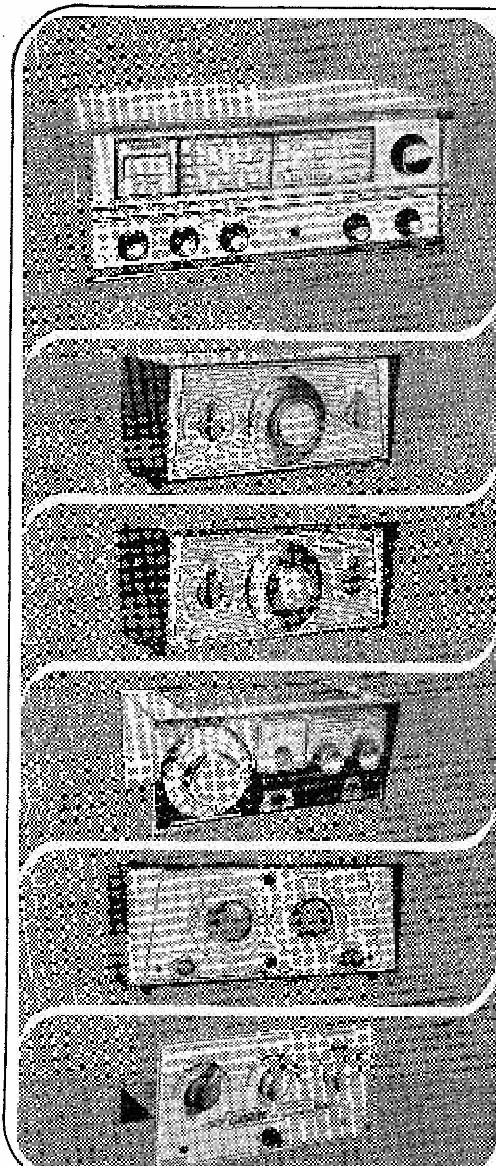
H.R.O. SENIOR TABLE MODEL TYPE M (50 KCS-30 MCS) with "S" meter and crystal filter in excellent, fully checked and tested condition together with set of 8 general coverage coils and original mains P.S.U. for 110/210v., **£26.10.0.** Carriage and packing 30/-.

RACK MODEL also available at the same price.

EDISWAN SEALED RELAYS TYPE H 96 C. 145 ohms plus 145 ohms, **12/6.** P. & P. 2/-.

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

CODAR — QUALITY



ANOTHER CODAR TRIUMPH!

THE NEW 1966 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-QOIL** 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.

CODAR R.F. PRE-SELECTOR MODEL P.R.30. Considerably improves the performance of any superhet receiver over 1.5-30 Mc/s. Uses EF183 Frame Grid Valve, and provides up to 20dB gain plus substantial image rejection, improved signal/noise ratio and selectivity. Selector switch for either dipole or single wire antenna. Power requirements 180-250 volts 12mA H.T. 6.3 volts, .3 amp L.T. Size 8½ x 5 x 4in. Ready built, complete with cables, plugs and instructions, **£5.10.0.** Carr. 3/6. **MODEL P.R.30X.** Self powered model for 200-250v. A.C. Also provides 25mA at 200v. H.T. and 6.3v. 1 amp L.T. for other accessories **£7.4.0.** Carr. 3/6.

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. 3/6. **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 3/6.

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/-. **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 5½ 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. 5/6. 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.

Send 6d. in stamps for illus. leaflets of the Codar range ● H.P. terms available ● World-Wide Mail Order Service

CRC

CODAR RADIO COMPANY

BANK HOUSE, SOUTHWICK SQUARE

SOUTHWICK, SUSSEX. Tel. 3149

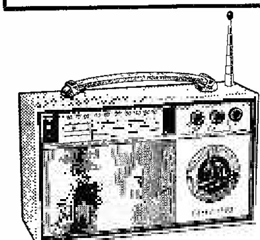
G3IRE G3HGQ

Canada: Codar Radio of Canada, Tweed, Ontario

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

TRANSISTOR PORTABLES

We consider our Construction Parcels to be the finest value available on the home construction market. If on receipt you feel not competent to build the set, you may return it as received within 7 days, when the sum paid will be refunded less postage.



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 Diode. Uses 4 U2 batteries. 5in. Ceramic Magnet P.M. Speaker. Easy to read Dial Scale, 500 MW Output. Telescopic Aerial and Ferrite Road 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: **45/-** deposit and 11 monthly payments of **14/2**. Total H.P.P. **£10.0.10**

★ 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.

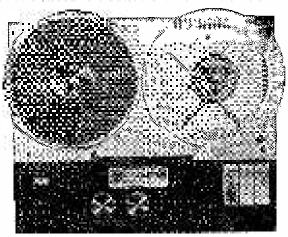
Only **10/-** extra Post Free.

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

Data 2/6 extra: Refunded if you purchase the parcel. **Four U2** batteries 3/4 extra. All components available separately.

TAPE RECORDERS

MAGNAVOX-COLLARO 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 13¼ x 11in. x 5¼in. 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.

THE "ARROW" DICTATION TAPE RECORDER

High Quality British Manufacture: Fully transistorised ● Battery operated ● Simple Cassette loading and single control lever (cassette takes 3in. spools giving 2×22 mins. twin track recording and 3¼in. spools giving up to 2×30 mins.) ● Volume control ● Accidental erasure safety device ● Fast rewind ● Operates on 4 U2 type batts. ● Strong two-tone plastic case size 9in.×6in.×3¼in., with transparent cover. ● Fully guaranteed ● *Complete with all these accessories:* * Cassette with 3in. spools and tape. * Microphone with lapel clip and remote pause control (doubles as speaker on replay). * Stethoscope type headset. * Telephone adaptor. * Foot Switch. * Desk speaker. * Reference pad. List price £31.

LASKY'S PRICE £7 . 19 . 6

Carriage 5/-, 4 long life Rayovac Batt. 6/- extra.

INTERNATIONAL TAPE

Famous American Brand—Fully Guaranteed

3in.	Message tape, 150ft.	2 6
3in.	Message tape, 225ft.	3 9
3in.	Message tape, 300ft.	7 6
3¼in.	Triple play, 600ft. Mylar	10 0
4in.	Triple play, 900ft. Mylar	17 6
5in.	Double play, 1200ft. Mylar	15 0
5in.	Long play, 900ft. Acetate	10 0
5in.	Standard play, 600ft. PVC	8 6
5in.	Triple play, 1800ft. Mylar	35 0
5¾in.	Double play, 1800ft. Mylar	22 6
5¾in.	Long play, 1200 ft. Acetate	12 6
5¾in.	Standard play, 850ft. PVC	11 6
5¾in.	Long play, 1200ft. Mylar	15 0
5¾in.	Triple play, 2400ft. Mylar	45 0
7in.	Standard play, 1200ft. Acet.	12 6
7in.	Standard play, 1200ft. Mylar	12 6
7in.	Long play, 1800ft. Mylar	19 6
7in.	Double play, 2400ft. Mylar	25 0
7in.	Long play, 1800ft. Acetate	15 0
7in.	Triple play, 3600ft. Mylar	58 6

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

CONSTRUCTORS BARGAINS

SPECIAL PURCHASE—UHF/VHF TV TUNERS

Well known British makers surplus stocks. Now available for the first time to the Home Constructor.

TRANSISTORISED UHF MINIATURE MODEL

Shielded metal case only 3½ x 1½ x 3in. Fully tunable—complete with two AF139 transistors. LASKY'S PRICE **39/6**

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 **17/6**

TRANSISTORISED VHF MODEL 1

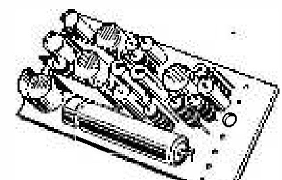
Miniature turret type fitted with 12 sets of coils and 3 Mullard AF102 transistors. In metal case size 4 x 2 x 3¼in. LASKY'S PRICE **29/6**

TRANSISTORISED VHF MODEL 2

Sub-Miniature turret type fitted with 12 sets of coils and 3 Mullard AF102 transistors. In metal case size 3 x 1½ x 2¼in LASKY'S PRICE **37/6**

Add 2/6 Post and Packing on each.

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 desgined 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. 40Ω, 2 x 1 x ¾in. .... PRICE **27/6**

TYPE LRPC 2. 5 transistor. Input sens. 1mV, output 330mW, output imp. 15Ω, size 2½ x 1½ x ¾in. .... PRICE **22/6**

TYPE LRPC 3. 5 transistor. Input sens. 5mV, output 400mV, output imp. 15Ω, size 2½ x 1½ x ¾in. .... PRICE **25/-**

TYPE LRPC 4. 5 transistor, Input sens. 150mV, output 330mW, output imp. 15Ω, size 2½ x 1½ x ¾in. .... PRICE **22/6**

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

TYPE LRPC 7. 6 transistor. Input sens. 8mV, output 1W, output imp. 8Ω, size 3 x 1¾ x ¾in. .... PRICE **39/6**

FULLY ENCAPSULATED MODULES

Special function modules—all one size 1⅝ 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. 3Ω output imp. .... PRICE **30/-**

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

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

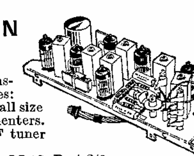
TYPE MT-1. Metronome module—provides audible and visual beat from 30 to 240 beats per minute (for use with 3Ω speaker or indicator lamp). .... PRICE **22/6**

SINCLAIR SUPER MINIATURE KITS

Write for details of Package Deals

THE MICRO-6 miniature radio only 1⅘ x 1³⁄₁₀ x 1½in.	£2 19 6
THE SLIMLINE 2-transistor pocket radio	£2 9 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

MAKER'S SURPLUS TELEVISION IF AMPS



38 Mc/s. Contains a large number of components, IF transformers, resistors, capacitors etc., and the following valves: 2 x PCF80, 1 x EB91, EF80, EF183 and EF184. Overall size 11½ x 3¾ x 4in. deep. Ideal for servicemen and experimenters. This IF amp. when used with the valve model UHF tuner (above) provides a suitable conversion for BBC2. No circuit available. LASKY'S PRICE **39/6** Post 2/6

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 1½ in. 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. ± 1c/s.
TF—01B 465 kc/s. ± 2 kc/s.
TF—01D 470 kc/s. ± 2 kc/s.

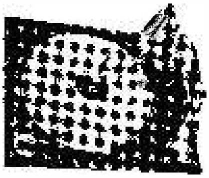
7/6 each
Post 6d.

LASKY'S RADIO FOR FINEST VALUE and COURTEOUS SERVICE

SERVICE IN GREAT BRITAIN AND HI-FI ENTHUSIASTS

LASKY'S RADIO

RECORD PLAYERS



B.S.R. AUTOCHANGERS

AT LOWEST EVER PRICES

Brand new and fully guaranteed—complete with cartridge and stylus.

UA14 4 speed mains model £4. 9.6
UA16 4 speed mains model £4.19.6
UA16 9v. battery model £5.19.6
UA20 4 speed mains model £5.19.6
Add 5/- carriage and packing on each.

GARRARD AUTOCHANGERS *NEW LOW PRICES!*

Auto-Slim Mono	£4 19 6
AT6 Mono	£8 19 6
AT6 Stereo	£9 9 0
3000LM with stereo cartridge	£7 19 6
SP25 Mono	£9 19 6
SP25 Stereo	£10 19 6
AT60 with stereo cartridge ..	£10 19 6
A70 less cartridge	£19 19 0
A50 less cartridge	£9 14 6
A1000 with GC8 cartridge ..	£6 6 0
A2000 with GC8 cartridge ..	£6 6 0
SRP12 with cartridge	£4 7 6
SRP10 Mains, with cartridge..	£4 19 9
SRP10 Battery, with cartridge	£4 19 6

GARRARD BASES

WB1	£3 12 8
WB2	£5 0 3

Postage and Packing on all above 5/-.

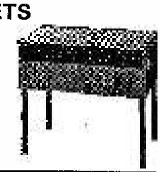
GREENCOAT RECORD PLAYER

2 speed model for $33^1/_3$ and 45 r.p.m. 6v. Battery operated Complete with pick-up and fitted with crystal cartridge. Size only 7½ × 6in. Fitted with auto. stop and start.

LASKY'S PRICE 59/6 Post 2/6

SPECIAL INTEREST ITEMS!

HIGH QUALITY EQUIPMENT CABINETS



Designed to take the Magnavox 363 Tape Deck and the Princess Auto Record Changer with space for amplifier and speaker (the motor board is ready cut out for the deck and changer). Soundly constructed from solid Afromosia wood with natural oiled finish. Removable hinged lid. Removable metal legs. Internal dimensions 26½ x 14½ x 5in. depth below motor board plus 4in. deep lid—16in. legs. Post 7/6.

LASKY'S PRICE £4.19.6

MARTIN HI-FI AUDIOKITS

Using specially developed circuits, the very latest transistors and printed circuits—these kits are all fully checked and tested before leaving the factory.

KIT 1.	5 stage Matching Input Selector Unit..............	LASKY'S PRICE £2/7/6
KIT 2.	Pre-amplifier with volume control	LASKY'S PRICE £1/17/6
KIT 3.	3-Channel Mixer, with plug-in adaptors for individually matching each circuit. Adaptors 8/6 each	LASKY'S PRICE £3/19/6
KIT 4.	Pre-amplifier with tone/volume control stages	LASKY'S PRICE £3/2/6
KIT 5.	10 and 3 watt Main Amplifier	LASKY'S PRICE £5/12/6
KIT 6.	Power supply Converter Unit	LASKY'S PRICE £2/12/6
KIT 7.	15 ohm version of Kit 5	LASKY'S PRICE £6/12/6
KIT 8.	Power supply for Kit 7	LASKY'S PRICE £2/15/-

THE HARROW POWER PACK

Battery eliminator for portable radios, etc. Converts your Battery radio to A.C. mains Replaces 4½v., 6v. and 9v. batts. Size only 3 x 2 x 2½in. State voltage required when ordering.

LASKY'S PRICE 29/6 Post 2/-

207 EDGWARE ROAD, LONDON, W.2 Tel. PAD 3271
118 EDGWARE ROAD, LONDON, W.2 Tel. PAD 9789
33 TOTTENHAM CT. RD., LONDON, W.1 Tel. MUS 2605
All the above branches open all day Saturday. Early closing Thursday.

42 TOTTENHAM CT. RD., LONDON, W.1 Tel. LAN 2573
152/3 FLEET STREET, LONDON, E.C.4 Tel. FLE 2833
Both open all day Thursday. Early closing Saturday.

Mail Orders and correspondence to 3-15 Cavell Street, Tower Hamlets, London, E.1. Tel.: STEpney Green 4821/2

LASKY'S FOR SPEEDY MAIL ORDER SERVICE

VALVES

SAME DAY SERVICE
NEW! TESTED! GUARANTEED!

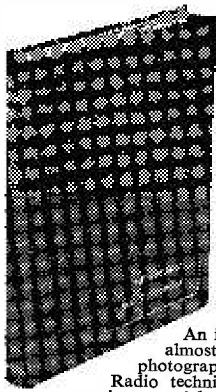
SETS 1R5, 1S5, 1T4, 3S4, 3V4, DAF91, DF91, DK91, DL92, DL94. Set of 4 for 16/-. DAF96, DF96, DK96, DL96, 4 for 24/6

1A7GT	7/6	10F1	9/9	DH77	4/-	EF91	3/6	PEN383	9/6	UCH81	6/6
1H5GT	7/3	10P13	8/6	DH81	12/6	EF92	2/3	PFL200	14/6	UCL82	7/3
1N5GT	7/9	12AT7	3/9	DK32	7/9	EF97	7/6	PL36	9/6	UCL83	8/9
1R5	4/9	12AU6	4/9	DK91	4/9	EF183	6/9	PL81	6/9	UF41	8/-
1S4	4/9	12AU7	4/9	DK92	8/-	EF184	6/9	PL82	5/6	UF80	6/3
1S5	3/9	12AX7	4/9	DK96	6/6	EL33	6/6	PL83	6/-	UF89	5/9
1T4	2/9	12K7GT	3/6	DL33	6/9	EL38	11/9	PL84	6/3	UL41	8/9
3Q4	5/6	12K8GT	8/6	DL35	5/-	EL41	7/9	PL500	14/-	UL44	15/-
3S4	4/9	12Q7GT	3/6	DL92	4/9	EL42	7/9	PL801	7/6	UL84	5/9
3V4	5/6	20F2	9/-	DL94	5/6	EL84	4/9	PX25	7/9	UY21	8/9
5U4G	4/6	20L1	11/9	DL96	6/-	EL90	4/9	PY32	9/-	UY41	4/9
5Y3GT	4/11	20P1	9/-	DY86	6/9	EL95	5/-	PY33	9/-	UY85	4/9
5Z4G/GT	6/9	20P3	10/9	DY87	6/9	EM80	5/9	PY80	5/3	VP4B	11/-
6/30L2	9/6	20P4	13/6	EABC80	6/-	EM81	7/3	PY81	5/3	VP1321	21/-
6AL5	2/3	25U4GT	11/6	EAF42	7/6	EM84	5/9	PY82	5/-	W76	3/6
6AM6	3/6	30C15	9/3	EB41	4/-	EM87	6/6	PY83	5/9	W77	2/9
6AQ5	4/9	30C18	8/-	EB91	2/3	EY51	6/3	PY800	6/6	Z77	3/6
6AT6	4/-	30F5	7/3	EBC33	6/-	EY86	6/-	PY801	6/6	Transistors	
6BA6	4/6	30FL1	10/6	EBC41	7/-	EZ40	6/3	R19	7/6	AC107	13/6
6BE6	4/3	30L15	11/-	EBF80	6/-	EZ41	6/6	R20	12/9	AC127	9/6
6BJ6	5/6	30L17	12/-	EBF89	5/9	EZ80	3/9	TH21C	9/6	AD140	17/6
6BW6	7/9	30P4	13/6	ECC40	6/9	EZ81	4/-	TH233	6/6	AF102	18/-
6F13	3/6	30P12	9/-	ECC81	3/9	KT61	6/6	U25	9/-	AF115	6/9
6F14	9/-	30P19	13/6	ECC82	4/9	KT63	4/-	U26	8/9	AF116	6/9
6F23	9/9	30PL1	11/9	ECC83	7/-	N18	5/6	U33	13/6	AF117	5/-
6K7G	1/6	30PL13	10/9	ECC84	6/3	N78	14/9	U47	8/6	AF118	16/6
6K8G	4/3	35L6GT	6/3	ECC85	5/6	PC97	6/9	U49	9/6	AF124	9/6
6K8GT	7/6	35W4	4/6	ECF80	7/6	PCC84	5/6	U52	4/6	AF125	9/-
6L18	7/6	35Z4GT	4/6	ECF82	6/9	PCC89	9/-	U78	3/6	AF126	8/6
6Q7G	5/6	85A2	5/9	ECF86	10/9	PCC189	9/-	U191	9/9	AF127	8/6
6Q7GT	7/6	185BT	20/-	ECH35	6/-	PCF80	6/6	U301	10/9	OC22	17/6
6SL7GT	4/9	6063	12/6	ECH42	9/-	PCF82	6/9	U801	15/9	OC25	10/-
6V6G	3/6	AZ31	8/9	ECH81	5/9	PCF86	8/3	UABC80	5/9	OC26	6/9
6V6GT	5/6	B36	4/6	ECH84	9/-	PCF800	10/6	UAF42	7/9	OC44	4/3
6X4	3/6	B729	10/-	ECL80	6/-	PCF801	9/6	UBC41	6/9	OC45	3/3
6X5GT	6/3	CY1	12/6	ECL82	6/9	PCF805	8/-	UBF80	6/-	OC71	3/6
7B6	10/6	DAC32	7/3	ECL86	7/9	PCL82	6/9	UBF89	5/9	OC72	4/9
7B7	7/9	DAF91	3/9	EF39	3/9	PCL83	9/-	UBL21	9/-	OC75	5/9
7C5	8/9	DAF96	6/-	EF41	6/3	PCL84	7/6	UC92	5/6	OC81	3/6
7H7	5/-	DF33	7/9	EF80	4/9	PCL85	7/6	UCC85	6/6	OC81D	3/6
7Y4	5/-	DF91	2/9	EF85	5/-	PCL86	8/6	UCF80	8/3	OC82	5/9
9BW6	6/6	DF96	6/-	EF86	6/9	PENA4	6/9	UCH21	8/-	OC82D	5/6
10C2	11/6	DH76	3/6	EF89	4/6	PEN36C	15/-	UCH42	8/9	OC170	7/6

READERS RADIO

85 TORQUAY GARDENS, REDBRIDGE, ILFORD, ESSEX. CRE 7441

Postage on 1 valve 9d. extra. On 2-valves or more, postage 6d. per valve extra. Any Parcel Insured against Damage in Transit 6d. extra.



R S G B AMATEUR RADIO HANDBOOK

Third Edition

An invaluable volume of 544 pages, containing almost 700 circuits and charts, with over 100 photographs, and covering the whole field of Amateur Radio techniques from fundamentals to u.h.f. transmitters, aerials, test equipment, single sideband, propagation, etc. Each of the 22 chapters contains much information in suitable form for beginners to experienced amateurs and radio enthusiasts.

MORE THAN 30,000 COPIES ALREADY SOLD

Bound in maroon, buckram linson. Price **34s.** (by post 36s.6d.) and **$5.50** post paid in USA and Canada.

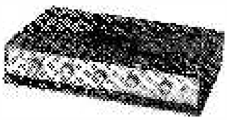
Further details of other R S G B publications, information about membership of the society, including a free copy of the monthly R S G B BULLETIN, and the Amateur Radio Handbook may be obtained from the publishers:

RADIO SOCIETY of GREAT BRITAIN

Dept. PW, 28 Little Russell Street,
London, W.C.1. *HOLborn 7373, 2444*

HI-FI AMPLIFIERS — TUNERS — RECORD PLAYERS

20+20 STEREO AMP. AA-22U



GARRARD PLAYER AT-60

TRANSISTOR MIXER. MODEL TM-1. A must for the tape enthusiast. Four channels. Battery operated. Similar styling to Model AA-22U Amplifier. Kit **£11.16.6.** Assembled **£16.17.6**

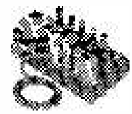
20+20W TRANSISTOR STEREO AMPLIFIER. Model AA-22U. Outstanding performance and appearance. 5 stereo inputs each channel, 20 transistor, 10 diode circuit. Kit **£39.10.0** Assembled **£57.10.0** (Cabinet **£2.5.0** extra).

GARRARD AUTO/RECORD PLAYER. Model AT-60, less cartridge **£13.1.7.** With Decca Deram pick-up **£17.16.1** incl. P.T.

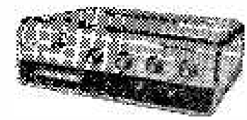
Many other Garrard models available, ask for Lists.

HI-FI MONO AMPLIFIER. Model MA-5. A general purpose 5W Amplifier, with inputs for Gram., Radio. Modern functional appearance. Kit **£11.9.6** Assembled **£15.15.0**

10W POWER AMP. MA-12



9+9W STEREO AMP. S-99



HI-FI MONO AMPLIFIER. Model MA-12. 10W output, wide freq. range, low distortion. Use with control units. Models UMC-1 (Mono) or USC-1 (Stereo). Kit **£12.18.0** Assembled **£16.18.0**

3+3W STEREO AMPLIFIER. Model S-33. An easy-to-build, low cost unit. 2 inputs per channel. Kit **£13.7.6** Assembled **£18.18.0**

DE LUXE STEREO AMPLIFIER. Model S-33H. De luxe version of the S-33 with two-tone grey perspex panel, and high sensitivity necessary to accept the Decca Deram pick-up. Kit £15.17.6 Assembled **£21.7.6**

HI-FI STEREO AMPLIFIER. Model S-99. 9+9W output. Ganged controls. Stereo/Mono gram, radio and tape inputs. Push-button selection. Printed circuit construction. Kit **£28.9.6** Assembled **£38.9.6**

POWER SUPPLY UNIT. Model MGP-1. Input 100/120V, 200/250V, 40-60 c/s. Output 6·3V, 2·5A A.C. 200, 250, 270V, 120mA max. D.C. Kit **£5.12.6** Assembled **£7.2.6**

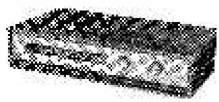
Heathkit DAYSTROM

Make the most of your leisure time..

Hear the BBC Stereo FM Programmes

on the TRANSISTOR STEREO FM TUNER

Elegantly designed to match the Stereo Amplifier, AA-22U

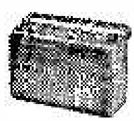


Many special features including:—

★ Pre-assembled and aligned RF tuning unit.
★ 4 stage IF amplifier, Automatic freq. control.
★ Printed circuit board, 14 transistor circuit.

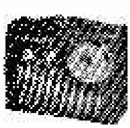
Available in two units, sold separately, can be built for a **TOTAL PRICE KIT** (STEREO) **£24.18.0** incl. P.T.
Kit (MONO) **£20.19.0** incl. P.T. can be converted to stereo with adaptor optional extra. Cabinet, optional extra **£2.5.0.** Send for details.

TRANSISTOR RECEIVERS



Oxford

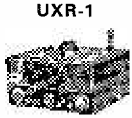
"OXFORD" LUXURY PORTABLE Model UXR-2. Specially designed for use as a domestic or personal portable receiver. Many features, including solid leather case. Kit **£14.18.0** incl. P.T.



UXR-1

TRANSISTOR PORTABLE. Model UXR-1. Pre-aligned I.F. transformers, printed circuit. Covers L.W. and M.W. Has 7″ x 4″ loudspeaker. Real hide case. Kit **£12.11.0** incl. P.T.

JUNIOR EXPERIMENTAL WORKSHOP Model EW-1. More than a toy! Will make over 20 exciting electronic devices! incl.: Radios, Burglar Alarms, etc. 72 page Manual. The ideal present! Kit **£7.13.6** incl. P.T.



GC-1U

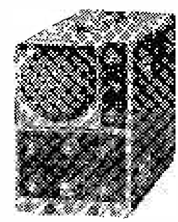
"MOHICAN" GENERAL COV. RECEIVER, GC-1U for Amateur or Short Wave listening. Send for leaflet. Kit **£37.17.6** Assembled **£45.17.6**

WELCOME TO OUR LONDON HEATHKIT CENTRE
233 Tottenham Court Road
We open MONDAY-SATURDAY 9 a.m.–5.30 p.m.
THURSDAY .. ..11 a.m.–2.30 p.m.
Telephone No: MUSEUM 7349
WHEN YOU ARE IN TOWN, WE HOPE YOU WILL VISIT US THERE

TEST INSTRUMENTS

Our wide range includes:

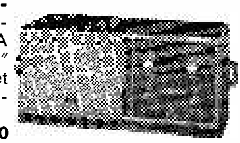
3″ LOW-PRICED SERVICE OSCILLOSCOPE. Model OS-2. Compact size 5″ x 7⅜″ x 12″ deep. Wt. only 9¾lb. "Y" bandwidth 2 c/s-3 Mc/s, ±3dB Sensitivity 100mV/cm. T/B 20 c/s-200 kc/s in four ranges, fitted mu-metal CRT Shield. Modern functional styling. Kit **£23.18.0** Assembled **£31.18.0**



OS-2

5″ GEN.-PURPOSE OSCILLOSCOPE. Model 10-12U. An outstanding model with professional specification and styling. "Y" bandwidth 3 c/s-4·5 Mc/s ±3dB. T/B 10 c/s-500 kc/s. Kit **£35.17.6** Assembled **£45.15.0**

DE LUXE LARGE-SCALE VALVE VOLTMETER. Model IM-13U. Circuit and specification based on the well-known model V-7A but with many worth-while refinements. 6″ Ernest Turner meter. Unique gimbal bracket allows operation of instrument in many positions. Modern styling. Kit **£18.18.0** Assembled **£26.18.0**



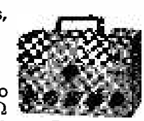
VVM, IM-13U

AUDIO SIGNAL GENERATOR. Model AG-9U. 10 c/s to 100 kc/s, switch selected. Distortion less than 0·1%, 10V sine wave output metered in volts and dB's. Kit **£23.15.0** Assembled **£31.15.0**

VALVE VOLTMETER. Model V-7A. 7 voltage ranges d.c. volts to 1,500. A.C. to 1,500 r.m.s. and 4,000 peak to peak. Resistance 0·1 Ω to 1,000MΩ with internal battery. D.C. input resistance 11MΩ. dB measurement, has centre-zero scale. Complete with test prods, leads and standardising battery. Kit **£13.18.6** Assembled **£19.18.6**

V-7A

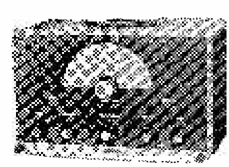
MULTIMETER. Model MM-1U. Ranges 0–1·5V to 1,500V a.c. and d.c.; 150μA to 15A d.c.; 0·2Ω tp 20MΩ 4½″ 50μA meter. Kit **£12.18.0** Assembled **£18.11.6**



RF-1U

R.F. SIGNAL GENERATOR. Model RF-1U. Up to 100 Mc/s fundamental and 200 Mc/s on harmonics. Up to 100mV putput. Kit **£13.18.0** Assembled **£20.18.0**

SINE/SQUARE GENERATOR. Model 1G-82U. Freq. range 20 c/s–1 Mc/s in 5 bands less than 0·5% sine wave dist. less than 0·15μ sec. sq. wave rise time. Kit **£25.15.0** Assembled **£37.15.0**



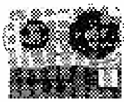
IG-82U

TRANSISTOR POWER SUPPLY. Model IP-20U. Up to 50V, 1·5A output. Ideal for Laboratory use. Compact size. Kit **£35.8.0** Assembled **£47.8.0**

Prices and specifications subject to change without notice

TAPE AMPLIFIERS — TAPE DECKS — CONTROL UNITS

FM TUNER FM-4U

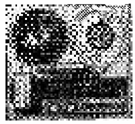


STUDIO-MATIC DECK

HI-FI FM TUNER. Model FM-4U. Available in two units. R.F. tuning unit (£2.15.0 incl. P.T.) with I.F. output of 10·7 Mc/s and I.F. amplifier unit, with power supply and valves (£13.13.0). For free standing or cabinet mounting. Total Kit **£16.8.0**

STUDIOMATIC "363" TAPE DECK. The finest buy in its price range. Operating speed: 1⅞", 3¾" and 7½" p.s. Two tracks, "wow" and "flutter" not greater than 0·15% at 7½" p.s. **£13.10.0** With TA-1M Tape Pre-amplifier kit **£31.5.6**

HI-FI AM/FM TUNER. Model AFM-1. Available in two units which, for your convenience, are sold separately. Tuning heart (AFM-T1—£4.13.6 incl. P.T.) and I.F. amplifier (AFM-A1—£22.11.6). Printed circuit board, 8 valves. Covers L.W., M.W., S.W., and F.M. Built-in power supply. Total Kit **£27.5.0**



TRUVOX DECK

AM/FM TUNER

TRUVOX D-93 TAPE DECKS. High quality stereo/mono tape decks. **D93/2**, ½ track, **£36.15.0** **D93/4**, ¼ track, **£36.15.0**

TAPE RECORDING/PLAYBACK AMPLIFIER. Thermometer type recording indicators, press-button speed compensation and input selection. Ideal for free standing or cabinet mounting.
Mono Model TA-1M Kit **£19.18.0** Assembled **£28.18.0**
Stereo Model TA-1S Kit **£25.10.0** Assembled **£35.18.0**

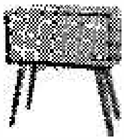
MONO CONTROL UNIT. Model UMC-1. Designed to work with the MA-12 or similar amplifier requiring 0·25V or less for full output. 5 inputs. Baxandall type controls. Kit **£9.2.6** Assembled **£14.2.6**

STEREO CONTROL UNIT. Model USC-1. Push-button selection accurately matched ganged controls to ±1dB. Rumble and variable low pass filters. Printed circuit boards. Kit **£19.19.0** Assembled **£27.5.0**

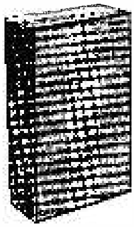
Enjoy building a Heathkit model

Heathkit DAYSTROM

SPEAKER SYSTEMS



SSU-1



Berkeley

HI-FI SPEAKER SYSTEM. Model SSU-1. Ducted-port bass reflex cabinet "in the white". Two speakers. Vertical horizontal models with legs, Kit **£12.12.0**, without legs, Kit **£11.17.6** incl. P.T.

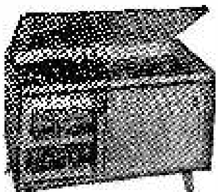
The BERKELEY SLIM-LINE SPEAKER SYSTEM, fully finished walnut veneered cabinet for faster construction. Special 12" bass unit and 4" mid/high frequency unit. Range 30-17,000 c/s. Size 26" x 17" only 7⅜" deep. Modern attractive styling. Excellent value. Kit **£19.10.0** Assembled **£24.0.0**

COTSWOLD SPEAKER SYSTEMS. Outstanding performance for price.
MFS: Size 36" x 16½" x 14" deep. Kit **£25.12.0** Assembled **£33.17.0**
STANDARD: Size 26" x 23" x 14½" deep. Kit **£25.12.0** Assembled **£33.17.0**

HI-FI CABINETS

A wide range available including kits, ready assembled cabinets or assembled and fully finished cabinets, for example:

GLOUCESTER. Kit **£18.10.0** incl. P.T.
MALVERN. Kit **£18.1.0** incl. P.T.
CHEPSTOW. Kit **£11.18.6** incl. P.T.



Malvern

SEND FOR THE LATEST FREE CATALOGUE

Deferred terms available in UK over £10
Prices quoted are Mail Order prices

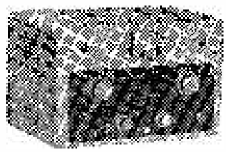
DAYSTROM LTD Dept. P.W.—10 GLOUCESTER

"AMATEUR" EQUIPMENT

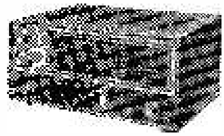
80-10m TRANSMITTER, DX-40U. Power inputs 75W. C.W., 60W peak CC phone. Output 40W tp aerial. Provision for VFO. Kit **£29.19.0** Assembled **£41.8.0**

SSB ADAPTOR, SB-10U Kit **£39.5.0** Assembled **£54.18.0**

AMATEUR BANDS RECEIVER Model RA-1. To cover all the Amateur Bands from 160-10 metres. Many special features, including: half-lattice crystal filter; 8 valves; signal strength "S" meter; tuned R.F. Amp. stage. Kit **£39.6.6** Assembled **£52.10.0**



DX-40U

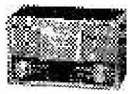


RA-1

160-10M TRANSMITTER. Model DX-100U. Careful design has achieved high performance and stability. Completely self-contained. Kit **£81.10.0** Assembled **£106.15.0**

COMMUNICATIONS TYPE RECEIVER. Model RG-1. A high performance, low cost receiver for the discriminating listener. Frequency coverage: 600 kc/s–1·5 Mc/s and 1·7 Mc/s–32 Mc/s. Kit **£39.16.0** Assembled **£53.0.0**

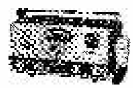
REFLECTED POWER METER and SWR BRIDGE. Model HM-11U. Indicates reliably, but inexpensively, whether the RF power output of your TX is being transferred efficiently to radiating antenna. Kit **£8.10.0** Assembled **£10.15.0**



HM-11U

OUTSTANDING "AMATEUR" EQUIPMENT
A wide range of American Amateur SSB equipments is now available in the U.K. Why not send for full details of range, for example:

FILTER TYPE SSB TRANSCEIVERS
Models for 80, 40 pr 20 metre bands.
Model HW-12 (80M) **£67.10.0** Kit.
Model HW-22 (40M) } **£66.0.0 each kit.**
Model HW-32 (20M) } price inc. duty ,etc.



80M Transceiver HW-12

Without obligation please send me (Tick here)
FREE BRITISH HEATHKIT CATALOGUE........................ ☐
FULL DETAILS OF MODEL(S).................................. ☐
(*Please write in BLOCK CAPITALS*)
NAME ....
ADDRESS..
.... DEPT. P.W.10

stern-clyne ELECTRONIC CENTRES

MEMBER OF THE PANTIYA GROUP OF COMPANIES

MAIL ORDER & ALL ENQUIRIES TO: DEPT. PW. 3-5 EDEN GROVE, HOLLOWAY, LONDON, N.7. Tel.NORth 8161/5.

LONDON:
18 Tottenham Court Road, W.1. MUS 5929/0095
23 Tottenham Court Road, W.1 MUSeum 3451
309 Edgware Road, W.2 PADdington 6963
109 Fleet Street, E.C.4. FLEet Street 5812/3
162 Holloway Road, N.7. NORth 7941

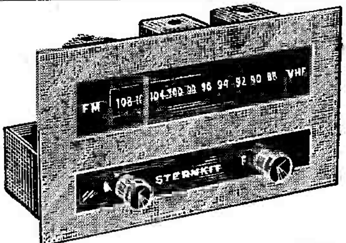
9 Camberwell Church Street, S.E.5. RODney 2875
220 Edgware Road, W.2. PADdington 5607
CROYDON: 12 Suffolk House, George Street. MUNicipal 3250
BRISTOL: 26 Merchant Street, Bristol 1. Bristol 20261

LIVERPOOL: 52 Lord Street. Royal 7450
MANCHESTER: 20/22 Withy Grove, M/c 4. Blackfriars 5379/5246
SHEFFIELD: 125 The Moor. Sheffield 29993
NOTTINGHAM: Eastown House, Lincoln St. Nottingham 45889

TUNE INTO THE WORLD with the *CR150 £19.10.0

New, advanced design provides fantastic sensitivity

Compact and attractive as a drawing room radio but packed with communications engineering features to bring in the most distant stations loud and clear. Continuous coverage from 540K to 30 mc/s takes in all broadcast bands, shipping, world-wide short wave and Ham radio. Built in features include extra large tuning dial, extending rod aerial, "S" meter, B.F.O., Noise Limiter, extra quality loudspeaker, etc. Meticulously constructed, handsomely finished. Essential for superb reception but cheaper than many domestic radios. Size only 13½ x 5 x 8in. Standard mains operation. Carriage and Insurance 15/-.



SUPERB NEW STERN-CLYNE FMI VHF TUNER

Specially designed for the Amateur builder, a new sensitive tuner unit that provides stable, interference-free reception of BBC FM transmissions. High quality output signal ensures optimum performance from any Hi-Fi audio system; superb styling makes for harmonious installation with existing equipment. Reliable easily aligned circuit employs RF stage, tuned anode tuned grid freq. changer, 2 IF's Noise Limiter and Ratio Detector. Input sens. 100mV for 40 db. Distortion less than 1% at full deviation. Power req. 200v at 20 mA and 6.3v at 1.8A. Panel black and silver grey. size 8 x 5 in.

FMI Kit of parts **£7.9.6** Carr. 4/-.
Assembled and tested £10.9.6 Carr. 4/-.
Optional Power Pack available.

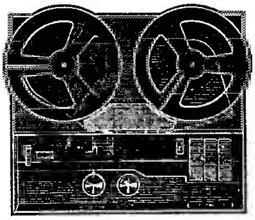
* stern-clyne's TREMENDOUS * PRICE BREAKTHROUGH in NEW UNIVERSAL RECORDING TAPES

- TENSILIZED—prestretched, extra strong
- Full frequency spectrum response
- Guaranteed playing times

STERN-CLYNE make huge bulk purchases of recording tapes from the world's biggest manufacturers—and hand on the enormous price advantage to their customers. The quality is unequalled: Tensilized to ensuer the most permanent type of base. Highly resistant to breakage, moisture, heat, cold or humidity. Highly polished, splice-free finish. Smooth output throughout entire audio range. Ideal for your most treasured recordings, cheap enough to use all the time. Double-wrapped—distinctively boxed. Available in both P.V.C. and Polyester qualities.

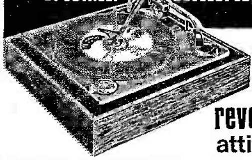
TENSILIZED P.V.C.			
3in.	250ft. Long Play	5	6
5in.	600ft. Standard	8	6
5in.	900ft. Long Play	10	0
5¾in.	1,200 ft. Long Play	12	6
7in.	1,200ft. Standard	12	6
7in.	1,800ft. Long Play	15	0
TENSILIZED POLYESTER			
3¼in.	600ft. Double Play	11	6
5in.	1,200ft. Double Play	15	0
5¾in.	1,800ft. Double Play	22	6
5¾in.	2,400ft. Triple Play	37	6
7in.	2,400ft. Double Play	25	0
7in.	3,600ft. Triple Play	50	0

MAGNAVOX 363 TAPE TRANSPORTER

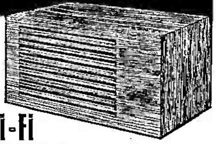


Manufactured to precise limits that permit recording and tape playback to the highest standards set by the Music industry. Simple reliable design employs a single high-duty motor with heavy flywheel. Features include fast wind on and rapid rewind, pause control, 3-speed selection with interlock, built-in revolution indicator, piano key controls. Speeds 1⅞, 3¾ and 7½ i.p.s. Wow and flutter 0.15% on 7½ i.p.s. Max. spool size 7in. Playing time up to 120 min. per track from 1,200ft. standard tape. Size 13½ x 11in. plus 5¼in. below mounting board. With ½ track heads, £10.10.0. With ¼ track heads. £13.19.6. *Add 10/- carriage and insurance.*

* SPECIALLY DEVELOPED, EXCLUSIVELY MADE FOR stern-clyne



*TWO unique units that revolutionize attitudes to Hi-Fi



GRAMSTAND £10·7·6
Plinth mounted changer

- Famous make Autochanger—with many superb added features
- Lightweight tubular arm
- Latest Stereo/Mono Ceramic cartridge with DIAMOND stylus
- Heavy balanced 10½ in. turntable. Hardwood plinth with PU plug & socket. 6 ft. mains lead

MEGAMITE £8·19·6
SPEAKER SYSTEM

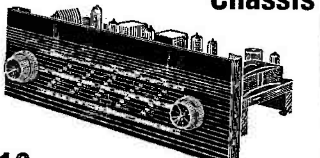
- Bookshelf size—handsome teak cabinet only 13 x 7 x 8 in.
- Full frequency range
- Special design free-cone Bass unit gives clean, deep down bass
- Matching tweeter & crossover
- Handles 10 watts

STERN-CLYNE DESIGNED, Modular Hi Fi, adapts to any room, matches to any amplifier, needs only simple wiring to link

* Widest range of best value-for-money amplifiers and tuners in stock, including famous Stern/Mullard ready built and home construction kits. Ask for demonstration.

EXCEPTIONAL OFFER OF AM/FM Radiogram Chassis

Superb new six valve unit covering long and medium wave on AM and all BBC VHF transmissions on AM. Highly sensitive AM circuit receives most stations through internal aerial, separate FM input employs famous Gorler tuning heart. Uncluttered facia covers whole frontal area and simplifies adaptation to existing cabinets or building into contemporary bookshelf units. Extra large illuminated dial and dual concentric controls for volume, tone selection and tuning simplify operation, enhance appearance. Powerful 4W. output matches standard 3 ohms speaker. Inputs provide for external AM and FM aerials and gramophone pickup. For 200/250 V. A.C. operation. Size overall 15in. x 6¼in. x 7¾in. deep.

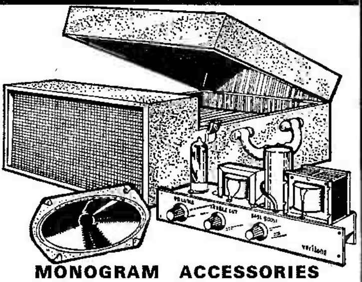


16 gns. Carr. 10/-

MONOGRAM AMPLIFIER

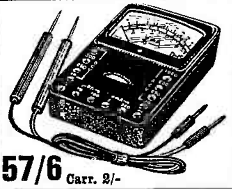
Superb space and cost economy design specially developed by Mullard Research Laboratories and quality constructed by Stern-Clyne. Actually uses only one multi valve but provides an undistorted output from any standard xtal pick-up. Plus features include Bass Boost and Treble Cut controls, panel illumination and specially wound output transformer. Size only 10 x 2½ x 4in., ¾in. high. Silver hammer chassis finish satin silver finish engraved panel.

Kit of parts **£4.10.0** Carr. 4/6.
Assembled and tested **£6.0.0** Carriage 4/6.



MONOGRAM ACCESSORIES

Specially designed PC3 Carrying case takes Monogram Amplifier, 8 x 5 Elliptical Speaker (illustrated) and any standard turntable or Autochanger. Size overall 18 x 16, 1/2 x 8, 1/2 in. Handsomely finished in dark grey fabric weave.
PC3 Case £3.5.0. Carriage 5/6d.
8 x 5 Speaker £1. Carriage 2/6.



TEST 8 MULTIMETER

Compact all purpose tester with 12 specially selected ranges for all home and motor car wiring and servicing, amateur radio, TV fixing, electronic hobby work, etc. Extremely robust construction employs rugged large scale meter movement and plug in range selection to obviate switch wear defects and ensure trouble-free life. In tough metal backed impact resisting case. Ranges: 0-10-250-500-1,000v. A.C. and D.C. (sens. 1,000 ohms per volt) 0-1-250 mA D.C. current. 0-10,000-100,000 ohms resistance. Size only 4⅞" x 3¼" x 1½" deep. Complete with test leads and battery.

57/6 Carr. 2/-

TEST 7 POCKET MULTIMETER

39/6 Carr. 2/-

A really versatile instrument that makes a handy pocket-size tool. Measures AC or DC voltage in three ranges of 0-15-150-1000v. Resistance 0-1000,000 ohms. and Current 0-150 mA. DC. Size only 3¾ x 2¼ x 1¼in., with ingenious dial design providing a clear, easily read scale. Complete with battery and test leads.

PRACTICAL WIRELESS

VOL 42 No 6

issue 716

OCTOBER 1966

TOPIC OF THE MONTH

THE LONG WAIT

AFTER many false starts, promises and delays, the Government has fired a preliminary salvo across the bows of the pirate radio ships. This was in the form of a Bill, presented by Mr. Edward Short, Postmaster General, and published on July 27th.

The *Marine, &c., Broadcasting (Offences) Bill* enacts that it shall be unlawful for a broadcast to be made from a ship, aircraft or any other structure within U.K. territorial limits. It also prohibits U.K. and colonial citizens from operating broadcasting stations on non-U.K. ships or aircraft on or over the high seas or on other structures.

Clause 4 makes it an offence to furnish ships or aircraft, supply goods and materials or to supply and maintain radio equipment or otherwise assist in their physical maintenance. Further clauses make it an offence to supply programme material or advertising and lay down that a person guilty of an offence under the Act shall be liable on summary conviction to a fine of £100, imprisonment for a term not exceeding three months, or both. This Bill, of course, has still to receive the approval of Parliament and the Queen.

There is already considerable pressure against this Bill. The listening millions who, if you believe all the claims, will not like it. Nor will the organisations running these stations; Radio Caroline alone is reputed to be making a profit of something like £1,000,000 a year.

Legislation is, of course, long overdue. The present proliferation of pop-music stations is ridiculous and their *modus operandi* is irresponsible. The whole situation must clearly be rationalised in a re-think of the whole broadcasting set-up to bring it into line with today's demands and requirements. The key factor is local broadcasting—its place in modern society, its shape, objectives and how it can slot into the existing national networks.

This problem, however, remains in the melting pot. For it is one of the subjects to be covered in the long awaited White Paper on Broadcasting—which has been promised, and postponed, so often that we can only assume that it has been absentmindedly filed in the Historic Documents Archives of the Post Office.

At the time of going to press, several newspapers carried reports that the Cabinet has agreed to set up a chain of v.h.f. stations to broadcast pop-music.

W. N. STEVENS, Editor

NEWS AND COMMENT

CONSTRUCTIONAL

GENERAL ARTICLES

NOVEMBER ISSUE WILL BE PUBLISHED ON OCTOBER 6th

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. © George Newnes Ltd., 1966. Copyright in all drawings, photographs and articles published in "Practical Wireless" is specifically reserved throughout the countries signatory to the Berne Convention and the U.S.A. Reproductions or imitations of any of these are therefore expressly forbidden.

Closed Shop !

WHILE I agree with you, the editor, that attendance figures for recent Radio Shows have been falling, I do not think the public should be barred from the Show. The reason for the poor attendance can clearly be put at the foot of the organisers' door.

At the last Radio Show—you cannot count last year's fiasco—I wasted 3/6d. going to Earls Court. Without doubt, I could have seen almost as much walking down my own High Street. As far as new developments were concerned, I saw few. Several of the major manufacturers—particularly the component boys—had large stands, but large portions were cordoned off for the "trade".

Many of the new developments were displayed within these private enclosures. I know, I falsely stated that I worked for J. Bloggs and Co. and "that we use your components". With this, a smiling representative shook my hand and gladly showed me all the latest developments. On others, I indicated that I was an amateur and received polite rebuffs.

So if we are allowed to see another Radio Show, please can we have a chance of seeing the "works"? Remember, the dealer is only a go-between; we are the real customers.

Also, is it not possible to popularise the Radio Show? In the good old days the radio and television organisations used to put on first-class entertainments. If the radio industry realised that these organisations are not so wealthy as everyone thinks, and was prepared to support them with "brass", I am sure something could be worked out. One can, of course, let the radio and television industry strangle itself. If present trends continue, it is only a matter of time.

Edward Salter, B.Sc. London, W.1.

Burglar Alarms

I AGREE with McNair's letter published in the July issue (concerning the Simple Proximity Detector, March 1966), but with the following reservations: It is indeed the responsibility of the Police to protect one's property and they will do so if they are informed. However, as McNair himself writes, the Police cannot work miracles, but they will make sure that premises are regularly inspected. It is the inbetween times when the burglar strikes. I know, it has happened to me.

Another point I wish to make is that electricity supplies can easily be disconnected from houses without the burglar having to enter the premises. Thus, it is important to operate any burglar device from separate supplies; transistor equipment has much to offer when compared with valve gear, since the current drain is nowhere near as high.

H. A. L. Wagner. Kuala Lumpur.

NEWS AND..

RADIO COMMUNICATIONS EXHIBITION

The Exhibition will again take place at the Seymour Hall, Seymour Place, London W.1., from Wednesday October 26 to Saturday October 29, 1966, and will be open from 10 a.m. to 9 p.m. daily. Admission 3s.

The Stage Presentation will be a display by the Royal Signals who are taking part for the first time. The Post Office will also be showing and the Royal Navy. All space for Exhibitors has been taken and the largest Exhibitor is a newcomer to this Hall: Standard Telephones and Cables Ltd., Components Group, who will display a comprehensive range of radio components. The return of the Company S.V.S. Aerials and Towers will assist many with their range of masts and fittings.

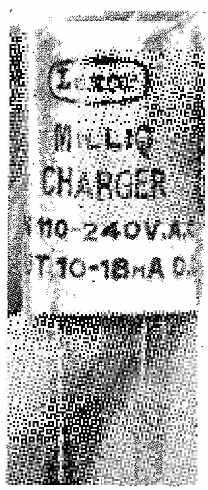
The RSGB Stand will be a longer stand with a book and information service, live transmitting stations on several frequencies including v.h.f.

Meetings of all Radio Groups and Armed Forces' Clubs will also be held in the Lecture Hall and Overseas Guests' Night will be held in the restaurant on Friday evening, October 28, 1966, when the attendance is expected to break last year's record. CCTV will be used to announce all overseas visitors.

The Exhibition Awards for Home Construction and Manufacturers' Equipment will again take place; silver plaques being presented to the winners. Many new ideas on developments of home and overseas transmitters, transceivers and receivers particularly on s.s.b. and v.h.f. will be seen. Also the latest technical books will be available for inspection or purchase.

A famous £200 world coverage communication receiver will again be presented to the lucky entry ballot card holder.

SUB-MINIATURE BATTERY CHARGER



Lexor announce a sub-miniature battery charger. Known as the "MilliQ", the unit is intended for incorporation into equipment employing rechargeable batteries or cells. Typical applications are with portable transistorised instruments, radio sets and tape recorders operating from nickel-cadmium accumulators. The inclusion of a "MilliQ" charger can enable the equipment to operate from either its internal battery or the mains supply, and in the latter case, the battery will be automatically recharged.

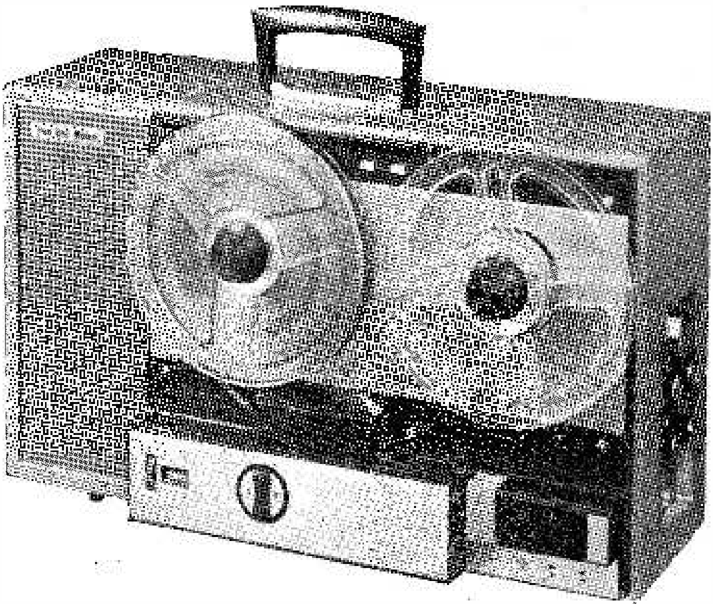
The unit measures 1¼in. x ¾in. diameter and is in the form of a sealed aluminium can. Two versions are available: one with flying lead connections for orthodox mounting and one designed for direct application to a printed circuit. Input voltages may range from 110 to 240V a.c., with resulting charge currents from 8mA at 110V input to 18mA at 240V input. Charging currents are constant for cells between 1·4V and 25V total. The unit is completely unharmed by short or prolonged overload or short circuit and may be disconnected from the battery without damage.

Prices can be as low as 8s. each in production quantities and the unit is offered on short delivery.

The address of Lexor Electronics Ltd. is 25/31 Allesley Old Road, Coventry.

...COMMENT

VAN DER MOLEN TAPE RECORDER



Van Der Molen, 42 Mawney Road, Romford, Essex, announce Model VR7, a high performance tape recorder using a new 3-speed 4-track vertical deck mechanism. It is fully transistorised, has 5 watts output, recording level meter, mixing, bass and treble controls, an 8in. round speaker and facilities for listening on record and stereo output. It has a polished teak cabinet, moving coil microphone and 7in. spool of tape. Price is 39 guineas.

BICC MICROWAVE TOWERS FOR IRAN

British Insulated Callender's Construction Company Ltd., has received an order from G.E.C. (Telecommunications) Ltd. for the supply and erection of three microwave towers in Iran. The towers will be sited at oil pumping stations at Abadan, Bandur Mashur, and Khor-doraq and will form part of a telecommunications network linking the pumping stations.

Two of the towers are 275ft. high and the other is 110ft. These have recently been added to the BICC range of standard towers.

MULLARD SERVICE DEPARTMENT

With effect from August 8, 1966, the Mullard Service Department at 294 Purley Way, Croydon, Surrey, moved to premises at the Mullard plant at Mitcham.

All enquiries should be directed to the new address: Mullard Limited, Service Department, P.O. Box 142, New Road, Mitcham Junction, Surrey. Telephone Mitcham 3471.

ECHO SOUNDERS FROM FERROGRAPH

The Ferrograph Company Ltd., announce three echo sounders. The "Offshore 500" at £108, the Inshore Sounder at £52 and the Graphic Sounder at £66. A leaflet describing these units and giving brief specifications may be obtained from The Ferrograph Company Ltd., Ferrograph House, 84 Blackfriars Road, London, S.E.1.

New Thinking Needed for Sound Broadcasting

On the subject of pirates, Mr Dobbs stated (July issue of Practical Wireless) that "our offshore buccaneers .... have probably indicated to the BBC that there is a healthy demand for 'Wall-paper' music throughout the day ...." Undoubtedly there is such a demand but the BBC seems to ignore this fact. Only recently, the Director General of the BBC (in Middlesbrough for a BBC Week) was reported in a local newspaper as saying something to the effect that the audiences claimed by pirates were excessive, that they (the pirates) must have tapped an entirely new kind of audience — because the audience measurements for the BBC sound services were constant. (In all fairness I must stress that these were not his exact words but it is a fair indication of what he was reported as saying.)

The recently published proposals for extending the BBC sound service does not take into account the demand for "non-stop pop". The objections of the Musicians' Union are cited as examples of obstacles but I have not noticed any detrimental effects on musicians since the first pirate went on the air—which is now some time ago.

I suppose that the numbers who listen to the BBC could decrease still further by the satisfaction with the present audience and the refusal to tap the so-called "new" audience. Objectors to the proposals to create a fourth radio channel serving the same purpose as pirates have pointed out the lack of available wavelengths as allocated to Britain at the last conference in Geneva on frequency allocations. They wish to preserve the European medium-wave band as it is at present—an intricately-arranged system of stations. But the pirates are playing havoc with this system; and as other countries extend their broadcasting facilities I very much doubt whether they will take much more notice than the pirates; for example, Mr. Dobbs mentioned the new Peking transmitter on 1,525 kc/s.

The obvious conclusion one can draw from the briefest summary of facts is that it is high time that a new conference be called to discuss the entire rearrangement of the wavebands, making use of new inventions and discoveries in the field of broadcasting, and making allowances for further expansion by each country of its existing broadcasting facilities. Then the BBC can follow the Swedish model and create a new channel for canned sound.

P. Charlton. Yorks.

More News and Comment on Page 420

A COMMUNICATIONS t.r.f. receiver

COVER SUBJECT

by T. Simon

THERE is no question that the superhet receiver offers far superior performance figures to those of the t.r.f. However, the constant reminder that one does not get something for nothing is very evident in this statement. With the superior performance comes additional and often complex circuitry, together with the need for a fair array of test equipment with which to tune and align the finished receiver for peak performance.

Very few serious amateurs or s.w.l's these days would dream of using a t.r.f. in fact the majority would probably laugh at the idea. Yet in the past these receivers were extremely popular and one reads of simple circuits giving truly amazing results.

The writer wished to use "double" valves for a particular application, but not having had a great deal of experience with them, decided to try the idea out first in a simple application in order to investigate the possibilities and the various snags which would doubtless arise. The result of this experiment is the unit about to be described.

Standard Circuitry

The "standard" circuit of a t.r.f. receiver is usually offered as a three valve unit. This comprising three stages with one valve to each stage; r.f. amplifier, detector and audio amplifier. It was decided to duplicate this "standard" but with the proviso that the three valves should be "double" valves. This arrangement gives, on the face of it, a three valve t.r.f., but since these valves are "doubles" then the project becomes a six-stage circuit. By this means it has been possible to design a t.r.f. receiver giving above average performance and having features which place it in the communications class.

The valves chosen are all the same type—ECF82/6U8. These are triode-pentodes whose normal function in life is in the role of a frequency changer up to 200 odd Mc/s. These are freely available both from manufacturers' sources and the surplus market.

Having now a chassis with three innocent looking valves perched on it, the problem resolves itself into fixing a function for each stage since in effect we have a six-valve circuit comprising three pentodes and three triodes.

The main drawbacks or "bugbears" of t.r.f.'s are (a) radiation of interference by the reacting detector stage; (b) lack of selectivity; (c) tricky reaction, often due to variations from the aerial circuit affecting the detector. In this design these difficulties are not so much reduced as annihilated!

The Circuit

Commencing with the aerial, the first valve in Fig. 1, the triode of V1 is connected in a grounded

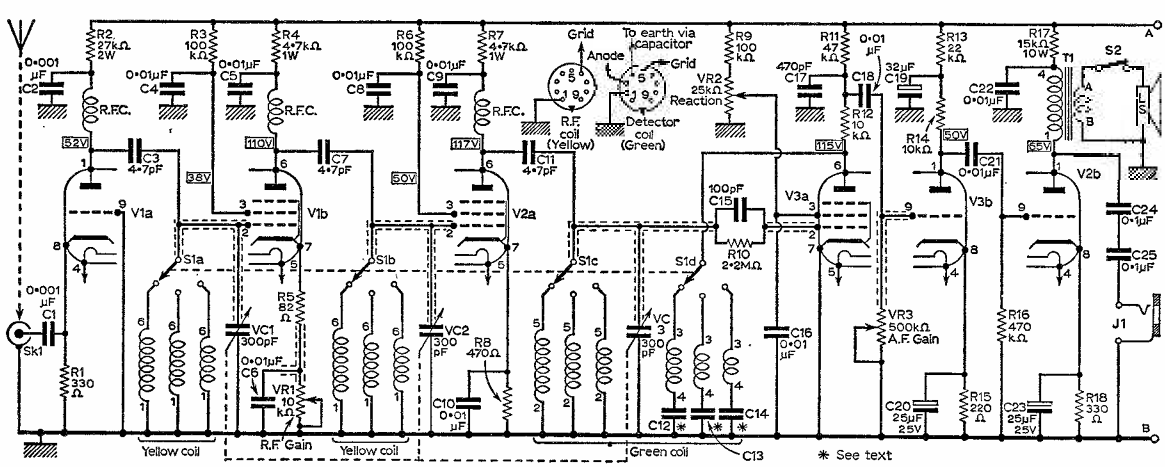


Fig. 1: Circuit diagram of the receiver, less power unit. (*See* Fig: 2)

grid configuration noted for its ability to isolate one stage from another and also present a low impedance input to the aerial. This stage is capacity coupled to the first tuned r.f. amplifier, the pentode section

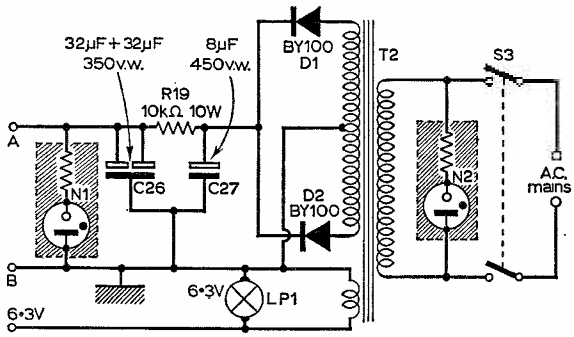


Fig. 2: The power unit. The resistors with N1, N2, are an integral part of the neon units.

of V1. This stage in turn is again top capacity coupled to V2a pentode wired as another tuned r.f. amplifier. V3a pentode is a reacting detector using the variation of screen potential as a reaction control.

At this point it will be realised that any spurious radiation from the detector has to fight its way through two tuned r.f. stages plus the grounded grid in order to reach the aerial. In the prototype it proved too much for this particular gremlin and no such radiation could be detected. The whole receiver is installed in an earthed aluminium case to ensure minimum radiation from the actual circuitry and components. Selectivity is extremely good since there are three tuned circuits plus an a.t.u. used by the writer. Also, variations in aerial loading affecting the regenerative detector stage are minimised by the three stages between detector and aerial, but more on this point later.

The high value of screen resistors was found imperative in the interests of stability. In the writer's model it was possible to reduce these values to around 82kΩ before instability set in. Since this "threshold" will vary with different constructors it was thought best to use the values marked.

The voltages at various strategic points in the circuit are marked in fig. 1 and should act as a guide only and not be interpreted as absolute

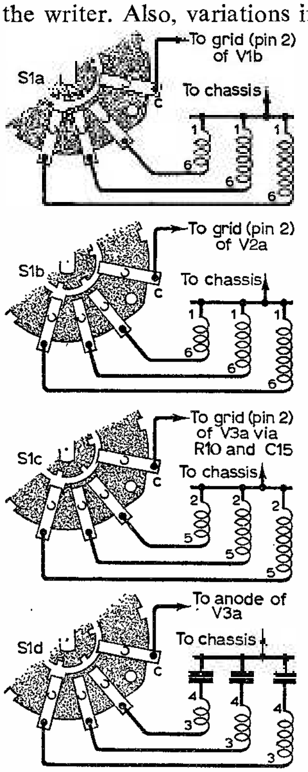


Fig. 3: Wiring of the wavechange switch S1–a, b, c, d. Screens omitted for clarity.

values. Similarly, for those who wish to experiment, the values of R13 and R17 may be varied for more gain on the audio side.

The remaining two triodes, V3b, V2b, are used as audio amplifier and output stage respectively, providing ample volume on local signals to drive the small loudspeaker used.

Construction

There is a great deal of gain in this receiver, and if due care is not taken in construction the end result will always be the same—instability. Careless wiring or a dry joint will practically guarantee this so watch these points carefully.

Each valve is screened from its neighbours with a strip of tinplate to help eliminate interaction between stages. Note also the extra screen across V1 which shields the triode section and its components from the pentode section. We don't want our hard won selectivity and isolation ruined by signal leaking round by various alternative paths.

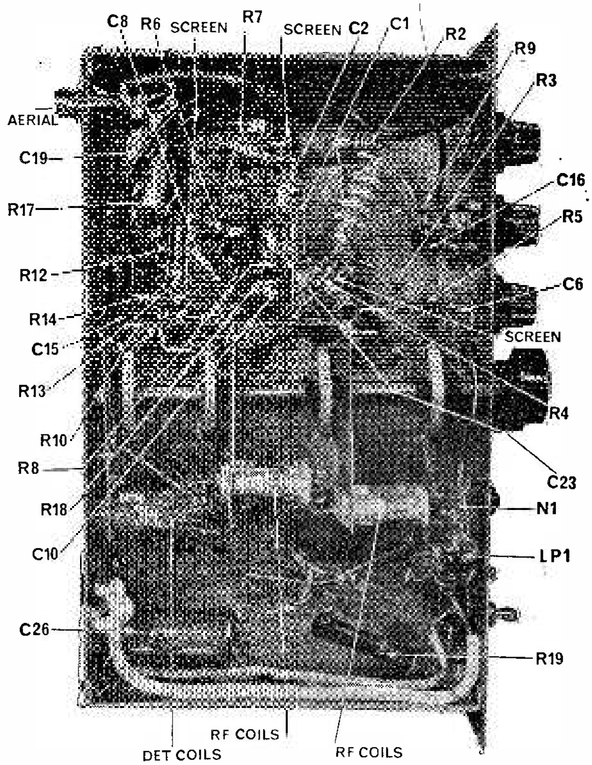


Fig. 4: Under chassis layout showing positions of some of the main components. Note small screen across V1.

Although there is more to this one than the average t.r.f. it is really no more difficult to wire up. If you can wire up a simple one valve circuit, then all you have to do is just that—six times! The obvious rules apply and are no different from any other unit construction. Heater leads twisted and kept away from the grids and associated components, wire these first, tuck the leads out of the way and wire 0·01µF disc ceramics across the heater pins at each valve base using the shortest possible leads. Keep anode and grid wiring as far apart as possible and make sure, very sure, that all soldered joints are "good uns".

A:- 7/8" dia. hole B:- 1/4" dia. hole C:- Drill to clear 4B.A. D:- Drill to clear 6B.A.

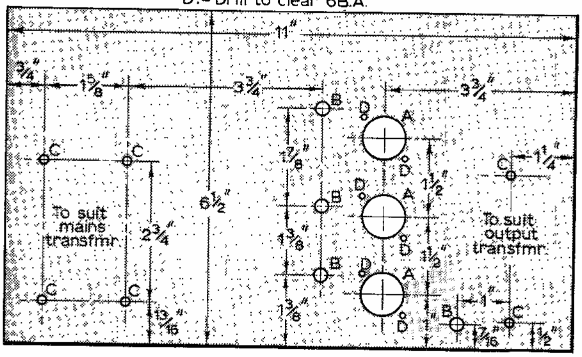


Fig. 5: Top chassis layout of the valves and two transformers.

The main tuning capacitor has a 10:1 reduction drive fitted. On the H.F. bands a greater reduction would be an asset due to the dozens of stations receivable. The dial pointer was made from a piece of thick celluloid and locked in position with the locking nut on the slow motion drive.

Bandswitching

As shown, the receiver covers approximately 1·5 to 30Mc/s in three switched bands. There is no reason at all why plug in coils should not be used and this would only require three B9A valveholders in place of the bandswitch. By this means the tuning range of the receiver could be extended to cover M.W. and L.W. Details of the bandswitch and coil unit are given in Fig. 3. Your scribe must confess to an oversight here in that when the unit was finished it was thought impossible to adjust the cores of the coils in order to align the receiver. However, by drilling holes in the screens to allow a fret saw blade through in line with the coil slugs this disaster was avoided.

To obtain peak performance the cores of the coils should be adjusted for maximum signal. The r.f. coil cores should be fixed before the unit is installed, the second r.f. stage and detector coils can then be peaked after the coil pack is fitted in position.

The reaction feedback capacitors C12, C13, C14, will require a value between 50-200pF. The best idea is to use a 200pF trimmer in these positions and adjust for the set to just oscillate when VR2 is at minimum. Alternatively various fixed values might be substituted until a satisfactory value is found.

There are no trimmers across the coils, if there were then these could be peaked instead of the coil cores. Would-be constructors might care to think along these lines before commencing construction. Dimensions are given but these will depend on the actual components used. An underchassis layout photograph is given in Fig. 4. Purchase all components first, lay them out on the chassis and then, only then, start drilling.

The loudspeaker in/out switch is optional if phones only are to be used. Also the power indicators, N1, N2, LP1, might be dispensed with since it is rather a luxury to have visual indication of mains, h.t., and heaters, perhaps fuses would be more useful. Certainly the inclusion of a fuse in the lead from the centre tap of the mains transformer to earth would be a wise precaution.

There is room beneath the chassis to install a smoothing choke for those who prefer this type of circuitry. If this is adopted then choke input is strongly recommended.

The mains transformer shown is a standard item although 80 mA is a very generous rating since the set only draws some 15-20 mA. Any transformer rated from 30 mA upwards at 20 volts will serve. Similarly almost any choke which will pass 30 mA may be used for the choke input circuit suggested.

The dials and wording are all hand-made to suit

—continued on page 401

★ components list

Resistors:

R1	330Ω	R11	47kΩ
R2	27kΩ 2 watt	R12	10kΩ
R3	100kΩ	R13	22kΩ
R4	4·7kΩ 1 watt	R14	10kΩ
R5	82Ω	R15	220Ω
R6	100kΩ	R16	470kΩ
R7	4·7kΩ 1 watt	R17	15kΩ 10 watt
R8	470Ω	R18	330Ω
R9	100kΩ	R19	10kΩ 10 watt
R10	2·2MΩ		

All ½W. except where marked

Capacitors:

C1	0·001μF	C15	100pF
C2	0·001μF	C16	0·01μF
C3	4·7pF	C17	470pF
C4	0·01μF	C18	0·01μF
C5	0·01μF	C19	32μF 250V. electrolytic
C6	0·01μF	C20	25μF 25V. electrolytic
C7	4·7pF	C21	0·01μF
C8	0·01μF	C22	0·01μF
C9	0·01μF	C23	25μF 25V. electrolytic
C10	0·01μF	C24	0·1μF
C11	4·7pF	C25	0·1μF
C12, C13, C14	see text	C26	32+32μF 350V. electrolytic
		C27	8μF 450V. electrolytic

Valves:

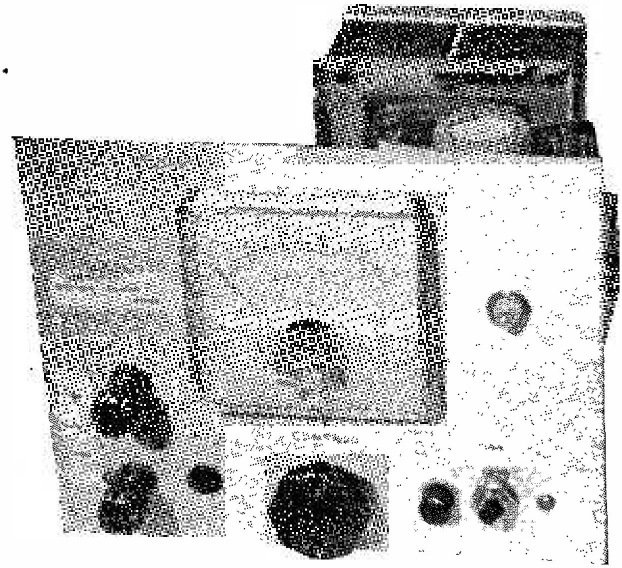
V1 ECF82/6U8
V2 ECF82/6U8
V3 ECF82/6U8

Miscellaneous:

VC1, VC2, VC3 } 3 gang 300pF
VR1 10kΩ pot.
VR2 25kΩ pot.
VR3 500kΩ pot.
D1 BY100
D2 BY100
3 R.F. Chokes
T1 Radio Spares Standard O.P.T.
T2 Mains Transformer 250-0-250 80mA. 6·3V. 3A.
3 B9A. valveholders
N1, N2 } mains neons (Bulgin type)
3 Coils Yellow Range 3, 4, 5 }
3 Coils Yellow Range 3, 4, 5 } Denco miniature dual purpose coils
3 Coils Green Range 3, 4, 5 }
Switch 1P 3W 4B Code SS/666 Specialist Switches Ltd., 23 Radnor Mews, London, W2. (24/- inc. p. & p.)
SPST (Speaker in/out)
DPDT (Mains on/off)
Co-ax. socket
3" 3Ω loudspeaker
6·3V. 0·3A. bulb
Slow motion drive 10:1 (Eddystone)
Jack socket
Knobs—Dial, etc.

LOW VOLTAGE POWER SUPPLY UNIT

by C. J. Mitchell



THIS design is for a simple stabilised voltage power supply suitable for running transistorised equipment, low voltage motors etc. It uses two low power transistors and one power transistor as well as a bridge rectifier assembly.

The voltage range is from 0·5 to 30 volts and the maximum current obtainable varies from 100mA at 30 volts output to 400mA at 0·5 volts output. It has been designed so that a short circuit across the output will not damage the supply. The short circuit current is about 450mA in order to protect the diodes in the bridge rectifier. If higher current rated diodes are available then the short circuit current and hence the maximum current can be increased. The design is relatively inefficient as far as power transfer is concerned as it uses a large ballast resistor. All components are readily obtainable and layout is not critical except for the ballast resistor which should be kept clear from other components particularly the semiconductors as it could dissipate a lot of heat under certain conditions.

Circuit Description

A Douglas MT104AT transformer which has a 50 volt 2 amp winding tapped at various voltages was used by the author. The 33 volt tap is used in this circuit. The primary has the usual adjustments for 200-250V input. If not obtainable then the MT103AT (1 Amp) or MT105 (3 Amp) transformers are also suitable, or for that matter any similar one by a different maker.

The bridge rectifier contains four OA210 semiconductors. Any higher current rated diodes can be used (i.e. BYZ12). The minimum rating required is 50 volts p.i.v. and 500mA mean rectified current. Do not omit the fuse in one side between the transformer and the bridge as if one diode goes short circuit the mains transformer will be subjected to an excessive load and possibly be damaged. A delay fuse or a resettable trip type might be a good idea in this position. The 2000μF capacitor is a simple reservoir/smoothing capacitor.

The Zener diode determines the maximum voltage and so a 30 or 33 volt diode is required. There are some 30 volt zeners on the market but three 10 or 11 volt zeners connected in series will do just as well. The 1·5kΩ resistor is a limiting resistor to limit the current through the zener to a reasonable value. The 10kΩ potentiometer is the output voltage control and should be a good quality linear wire wound pot. if possible. This taps off a voltage from the zener reference and passes it to the first transistor, then to the second transistor and finally to the OC29 power output transistor. The transistors act as current amplifiers

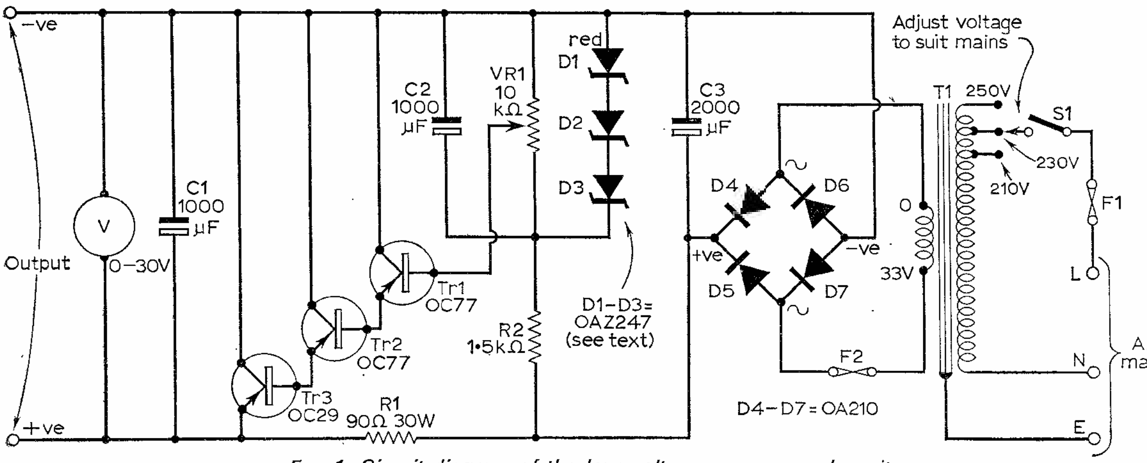
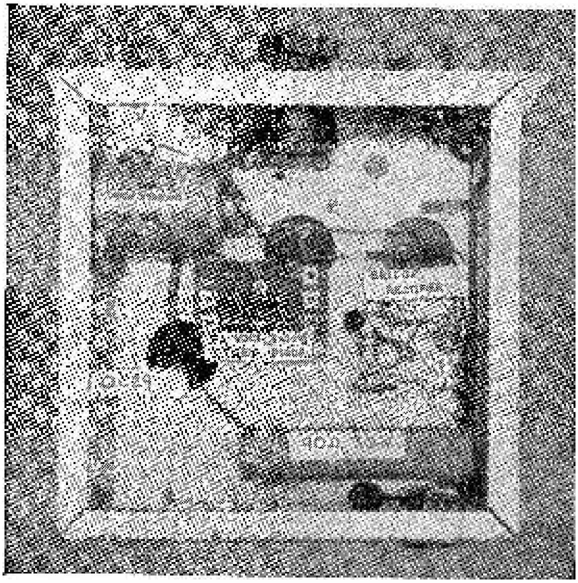


Fig. 1: Circuit diagram of the low voltage power supply unit.



i.e. even though the load current is say 100 mA the current drawn from the zener is a few microamps, thus the voltage delivered from the reference does not alter.

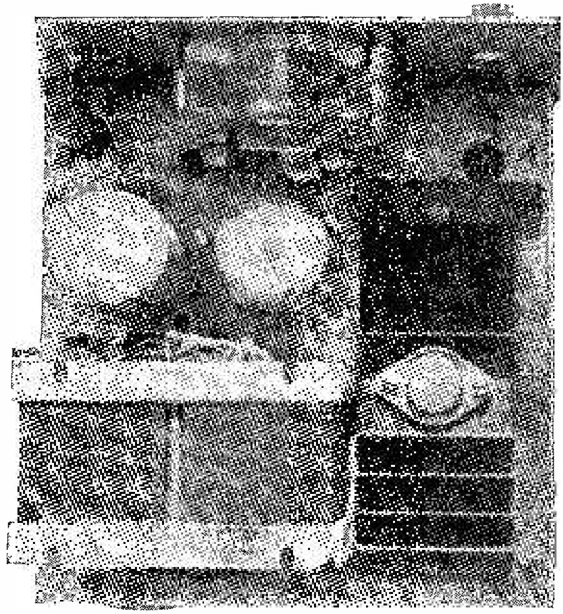
Excess voltage, i.e. the voltage difference between required output as set by the zener diode and the output voltage from the bridge rectifier is dissipated by the ballast resistor. This resistor also determines the short circuit current of the supply and thus, has a fairly high wattage rating.

Almost any voltmeter 0–30V is suitable for the power supply unit. The cheaper Japanese ones on the market are ideal.

Construction

The prototype was built on a chassis 7 x 7 x 2 in. with a small front panel, but any available chassis will suffice. If the supply is to be built into a case then make sure that there is adequate ventilation over the ballast resistor. The OC29 transistor should be bolted to the chassis using a mica washer and insulating bushes so that the case of the transistor is electrically isolated from the chassis but maintains good thermal contact. Doing this ensures that the output is floating i.e. neither rail is earthed so that the supply can be used with equipment needing either connection (i.e. positive or negative earth). The OC77 transistors are best used with cooling clips bolted directly to the chassis but this is not essential. The 90Ω ballast resistor should be soldered to two tag strips mounted above the chassis. The capacitors should be fixed using the normal clips making sure that the cases are isolated from the clips by the plastic case of the capacitors or by insulating tape. The polarity of these capacitors must be closely followed. The bridge rectifier is best assembled on three small pieces of metal as a heat sink (see Fig. 2), and mounted away from other components. The choice of mains input socket, output terminals etc., is up to the individual and will depend

continued overleaf



Various views of the power supply unit.

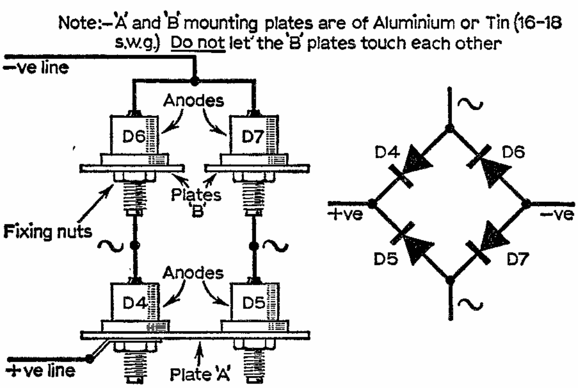


Fig. 2: Constructional details for the bridge rectifier.

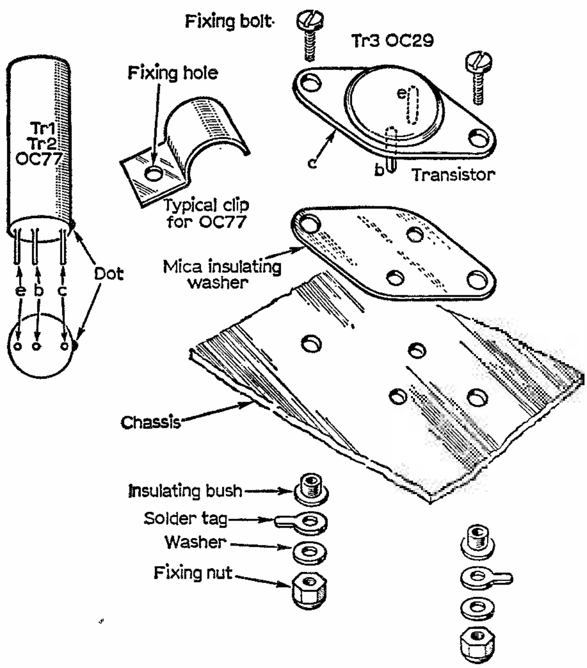


Fig. 3: Mounting data for the transistors.

on the case used etc. A neon to indicate when the supply is on would also be useful. It is important that all joints are properly soldered as a poor contact will decrease the stabilisation of the supply. Critical values are that of the 90Ω resistor and the transformer output voltage. If these are wrong the unit may not function or F2 may blow. If BYZ12 diodes are used then the 90Ω resistor may be replaced by a lower value and the max. output current is then higher i.e. (33Ω, 1·5A fuse), but care must be taken not to over-dissipate the ballast resistor. Alternative transistors which can be used are OC76 or OC77X in place of OC77. OC28 or OC35 in place of OC29. It should be possible to use only one OC77 taking the emitter of Tr1 to the base of the OC29 directly but this has not been tried. ■

★ components list

Resistors:

R1	90Ω 30W (Radiospares)	VR1	10kΩ linear wirewound
R2	1·5kΩ		

Capacitors:

C1, C2	1000μF 50V	C3	2000μF 50V

Semiconductors:

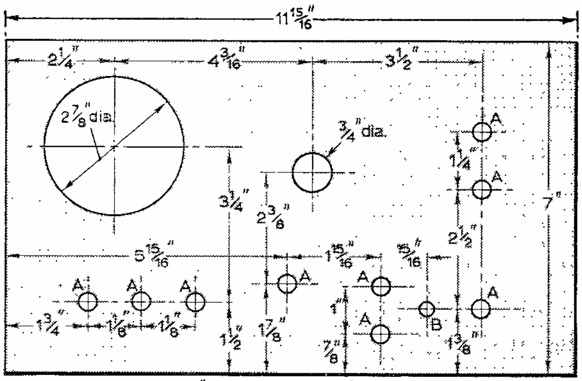
Tr1 & 2	OC77	D1—3	OAZ247
Tr3	OC29	D4—7	OA210

Miscellaneous:

T1 Douglas MT104 or similar; F1 1A fuse; F2 500mA; SW S.P. on/off; Meter 0–30V.

A COMMUNICATIONS t.r.f. receiver—*continued from page 398*

using scraper board, while the case is a standard item but with its front panel re-sprayed. Almost any output transformer will suit for T1 if phones only are envisaged. Incidentally, if phones and speaker are to be used together then the phones



A:- 3/8" dia. hole B:- 5/16" dia. hole

Fig. 6: Front panel drilling diagram.

must be high resistance, say, 2000-4000Ω. Using low resistance phones will result in a drastic reduction in volume from the speaker.

Panel Controls

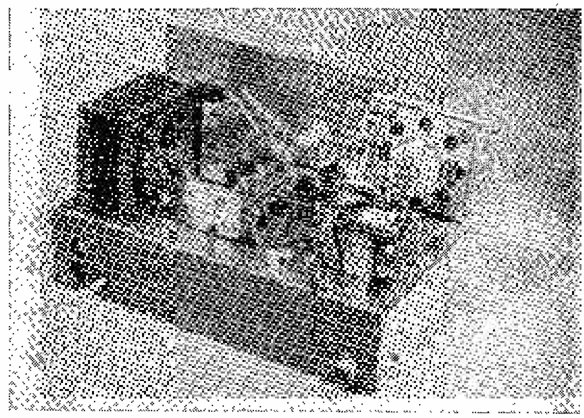
These controls are fairly straightforward but, due to the very high sensitivity, the setting of the r.f. gain does affect the reaction control to some slight degree. However, the r.f. gain pot. is extremely useful on strong signals, particularly the Light Programme, Luxembourg, pop pirates, etc., as it prevents the detector from being overloaded.

The input circuit is designed to accept a low impedance input but any length of wire plugged in will receive signals.

The prototype was fed from a 100ft. long wire via an aerial tuner unit. This method is strongly advised not merely for this receiver but for all those which cover the short waves. In this way it is possible to cover almost any sector of the short waves spectrum and still present a nicely matched 80 ohms to the input of the receiver. As will be appreciated, the impedance at the end of a random length of wire will vary, its exact value depending upon the frequency in use. Since the receiver is designed to accept an 80Ω input, any value other than this will present a mismatch, and thus the efficiency of the unit will be impaired. A dipole cut to a particular band, will automatically present this 80Ω impedance but the dipole is essentially a one-band device. (A dipole cut for the 7Mc/s amateur band, will present around 90Ω's on the 21Mc/s amateur band, which can be tolerated.)

The reduction drive of 10:1 is quite adequate on the lower and middle range. However on the 10-30Mc/s range, crowding of stations is noticeable and an even greater reduction is desirable. Constructors who like to experiment might consider putting a 3-gang variable capacitor of say 25pF per section in parallel with the main tuning capacitor. However if this idea is adopted due allowance should be made in the layout.

Set r.f. gain, a.f. gain and reaction to half way and tune in the signal. Adjust the r.f. control for max. signal, then turn up the reaction. The r.f. gain may now need a slight



adjustment. If greater volume is now required turn up the a.f. gain.

For reception of a.m. signals and B.C. stations the reaction should be advanced to the point just before it commences to oscillate. For c.w. reception it should be adjusted to just on the point of oscillation. ■

ON THE SHORT WAVES

MONTHLY NEWS FOR DX LISTENERS

Times in GMT
Frequencies in kc/s

THE BROADCAST BANDS by JOHN GUTTRIDGE

Albania: *Radio Tirana* (Rue Ismail Quemal, Tirana) now has an English transmission at 1500—1530 on 7,090.

Ascenion Island: BBC South Atlantic Relay (C.E.X.B., Bush House, London, W.C.2) has started transmissions with first of its four 250kw transmitters. It has been heard on 15,350 with the following scheduule: 1735—1830 World Service; 1830—1930 French; 1930—1945 Hausa; 1945—2245 close down World Service.

Clandestine: A further report on *Radio Scari* says this station's full title is *La Voz de Resistenzia Basque*. A new station reported is *Radio Cassanova* which has been heard with an Italian programme at 1800 in the 31 m.b.

Radio Portugal Libre has now been heard at 0700—0730 on 12,008.

Denmark: *Radio Denmark* (Radio House, Copenhagen V) introduced a brand-new schedule on September 4, the main feature of which is daily broadcasts to all transmission areas. English transmissions will be at 0145—0215 on 9,520 and 0745—0815, 1245—1315, 1445—1515 and 1915—1945 on 15,165. In addition, the Saturday test transmission at 1015—1100 on 9,520 will continue.

Egypt: *Cairo Radio* (U.A.R. Broadcasting and Television, P.O. Box 1186, Cairo) has English as follows: 0130—0300 9,580; 0130—0230 11,710; 1200—1430 17,690; 2045—2215 15,135; 1930—2015 17,690; 2145—2315 9,475/11,915.

Ethiopia: *Radio Voice of the Gospel ETLF* (P.O. Box 654, Addis Ababa) can be heard until 1455 with an Arabic programme 21,690. Severe interference is caused by a Hindi programme relayed by the Voice of America, Tangier, on the same frequency. The 1830—1945 Hausa and English transmission is now on 15,295.

Gabon: *Radiodiffusion Television Gabonaise* (P.B. 150, Libreville) can be heard at 2055 on 4,777 with news in French. Full verification is given.

Greece: An unidentified Greek station has been heard at various times between 1500—2015 on 6,915 through heavy interference.

Liberia: *Voice of America* Monrovia relay (Washington 25, D.C., U.S.A.) can be heard on with Urdu at 1500—1530 and a special Swahili, English and Arabic transmission at 1530—1600 on 21,670. The same outlet carries Arabic at 1830. The higher frequency bands have been good recently with very little interference.

Portugal: *Radio Lisbon* (Rua do Quelhas 2, Lisbon) broadcasts in English at 2015—2100 on 6,025 and a 41 m.b. outlet variously reported as 7,130 or 7,225. There is a new French transmission at 0615—0745 on 6,185/7,130. A new series of Portuguese by radio is to be broadcast shortly and those wishing to take part should send their names and addresses to the station by September 30. DX vocabularies and Portuguese and Spanish specimen report letters are available on application to the station.

Spain: *La Voz de Andalucia* (Cordoba) now has a shortwave outlet on 6,280, which is on the air from 0645—1000 and 1600—2200. Morning transmissions include language lessons.

Sweden: *Radio Sweden* (Box 955, Stockholm) is now reported to air its DX programme on Wednesdays instead of Tuesdays as previously.

Switzerland: S.B.C. (CH 3000, Bern 16) now uses 15,235 instead of 15,305 in its 1330—1500 English transmission. Other frequencies used remain 15,395/11,855/17,830.

U.S.S.R.: *R. Moscow* from September 1 transmits to Europe in English as follows: 0700—0730 11,830 / 9,710 / 9,480 / 5,980; 1200—1230 15,480 / 11,930/11,830/11,740/11,700; 1900—1930 9,590/ 7,340/7,280/6,050/5,980/1,320; 2000—2030 9,590/ 7,340/7,280/7,160/6,050/1,380; 2100—2200 9,750/ 7,280/7,260/6,050/1,490; 2200—2230 7,280/6,050/ 5,960/1,490/1,380/1,320.

Radio Yerevan (Armenian Radio, Mravian Street 5, Yerevan 25) has Armenian at 0900 and French at 0950—1000 on 11,830 / 11,790 / 11,745 / 9,800. Full QSL verification is given.

Radio Kiev (Ukrainske Radio, Radio Centre, ul Khreshchatik 24, Kiev, Ukrainian SSR) has English Monday, Thursday and Saturday at 1900—1930 on 7,210/11,730 and 2230—2300 on 1,241. Also on Tuesdays, Fridays and Sundays at 0030—0100 on 9,610/9,670/9,690/9,710/9,810 and 0430—0600 on 9,610/9,630/9,670/9,690.

Radio Vilnius: (Lietuvas TSR Radijas, ulkanarskio 49, Vilnius) has English on Sundays and Fridays at 2100 and 2230 over 665/6,200/7,180.

Help this month came from S. Ormerod, M. O. Donnelly, Des Walsh, J. F. French, D. Torbell, R. Patrick, I. Patterson, A. B. Thompson, G. Roberts, I. Perry, T. Davis, International Short Wave Club, "Swiss Shortwave Merry-Go-Round."

REGRETTABLY we kick off this month with a serious plea. Better logs! A large number of s.w.l.'s take the trouble to write and send in a log which is of very little value. Others omit important details which really are necessary and not just needed to satisfy a whim on the part of yours truly. As an example the following log was received yesterday. It reads—receiver HE-30—CN8AA, CR6AN, EA8EA, JA4BU, KZ5MC, OD5BU, PY1AGB, SVØWO, VO1AQ, VP6BW, W6JRY, YV5NSZ, ZS1MW, 4X4HI, JA1TK, 5N2FEL, 9J2DL. Name and address were supplied and that was it. The big question is now—what aerial, what band? On 10 metres this is very good, on 15 and 20 average to good, on the l.f. bands really excellent. This insistance on a good standard should, in the long run, help the s.w.l. since the cultivated habit of well kept and complete log keeping is a decided asset. Briefly then, please, date; time g.m.t.; r.s.t.; frequency; a.m./c.w./s.s.b.; and last but not least, alphabetical order does help a great deal. Of course, we need the receiver and aerial gen., too.

Vive la l.f.

Confess at once! Some of you have been having sneaky listen on the l.f. segments. **David Douglas** (Dundee), reports 1·8—F5DP, HB9T, OE5CD, SP9LP, XE2OK, 7·0—CE1ED, VS6FF. David offers to QRX for ZS stations on 160. How about a sked from some of you r.f. generating ZS gentlemen? I will pass on any sked news as and when I hear, and perhaps we can all QRX. "Very noisy but good if you can stick it." This is 40 according to **Chris Peel** (Stoke-on-Trent), S750, PR30, 20m dipole. He claims best times are late night and early mornings. Proof of this is CN8AW, EL2A, W1FZJ/KP4, PY7APS, PY1CAD, UC2BF, UT5DZ, UB5UN, ZD8ARP, ZS1JA, all on 40 s.s.b.

Another 40-metre listener, **Paul Baker** (Pontypool), HE30, 45 ft. l.w. logged CN8AC, HK4ECM, KØWOO, OX3TI, PY1MEN, PY7LAK, W1PZB, W3JAL, W4TL, W6AP, plus 16 separate EU prefixes. No other logs down the l.f. end this month, but by now some might have read last month's "dare" and next month we might have more l.f. than h.f. reports. (Will the man who laughed please leave the tent!)

20 and 15

The terrible twins 14 and 21, they never fail to produce the exotic stuff. **J. Currie** (Kirkintilloch), HA-230, 40 ft., end fed, 21Mc/s—CR6BC, CR7FM, PY1BOL, VE8BZ (Baffin Island, "expecting snow any minute"), WA4JWT, ZC4MO/P, 5A1TK, 5H3JL, 5X5JK, 9Q5DL, 9H1AM, all a.m.

If you have an Eddystone S750 with a PR30 pre-selector and a 20-metre dipole in the loft, you have the same set up as **Chris Peel** (see 40-metre log). Did you hear the same stations on 20 too? BV1USA, CE—1HU, 3CR, 3QB, CP1PE, CR5EB, CR6HF, CR7GF, CO8MN, CX9AAK, W6FHM/DU1, DU1FA, DU1AA, EL2AR, EP—2AX, 2TR, 2GF, 3AM, ET3AC, FO8AB (Tahiti), FY7AJ, HC1PB, HC8JG (Galapagos Is.), HC5NW, HK3KR, HP3MC, H17PB, HL—1CP—9CH (Korea), HR1SO, HZ1AB, JA—1CA, 1BZF, 1HER, 1BTR, 2AEV, 2ADH, 4BJO, 6DCE, 6MV, 7GY, 8AA, KA1KFH, KC6BO, KJ6AJ, KG6IG, KR6—DI, SR, BB, UL, LL, KS6BR, KX6BQ, KW6EB, KH6—BJ, ACC, BVS, EJM, UDR, CHU, OR, KL7—FIL, IFX, ESA, EBK, KV4EQ, KP4COS, KZ5PW, LA8FG/P (Jan Meyen Is.), LU—1DTL, 8BC, 8CZ, 8MIB, MP4BCC, OA—4PF, 6BL, OX3—AU, WX, GL, PY 1, 2, 3, 7, PZ1BW, PJ4AC, SU1DL (United Arab Republic), UA9—HA, CV, EU, VE—4TQ, 4IG, 5LY, 5RN, 6UM, 7AEZ, 8MA, VE8RCS (Ellesmere Is.), VK—1AL, 2PP, 2WB, 2ASP, 2AVA, 3AUP, 4FJ, 5FM, 5GG, 6XX, 6RL, 7CK, 7PW, 8KK, 9MK, VP2MW, VP3JR, VP5EC, VP6WR, VP7NS, VP8CW, VP9FK, VQ9HB, VS9AJC, VU2FN, W1, 2, 3, 4, 5, 6, 7, 8, 9, Ø, XE1YO, XW8AX, YA1AC, YS1JSM, ZF1GT (Grand Caymen), W9WNV/ZK1 (Don Miller on Manahiki Is.), ZL—1AUR, 2AFM, 5AA, ZP5KT, ZD8ES, ZD9BE (Tristan Da Cuhna), ZS 1, 2, 3, 3A2BF (Monaco), 5H3JR, 5N2AAE, 5U7AG (Niger), 5Z4FB, 6O1GB, 6Y5AR, 7Q7PS, 7X2CK, 9J2FF, 9L1AX, 9M4VP, 9V1MT, 9U5BB (Burundi), 9Y4VP. All s.s.b. and in alphabetical order, too.

John Farrer (Bishop's Stortford), Mini-clipper plus 2 transistor amp. and 20m. dipole heard on. 20 BV1USA, CN8BB, CR6HG, CT1PE, CX1YR, EL2AT, EP2AX, ET3MEN, HB9DL, HK3RQ, HM2BD, HP1JC, HR1RP, HS1HC, JA2CTC, JA6CZD, JA8CKC, KA2HQ, K6DJZ, KB6CZ, KG4AN, KL7DRZ, KP4AXC, KR6CL, MP4BDP, OD5BZ, OY2BE, PR1AQ, VE2BUJ/SU, VE7BV, VP2LS, VQ9DC, VS9AJC, WA6FPB, XE3JG, XW8AZ, YN1CML, YV1LA, YS1AD, ZD8JK, ZP5OG, 4X4BC, 5A1TM, 5N2AAW, 7Q7BN, 9H1AB, 9J2JC, 9K2AF, 9M2CP, 9Q5CZ, 9V1MX, 9X5CE. On 15 metres **Paul Baker** (see 40-metre log), netted CE3IY, CP5ET, CR4BC, CR5SP (Sao Thome), CR6—AR, JT, LA, CR7GJ, CT2AG, CT3AM, CX5AAM, EA6BG, EP2—AX, RJ, ET3USA, JA9AVK, KP4CRT, MP4BBA, OA4OS, OD5—CS, ET, ST2SA, SVØWU, VE8BZ, VO1EX, VP2AZ, W1ORD/MM, XE1DW, ZB2AS, ZC4—KF, MO, ZS1BV, 4X4VB, 5A1TK, 5H3JL, 5X5JK, 9G1FL, 9Q5—QR, QV, RW, 9U5KU.

On ten metres **C. Clarke** (Farnham), 12 v. s/het, ground plane, logged DL2BU, G—3PQF, 3OUF, 8MY, GB3LER (Beacon in the Shetland Is.), GI3OZW, I1CGV, OE3GSA, OH2TI, OZ3Y, SM5DTK, SMØCQR, UP2ADZ, UQ2KKD, 5N2AAF, 9J2DT. **John Farrer** (see 20-metre log) managed to hear DL2CM, G3NMH, I1HC, LA3II, OH2TI, OZ1VR, OZ8PK, SM4AIQ, SM7XV, ZD8RB, 7Q7RM, 9J2DT. **Chris Peel** (see 20-metre log) logged only the a.m. signals which came in—CE3RC, CR6AT, EA8AE, EL2AK, KP4BJM, PY1AGP, PY7AC, SVØWF, ZE2KL, ZS1BK, 5N2AAM, 5H3JR, 7Q7RN, 9J2WR, 9J2DT, 9Q5BH.

News and Contests

Known to be lurking top band CX3BH (Uruguay).

Contests for September include 10th—11th WAE (C.W.) contest. 11th—VHF—NFD. 18th—D/F National Final. Don't forget the RSGB mobile rally at Woburn Abbey, Beds., on September 11th. Your scribe will be loitering at this one, personal audio QSO's welcomed. Deadline for this month is September 25th.

MINIATURE transistorised tape recorders are nowadays offered in a wide variety of models, the simpler of which make no attempt to maintain constant motor speed, or even constant tape speed irrespective of the position on a reel. Indeed, the motor speed is often manually variable on such machines, which means that recordings made on one instrument cannot in general be played back on a different one or even on the same one if the speed has in the meantime changed. Reasonable speech and dictation performance may be achieved even under such conditions, but musical recordings are not possible.

Without even making any claims towards true high fidelity, a tape recorder with constant tape speed is essential for all serious musical recordings and preferably for good speech recordings too. This means that a tape drive capstan must be driven from a constant-speed motor, and not the tape take-up reel. Even if the motor runs at constant speed on a take-up reel drive, the tape speed will vary with the diameter to which tape is wound on to the reel at any time. The recording will then run at incorrect pitch if the tape is at any subsequent time spooled on to a reel of different diameter.

It is the aim of this article to discuss and explain

SPEED STABILISATION for BATTERY MOTORS

BY M.L. MICHAELIS, M.A.

what manufacturers and designers have consequently undertaken in the meantime to improve low-power battery motors. The situation has now changed and motors are available with a reliability at least equal to that of other parts of the tape recorders or record players, so that at any rate these instruments incorporating the new Bühler RF-Stabilised Motor, and many using simpler switch-transistor stabilised systems are to be recommended.

STABILISER SYSTEMS

It is obviously a prime requirement for any automatic speed control arrangement to provide some means of deriving an electrical signal as indication of the actual motor speed at any time. Furthermore, this "actual speed" signal must be compared with a reference standard and the discrepancy, i.e. error, detected by the circuit must be used to correct the motor speed, preferably after amplification of the error signal, so that the locking action is very rigid.

This is the skeleton principle of any automatic regulator system, including non-electrical systems in purely mechanical or hydraulic machinery. The other electrical example probably familiar to the reader, the electronically stabilised h.t. supply is thus of exactly the same construction. A portion of the actual h.t. output voltage at any moment is applied to the grid of an amplifier valve, to whose cathode is tied a fixed reference voltage from a neon tube. The detected error voltage thus appears between the grid and cathode of the valve, is amplified by it, and thereafter regulates the principal series control valve(s) to correct the h.t. output voltage.

OBTAINING A SPEED SIGNAL

Now there are, in principle, several possible methods of deriving an electrical signal as a measure or indication of the actual speed of a motor. A tiny alternator (a.c. generator) can be coupled to the shaft, when the output frequency thereof is a measure of the motor speed. Such an arrangement requires an external frequency meter (ratemeter) circuit, a reference oscillator of known and constant frequency and an error detection discriminator, quite apart from the amplifier and actual regulator circuit then operated off the finally derived speed error signal. Such a circuit would be rather complicated so we must look for simpler, more elegant solutions. If the motor shaft carries a small rotating radial obstruction at one end and this interrupts a beam of light impinging on a photocell or other photoelectric device, once every revolution of the motor shaft, the output waveform of the photocell will contain a pulse component whose repetition frequency is equal to the actual speed of the motor at all times.

REFERENCE OSCILLATOR

All that this arrangement brings in the way of improvement over the slaved alternator is that no sliprings are required to take the speed signal from the rotating part of the motor to the stationary part of the circuit. Sliprings and brushes are a constant source of trouble, so any way of avoiding them is certainly an advantage. But they could in fact be obviated even in a tacho-alternator if the coil is made the stator and a small permanent magnet is rotated on the motor shaft within this coil. There is

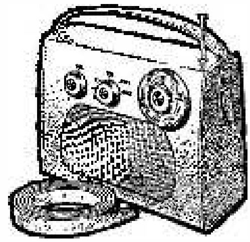
Why NOT BUILD ONE OF OUR PORTABLE TRANSISTOR RADIOS...

FIRST FOR PERFORMANCE, QUALITY & PRICE!

BACKED BY OUR SUPER AFTER SALES SERVICE

"A wonderful range of transistor radios using first grade components for guaranteed results."

NEW ROAMER SEVEN Mk IV



7 WAVEBAND PORTABLE OR CAR RADIO

Amazing performance and specification ● ***Now with PHILCO MICRO-ALLOY R.F. TRANSISTORS***

FULLY TUNABLE ON ALL WAVEBANDS ● **9 stages—7 transistors and 2 diodes**

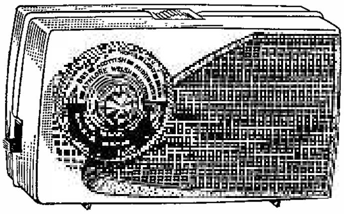
Covers Medium and Long Waves, Trawler Band and three Short Waves to approx. 15 metres. Push-pull output for room filling volume from rich toned 7 x 4in. speaker. Air spaced ganged tuning condenser. Ferrite rod aerial for M. & L. Waves and telescopic aerial for S. Waves. Real leather-look case with gilt trim and shoulder and hand straps. Size 9 x 7 x 4in. approx. **The perfect portable and the ideal car radio.** (Uses PP7 batteries, available anywhere.)

★ **EXTRA BAND FOR EASIER TUNING OF PIRATE STATIONS, etc.**

Total cost of parts now only **£5.19.6** P. & P. 5/6

Parts Price List and easy build plans 3/- (Free with kit)

NEW MELODY MAKER SIX



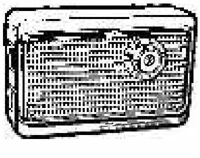
3 WAVEBAND PORTABLE **8 stages— 6 transistors and 2 diodes**

Covers Medium and Long Waves and EXTRA BAND FOR EASIER TUNING OF PIRATE STATIONS, etc. Top quality 3in. Loudspeaker for quality output. Two RF stages for extra boost. High "Q" 6in. Ferrite Rod Aerial. Approx. 350 milliwatts push-pull output. Handsome pocket size case with gilt fittings. Size 6¼ x 3¾ x 1¼in. (Uses long-life PP6 battery.) Carrying strap 1/6 extra.

This amazing receiver may be built for only **£3.9.6** P. & P. 3/6

Parts Price List and easy built plans 2/- (Free with kit).

NEW TRANSONA FIVE



"Home, Light, A.F.N., Lux. all at good volume." G.P., Durham.

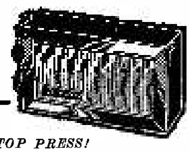
● **7 stages—5 transistors and 2 diodes**

Fully tunable over Medium and Long Waves and Trawler Band. Incorporates Ferrite rod aerial, tuning condenser volume control, new type fine tone super dynamic 2½in. speaker, etc. Attractive case. Size 6¼ x 4½ x 1½in. with red speaker grille. (Uses 1289 battery, available anywhere.)

Total cost of all parts now only **42/6** P. & P. 3/6

Parts Price List and easy build plans 2/- (Free with kit)

POCKET FIVE



● **7 stages—5 transistors & 2 diodes**

Covers Medium and Long Waves and Trawler Band, a feature usually found in only the most expensive radios. On test Home, Light, Luxembourg and many Continental stations were received loud and clear. Designed round supersensitive Ferrite Rod Aerial and fine tone 2½in. moving coil speaker, built into attractive black and gold case. Size 5½ x 1¼ x 3½in. (Uses 1289 battery available anywhere.)

Total cost of all parts now only **42/6** P. & P. 3/-

Parts Price List and easy build plans 1/6 (Free with kit)

STOP PRESS!
Pocket 5 med and Long wave version with miniature speaker.
29/6 P. & P. 3/-

NEW ROAMER SIX

NOW, WITH PHILCO MICRO-ALLOY R.F. TRANSISTORS

● **6 WAVEBAND ! !**

● **8 stages—6 transistors and 2 diodes**

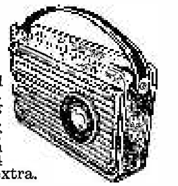
Listen to stations half a world away with this 6 waveband portable. Tunable on Medium and Long Waves, Trawler Band and two Short Waves. Sensitive Ferrite rod aerial and telescopic aerial for short waves. Top grade transistors. 3-inch speaker, handsome case with gilt fittings. Size 7½ x 5½ x 1½in. (Carrying strap 1/6 extra.)

★ **EXTRA BAND FOR EASIER TUNING OF LUX., ETC.**

Total cost of all parts now only **£3.19.6** P. & P. 3/6

Parts Price List and easy build plans 2/- (Free with kit)

TRANSONA SIX



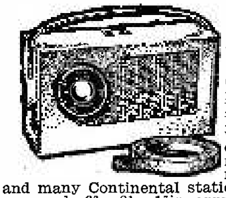
● **8 stages—6 transistors and 2 diodes**

This is a top performance receiver covering full Medium and Long Waves and Trawler Band. High-grade approx. 3in. speaker makes listening a pleasure. Push-pull output. Ferrite rod aerial. Many stations listed in one evening including Luxembourg loud and clear. Attractive case in grey with red grille. Size 6¼ x 4½ x 1½in. (Uses PP4 battery available anywhere.) Carrying Strap 1/- extra.

Total cost of all parts now only **59/6** P. & P. 3/6

Parts Price List and easy build plans 1/6 (Free with kit)

MELODY SIX



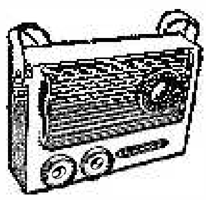
● **8 stages—6 transistors and 2 diodes**

Our latest completely portable transistor radio covering Medium and Long Waves. Incorporates pre-tagged circuit board, 3in. heavy duty speaker, top grade transistors, volume control, tuning condenser, wave change slide switch, sensitive 6in. Ferrite rod aerial. Push-pull output. Wonderful reception of BBC, Home and Light, 208 and many Continental stations. Handsome leather-look pocket size case, only 6¾ x 3½ x 1½in. approx. with gilt speaker grille and supplied with hand and shoulder straps.

Total cost of all parts now only **£3.9.6.** P. & P. 3/6

Parts Price List and easy build plans 2/- (Free with kit)

SUPER SEVEN



● **9 stages—7 transistors and 2 diodes**

Covers Medium and Long Waves and Trawler Band. The ideal radio for home, car, or can be fitted with carrying strap for outdoor use. Completely portable—has built-in Ferrite rod aerial for wonderful reception. Special circuit incorporating 2 RF Stages, push-pull output, 3in. speaker (will drive large speaker). Size 7½ x 5½ x 1½in. (Uses 9V battery, available anywhere.)

Total cost of all parts now only **£3.19.6** P. & P. 3/6

Parts Price List and easy build plans 2/- (Free with kit)

Callers side entrance Barratts Shoe Shop.

RADIO EXCHANGE CO.

Open 9—5 p.m. Saturday 9—12.30 p.m.

61 HIGH STREET, BEDFORD Telephone: Bedford 52367

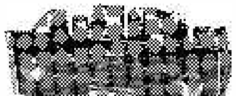
NEW BRITISH RECORDING TAPE

Famous Mfr. Bulk Purchase—Genuine recommended Tape Bargain. Unconditional Guarantee. Fitted Leader and Stop Foils (except 3").

St'd. (PVC base)			L.P. (PVC base)		D.P. (Milar base)		Triple Play	
3"	150ft.	**3/9**	225ft.	**4/9**	300ft.	**6/6**	3" 450ft.	**12/6**
5"	600ft.	**11/6**	900ft.	**15/-**	1,200ft.	**23/6**	4" 900ft.	**25/-**
5¾"	850ft.	**14/6**	1,200ft.	**17/6**	1,800ft.	**29/6**		
7"	1,300ft.	**17/6**	1,800ft.	**22/6**	2,400ft.	**37/6**		

Post and Packing—3" Reels 6d. Each additional Reel 3d. 4" to 7" Reels 1/-. Each additional Reel 6d. All tape accessories stocked.
EMPTY TAPE REELS (Plastic): 3" 1/3, 4" 2/-, 5" 2/-, 5¾" 2/-, 7" 2/3.
PLASTIC REEL CONTAINERS (Cassettes): 3" 1/3, 5" 1/9, 5¾" 2/-, 7" 2/3.

6 VALVE AM/FM TUNER UNIT



Med. and VHF 190m-550m, 86 Mc/s-103 Mc/s, 6 valves and metal rectifier. Self-contained power-unit, A.C. 200/250V operation. Magic-eye indicator, 3 push-button controls, on/off, Med., VHF. Diode and high output Sockets with gain control. Illuminated 2-colour perspex dial 11½" x 4", chassis size 11⅝" x 4" x 5¾". A recommended Fidelity Unit for use with Mullard "3-3" or "5-10" Amplifiers.
BARGAIN PRICE. Complete kit of parts, inc. Power Pack (*as illustrated*) **Price £10.19.6,** Carr. 7/6. Ditto, less Power Pack, **£9.19.6,** carr. 7/6. Circuit and constr's details, **4/6,** free with kit.

TRANSISTOR COMPONENTS

Midget I.F.'s—465 kc/s 9/16" diam., first, second or third, each	**5/6**
Osc. coil M. & L.W. 9/16" diam.	**5/-**
Midget Driver Trans. 9:1	**6/-**
Ditto O/Put Push-pull 3 ohms	**6/-**

Elect. Condensers—Midget Type 15V 1 mfd-50mfd, ea. **1/9.** 100mfd, **2/-.**
2.5mH, 5mH, 7.5mH, 10mH RF chokes **2/6** ea.
Condensers—150V wkg. .01 mfd. to, .04mfd., **9d.** .05mfd., .1mfd., **1/-.** .25mfd. **1/3.** .5mfd., 1/6, etc.
Tuning Condensers. J.B. "OO" 208+176pF, **8/6.** Ditto with trimmers, **9/6.** 365pF single, **7/6.** Sub-min. ¾" DILEMIN 100pF, 300pF, 500pF, **7/-.**
Midget Vol. Control with edge control knob, 5kΩ with switch, **4/9,** ditto less switch, **3/9.**

TUB-ELECTROLYTICS-CAN

25/25V, 50/12V, **1/9;** 8+8/450V, **4/6;** 50/50V, 100/125V, **2/-;** 32+32/275V, **4/6;** 8/450V, 4/350V, **2/3;** 50/50/350V, **6/6;** 16+16/450V, **5/6;** 60/250/275V, **12/6;** 32+32/450V, **6/6;** 100+200/275V, **12/6.**

ENAMELLED COPPER WIRE—2oz. reels 14g-20g, **3/-;** 22g-28g, **3/6;** 30g-34g, **4/3;** 36g-38g, **4/9;** 39g-40g, **5/-,** etc.
TINNED COPPER WIRE. 16-22g, **4/-** 2 oz. reels.
ERSIN MULTICORE SOLDER, 60/40, **4d.** per yard, Cartons **6d., 1/-, 2/6,** etc.

TYGAN FRET (Contem. pat.), 12 x 12", **2/-;** 12 x 18", **3/-;** 12 x 24", **4/-,** etc.
EXPANDED ANODISED METAL—Attractive gilt finish ¼" x ⅛" diamond mesh **4/6** sq. ft. Multiples of 6" cut. Max. size 4' x 3', **47/6** plus carr.
BONDACOUST Speaker Cabinet Acoustic Wadding (1" thick approx.) 18" wide, any length cut, **6/-** yd.

Volume Controls—5K-2 Meg-ohms, 3" Spindles Morganite Midget Type. 1⅛" diam. Guar. 1 year. LOG or LIN ratios less Sw., **3/6.** DP. Sw. 5/-. Twin Stereo less Sw., **7/6.** D.P. Sw., **9/6** (100k to 2 Meg. only).

Condensers—Silver Mica. All values 2pF to 1,000pF, **6d.** each. Ditto Ceramics, **9d.** Tub, 450V T.C.C. etc. 0.001 mFd to 0.01 **9d.** and 0.1 350V, **10d.** 0.01-0.1/500V, **1/-.** 0.25 Hunt, **1/6.** 0.25 T.C.C., **1/9,** etc., etc.

Close Tol. S/Micas—10% 5pF- 500pF, **9d.** 600-5,000pF, **1/-,** 1% 2pF-100pF, **9d.** 100pF-500pF, **11d.** 575pF-5,000pF, **1/6.**

Resistors—Full Range 10 ohms-10 meg. ohms 20% ¼ and ½W, **3d.,** ¾W, **5d.** 1W, **6d.,** 2W, **9d.,** 10% ¼W and ½W, **4d.** **Hi-Stab.** 5% ¼W, ½W, **6d.** (100 ohms-1 meg.). Other values **9d.** 1% ½W, **1/6,** etc., etc.
Wire-wound Resistors—25 ohms to 10K ohms, 5 watt **1/3d,** 10 watt **1/6d,** 15W **1/9.**

MULLARD "3-3" & "5-10" HI-FI-AMPLIFIERS

3 OHM & 15 OHM OUTPUT
"3-3" Amp. 3-valve, 3 watt Hi-Fi quality at reasonable cost. Bass Boost and Treble controls, quality sectional output transformer, 40 c/s-25 kc/s — 1dB. 100mV for 3W, less than 1% distortion. Bronze escutcheon panel. **Complete Kit only 7 gns.** Carr. 5/-. **Wired and tested £8.10.0.**
MULLARD "5-10" AMPLIFIER—5 valves 10W, 3 and 15 ohms output. Mullard's famous circuit with heavy duty ultra-linear quality output tfr. **Basic amplifier kit price £9.19.6.** Carr. 7/6. **Ready built 11½ gns.**
2-VALVE PRE-AMP. UNIT
Based on Mullard's famous 2-valve (2 x EF86) circuit with full equalisation with volume, bass, treble, and 5 position selector switch. Size 9" x 6" x 2¼" Complete kit **£6.6.0.** Ready built **£7.19.6,** carr. 3/6d.

TRANSISTOR DECODER — FM STEREO

Based on Mullard design, printed circuit, etc. complete kit of parts. S.A.E. for full details.

ALUMIN. CHASSIS

18 g. Plain Undrilled folded 4 sides, 2in. deep, 6in. x 4in., **4/6;** 8in. x 6in., **5/9;** 10in. x 7in., **6/9;** 12in. x 6in., **7/6;** 12in. x 8in., **8/-,** etc.

ALUMIN. SHEET

18g. 6in. x 6in. **1/-;** 6in. x 9in., **1/6;** 6in x 12in. **2/-;** 12in. x 12in., **4/6** ea.

Jack Plugs. Standard 2½" Igranic Type, **2/6.** Screened Ditto, **3/3.** Miniature scr. 1½", **2/3.** Sub-min., **1/3.**

Jack Sockets. Open Igranic Moulded Type, **3/6.** Closed Ditto, **4/-.** Miniature Closed Type, **1/6.** Sub-min. (deaf aid) ditto, **1/6** Stereo Jack Sockets, **3/6.** Stereo Jack Plugs, **3/6.**

Phono Plugs, 9d. Phono Sockets (open), **9d.** Ditto (closed), **1/-.** Twin Phono Sockets (open), **1/3.**

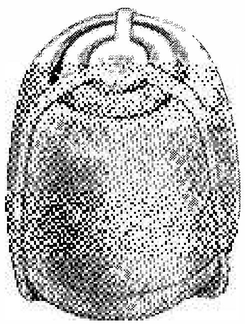
TRS Est. 1946

RADIO COMPONENT SPECIALISTS

70 Brigstock Road, Thornton Heath, Surrey.
THO 2188. *Hours: 9 a.m.-6 p.m., 1 p.m. Wed. Terms. C.W.O. or C.O.D. Post and Packing up to ½lb.,* 1/-, 1*lb.* 1/9, 3*lb.*, 3/-, 5*lb.* 3/9, 8*lb.*, 4/6.

SPECIAL OFFER of GUARANTEED *NEW* LUSTRAPHONE

Moving-coil Microphones



Specification: Moving-coil Model LD61, medium impedance (nominal 600 ohms at 1kc/s) in cream plastic casing with a fabric blast guard, 9ft. co-axial lead which can be extended to considerably greater lengths, fitted with a Belling-Lee co-axial plug—list price £3.7.6. **Yours for only 26/-.** This high quality mic. is omni-directional in the horizontal and approaches cardioid characteristic in the vertical planes. Frequency response approx. 70-12,000 cycles/sec. Sensitivity approx. 75 db(m).

The impedance of this microphone enables you to use it with a screened lead a hundred feet or more from your equipment without undue attenuation or hum pick-up. A transistor adaptor can be easily made to use this mic. with practically any tape recorder or amplifier (circuit supplied).

26/- each
Post Free in U.K.

Order NOW
While stocks last

Money Orders, Postal Orders or Cheques should be crossed and made payable to "Andrew Merryfield Ltd."

ANDREW MERRYFIELD LIMITED

Dept. 29, Wright's Lane, Kensington, London W.8

YOUR CAREER in *RADIO & ELECTRONICS?*

Big opportunities and big money await the qualified man in every field of Electronics today—both in the U.K. and throughout the world. We offer the finest home study training for all subjects in radio, television, etc., especially for the **CITY & GUILDS EXAMS** (Technicians' Certificates); the Grad. Brit. I.R.E. Exam.; the **RADIO AMATEUR'S LICENCE;** P.M.G. Certificates; the R.T.E.B. Servicing Certificates; etc. Also courses in Television; Transistors; Radar; Computers; Servo-mechanisms; Mathematics and Practical Transistor Radio course with equipment. We have **OVER 20 YEARS'** experience in teaching radio subjects and an unbroken record of exam. successes. We are the only privately run British home study College specialising in electronic subjects only. Fullest details will be gladly sent without any obligation.

To: British National Radio School, Reading, Berks.

Please send FREE BROCHURE *to:*

NAME .... Block
ADDRESS .... Caps.
.... Please
10.66

BRITISH NATIONAL RADIO SCHOOL

thus hardly any point in going to the extra trouble of employing photocells and light beams. In any case all such systems, whether employing tacho-alternator or photoelectric pick-up, require the external reference frequency oscillator, ratemeter discriminator and error amplifier/regulator circuit. Such designs are not simple and the stabilisation factor can never be any better than the inherent stability of the reference oscillator of such a circuit, which is generally insufficient in the face of the large range of battery voltages encountered.

It is as well to consider what degree of stability is actually required for good musical tape recordings. Taking the most sensitive region of the response curve of the human ear, say 1kc/s, a change of motor speed such that the originally recorded 1kc/s note shifts by about ±50c/s will move the whole recording one whole musical key either way. Any residual changes for the average music lover should be less than a fifth of this and even better for the specialist. A motor speed stability of better than ±1% is therefore definitely essential for even reasonably good musical recordings or record disc reproduction. A reference oscillator in a frequency discriminating stabiliser circuit should thus be stable to better than 0·25% to allow a margin for other influences without exceeding the total permissible limit.

A free-running oscillator can be made to achieve this order of frequency stability only at the price of some considerable compensatory measures and circuit complications. A short-term stability of this order during any one period of operation is very much easier to achieve than a long-term stability of this order between various times of operation in winter or summer, indoors or outdoors, with new and exhausted batteries in any of these instances.

OPTIMUM REQUIREMENTS

The optimum system of deriving a speed indication signal from the motor shaft should be such as to transmit that signal to the external stationary circuit without any need for sliprings and brushes subject to rapid wear. In other words, some system of radiation or induction into a stationary pick-up element is called for. There is no objection at all to the use of commutator segments or sliprings and brushes to take the main motor running current to the armature, since any effects of wear on these components are then corrected by the speed stabiliser loop, which does not include them and thus is not influenced in its accuracy by them. Any sliprings and brushes within the speed stabiliser loop will affect the speed indicator signal to a greater or lesser extent and will thus affect the accuracy of the entire stabilisation. It is found that changes of contact resistance of any sliprings and brushes within a speed regulator circuit are the chief detrimental factors and these resistance fluctuations affect the speed signal the more the greater the current flowing in the circuit needs to be. The input of the regulator electronics should therefore be of very high impedance especially in simpler systems which do need to use sliprings after all.

The circuit should also be able to operate without any form of external reference standard. This requirement was satisfied as soon as it had been realised that there is in fact no need at all to transmit a continuous signal of actual motor speed at all times. It is quite sufficient for all but the most exacting professional purposes if the motor can be made to transmit a simple binary signal, i.e. merely either one of two possible states, "too slow" or "too fast". This is provided in the simplest practical manner imaginable by a centrifugal contact.

CENTRIFUGAL CONTACTS

A centrifugal contact is simply a spring-loaded contact very similar to the type found on conventional relays but mounted on and rotating with the motor shaft in such a manner that at the desired speed of rotation the outward centrifugal force just balances in inward spring pressure and the contact consequently then open. The closed centrifugal contact thus signifies "motor running too slow" and the opened centrifugal contact "motor running too fast". The speed at which the contact opens, which is the speed at which the electronics then stabilises the motor can be set over a wide range with a small grubscrew bearing down upon the contract spring. This is normally preset to the correct value for a particular motor at the factory and then sealed, but adjustments on the part of the service engineer are certainly possible when necessary.

The "reference" in this system is the effective stiffness of the contact spring and its physical geometry. The accuracy of the entire stabiliser system is as good as the constancy of these mechanical parameters of the centrifugal contact provided that the regulator circuit is designed (a) in such a manner that contact

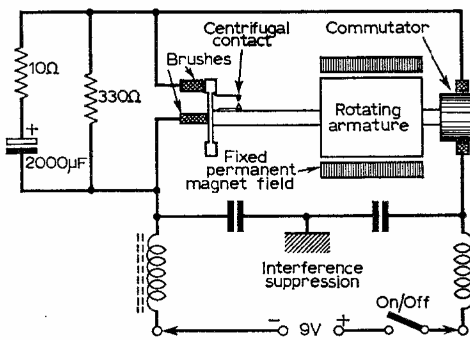


Fig. 1: The earliest method of stabilising the speed of a battery motor, using a centrifugal contact to break the main current through the motor when the desired speed has been reached.

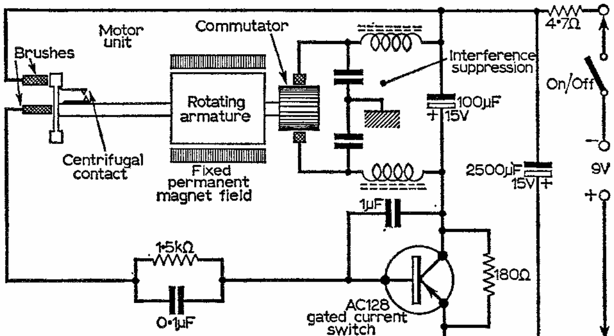


Fig. 2: An improved method with a centrifugal contact. The loading on the contact is reduced, by using it only to gate a switch transistor which in turn interrupts the main motor current.

wear in the electrical sense is minimised and (b) any such wear and resulting fluctuations of electrical resistance are unable to affect the circuit to any significant extent. Virtually all modern speed stabilised motors in battery operated equipment, at least in the domestic range, now employ centrifugal contacts as speed indicators. The external electrical circuits all involve some means of choking back the full motor drive current when the centrifugal contact opens and restoring the full motor current as soon as the motor has slowed down again sufficiently to close the contact. The better the particular circuit the lower the electrical loading imposed upon the centrifugal contact.

DIRECT SWITCHING

Fig. 1 depicts the simplest form of speed stabiliser circuit with a centrifugal contact which, however, meets none of the requirements already discussed for achieving good reliability. The centrifugal contact switches the full motor current directly and is thus heavily loaded and it is necessarily connected by sliprings and brushes under these conditions. The earliest speed-regulated tape recorders and record players nearly all employed this circuit, which turned out to be notoriously unreliable and led to the bad reputation of such equipment mentioned earlier in this article. The very cheapest recorders without any form of stabiliser, which merely employed a manually variable resistor in series with the motor, gave superior reliability.

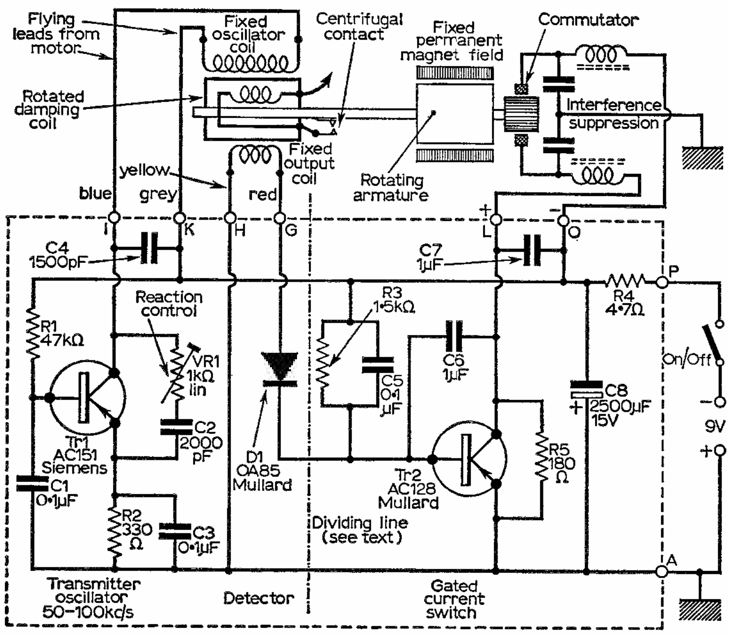
In the arrangement of Fig. 1 the centrifugal contact rapidly burns up, in some cases after only 20 to 50 running hours of a new motor. Resulting changes of contact and slipring resistance reflects greatly as speed fluctuations, in some cases to a greater extent than the fluctuations encountered in simple unstabilised motors. The arrangement of Fig. 1 was thus largely a commercial failure as it stands, although many machines were marketed using it.

The chief root of the trouble was the heavy and continuous arcing at the centrifugal contact because this contact hovers close to the make/break state, never getting really far away from it. The 10Ω resistor and 2,000μF capacitor shown in Fig. 1 were added to make the action more sluggish in an attempt to reduce this "hover arcing". When the contact opens, the charge stored in the capacitor keeps the motor running at the higher speed for a moment to allow the contact to open fully before speed falls and it closes again, whereupon it remains closed properly for a moment until the capacitor has recharged and the motor can gather speed again. This innovation was not really successful either because any increase of the time-constant of the resistor/capacitor combination sufficient to kill the arcing led to an intolerably high level of motor hunting, i.e. wow and flutter in the recorder or record player. Moreover such measures are in direct contradiction to the purpose of the drive capstan flywheel of a tape recorder (or the turntable mass of a record player). It is not the charge stored in the capacitor of Fig. 1 that is the decisive factor, but rather the time-constant of the motor speed variation, which is largely dictated by the flywheel, i.e. the mechanical inertia of the system. This leads to a vicious circle in trying to reach any satisfactory compromise along these lines. A much better approach is to reduce the current loading of the centrifugal contact, which will reduce arcing without any contradictory side effects.

SWITCH-TRANSISTOR CONTROL

The better machines of past years thus resorted to the circuit arrangement shown in Fig. 2 where the centrifugal contact is used merely to switch the base bias of a gating transistor which in turn controls the full motor drive current. Loading and wear of the centrifugal contact were therefore much reduced and any fluctuations of contact or slipring resistance in this circuit of much higher impedance led to far smaller speed fluctuations. Such circuits were reasonably successful and found widespread application.

If any reader possesses a tape recorder or record player with the arrangement of Fig. 1 he is well



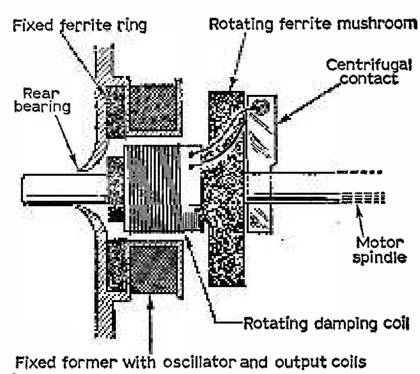


Fig. 3a (left): The final design used by the author utilising a centrifugal contact. Note the centrifugal contact (or switch) is connected to the rotating damping coil.

Fig. 3b (above): Construction of the Bühler motor.

PEAK SOUND

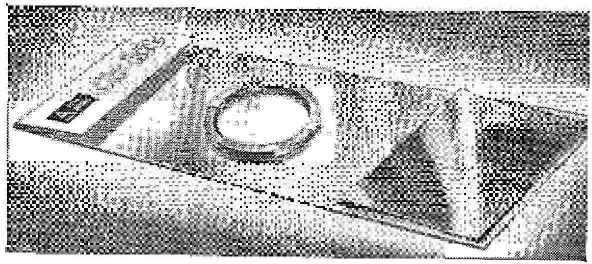
Cir-kit

WHAT EVERY CONSTRUCTOR, EXPERIMENTER AND DESIGNER SHOULD HAVE

THE NEW WONDER CIRCUIT SYSTEM

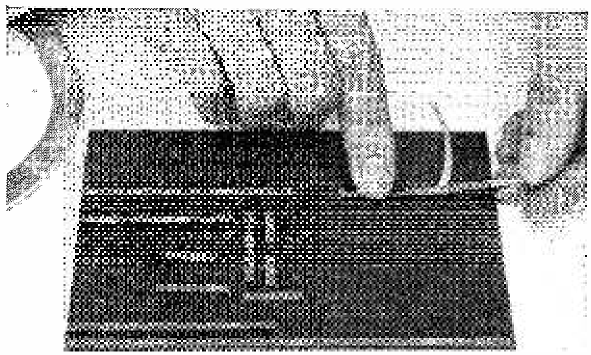
for making your own *INSTANT* circuits

Think what it means to be able to have just **ONE** printed circuit to the design you want and you will see immediately just how wonderfully **CIR-KIT** more than fills that long felt need. **CIR-KIT** is quick—you simply lay the self-adhesive strip on the board, drill holes for the components and you are ready to solder them in at once. **CIR-KIT** is clean—there are no chemicals, acids or etching processes involved. **CIR-KIT** is adaptable—you can amend a circuit again and again quickly and easily. Ideal for experimenters, this. **CIR-KIT** is economical—the No. 3 Constructors' Kit advertised here contains enough material to make up about 10 circuits, and components may be closely mounted if desired. You can also repair damaged conventional printed circuits; you can experiment quickly and cheaply. In fact, **CIR-KIT** is the most revolutionary advance in circuit techniques since the printed circuit itself was invented and is already being used by many of the most famous houses in electronics.



This is Kit No. 3 complete with instructions, board and material in sealed polythene pack ready for immediate use. Price 15/-

NO CHEMICALS, ETCHING HEAT, SPECIAL TOOLS OR RESTRICTIONS to LAY-OUT



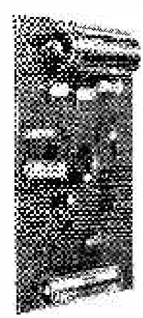
Enough for about ten circuits

CIR-KIT KIT No. 3 contains high quality mounting board (Bakelite laminate E.10) size 6" x 12", 4" x 6" CIR-KIT special adhesive copper sheet and 15ft. of ⅛" CIR-KIT special adhesive copper strip. Land areas and special shapes are cut from the CIR-KIT sheet. The heat-resistant adhesive used will last indefinitely with normal use even if you strip and remount your CIR-KIT. With full instructions.

15/-

PROFESSIONAL IN EVERY WAY

Lay the strip and land areas, drill holes for the components and your circuit is ready for the components. Nothing could be simpler, yet the result is 100% professional.



PEAK SOUND Cir-kit

PEAK SOUND (HARROW) LTD.,
10, ASHER DRIVE, ASCOT, BERKSHIRE
Phone OEH47-3217

Distributors to the Wholesale and Retail Radio Trade in the U.K.

TECHNICAL SUPPLIERS LTD.
63, GOLDHAWK ROAD, LONDON, W12
Phone 01-603-2581: 01-603-4794

Please quote Dept. PW.10 if you prefer not to cut coupon out.

To PEAK SOUND (HARROW) LTD., 10 Asher Drive, Ascot, Berks.

Please send .... CIR-KIT(s) for which I enclose ....

NAME ....

ADDRESS ....

....

BLOCK LETTERS PLEASE PW.10

THE AUDIO FIDELITY STEREO-33

A High Fidelity All Transistor Stereo Amplifier providing 10 watts R.M.S. on each channel

OUTPUT (per channel)
10 watts R.M.S. into 15 ohm load.
15 watts R.M.S. into 3.75 ohm load.

TOTAL HARMONIC DISTORTION
0.1% at 10 watts R.M.S. 1,000 c.p.s. } into 15 ohm load

DAMPING FACTOR 20

FREQUENCY RESPONSE
±1½ dB 20-20,000 c.p.s.

HUM AND NOISE—80dD

CROSSTALK—42dB to—53dB

MAINS INPUT SELECTION
100-110—120-200-210-220-240v. 50/60 c.p.s.

SEMI-CONDUCTORS (per channel)
AC107, OC44(3), OC81Z(2), OA5, OC127Z, AD149(2).

BASS CONTROLS
+11 dB to —16 dB at 40 c.p.s.

TREBLE CONTROLS
+15 dB to —15 dB at 10 Kc/s.

EQUALISATION
Gram. to std. R.I.A.A. characteristic.
Tape head to std. C.C.I.R. characteristic.

SIZE 12¾" x 4" x 8¾"

WEIGHT 12¾lb.

FILTER (Steep Cut)
7 Kc/s, 11 Kc/s, 15 Kc/s.

Please send SAE for leaflet

Incorporation of the very latest Transistors has made possible the really outstanding performance figures of this brilliant design. Compare them with other leading makes currently available.

RETAIL PRICE 39 GNS

THE PRE-AMPLIFIER IS A COMPLETELY NEW DESIGN

IT MINIMISES THE NECESSITY OF MATCHED INPUTS & COMPLICATED SWITCHING ARRANGEMENTS. IT ALSO PRODUCES CONDITIONS OF MINIMUM NOISE AT HIGHEST SENSITIVITIES.

INPUT SENSITIVITIES
(for 10 watts R.M.S. into 15 ohms),
Pick-up Magnetic
3.5 m.v. 33⅓ r.p.m.
7 m.v. 78 r.p.m.
Pick-up Crystal/Ceramic
400 m.v.
Microphone 5 m.v.
Tape Head 2 m.v. Aux. (Radio Tape, Ceramic P.U. etc.) 100 m.v.
(Above sensitivities will be doubled when output load is 3-4 ohms.)

INPUT SELECTOR
33⅓ r.p.m. 78 r.p.m. Aux. Mic. Tape Head.

INPUT SOCKETS
Magnetic P.U., Crystal/Ceramic Pick-up Aux., Tape Head. Microphone.

Built to the highest standards employing latest materials and techniques.

DESIGNED FOR EASE OF FITTING IN CABINET OR FOR FREE-STANDING USE.

Tested for satisfactory operation in temperatures of up to 50°C. (120°F.)

EXPORT ENQUIRIES INVITED

Designed and developed by the Audio Fidelity Group of Companies.

Manufactured and Distributed by LINEAR PRODUCTS LTD. ELECTRON WORKS, ARMLEY, LEEDS.

SUPPLIERS OF ELECTRONIC EQUIPMENT TO . . .

ALPHA

* UNIVERSITIES
* COLLEGES OF TECHNOLOGY
* COLLEGES OF FURTHER EDUCATION & SCHOOLS
* FOR ALL ENTHUSIASTS

OFFICIAL SUPPLIERS TO MANY EDUCATION AUTHORITIES
Usual Educational Discounts

OUR NEW 1966/67 illustrated catalogue NOW AVAILABLE
(send 1/- in stamps for your copy)

INCLUDES
Valves, Transistors, Transformers, Loudspeakers, Recording Tape, Coils, Resistor, Condensers, Potentiometers, Chassis, Rectifiers, Test meters, Microphones, Tools, Solder etc.

ALPHA RADIO SUPPLY CO
103 Leeds Terrace,
Wintoun Street, Leeds 7
Telephone 25187

RADIO AND AUDIO SERVICING HANDBOOK

A practical guide to fault-tracing, adjustment and repair in radio receivers, car radios, radiograms, tuner units, record reproducers, turntable units and tape recorders.
By G. J. King

30/- Postage 1/6

1966 WORLD RADIO TV HANDBOOK SUMMER SUPPLEMENT 1966. 12/6. Postage 9d.

SERVICING ELECTRONIC ORGANS by C. R. Pittman and E. J. Oliver. **30/-.** Postage 1/-.

HOW TO REPAIR MAJOR APPLIANCES by E. Tricomi. **30/-.** Postage 1/-.

Inter. G.E.C. TRANSISTOR MANUAL 7th ed. **18/-.** Postage 2/-.

TRANSISTOR IGNITION SYSTEMS HANDBOOK by Brice Ward. **22/6.** Postage 1/-.

THE RADIO AMATEUR'S HANDBOOK by A.R.R.L. 1966 ed. **40/-.** Postage 2/6.

AMATEUR RADIO ANTENNA HANDBOOK by H. D. Hooton. **24/-.** Postage 1/-.

100 IDEAS FOR DESIGN. No. 1. Electronic Design. **15/-.** Postage 1/-.

COMPLETE CATALOGUE 1/-

THE MODERN BOOK CO.
BRITAIN'S LARGEST STOCKISTS
British and American Technical Books
19-21 PRAED STREET LONDON, W.2
Phone: PADdington 4185
Closed Saturday 1 o'clock

TRANSISTORS, COMPONENTS ETC.

Types:—
AC 127 2/-; AF 115 4/6; AF 117 4/-; BY 100 2/9; OC 19 4/6; OC 26 4/6; OC 44 2/-; OC 71 2/-; OC 72 2/-; OC 81 2/-; OC 81D 2/-; OC 170 4/6; OC 171 4/-; 2G 339A 2/-; 2G 371 2/-; GET 883 4/-; GET 884 4/-; S15T (Match paired output) 6/-; Signal Diode 1/-.

All types of semi-conductor rectifiers from 50V-400V.

Price on request.

MULLARD MINIATURE ELECTROLYTIC CAPACITORS

1/- each; 9/- per dozen

RANGE:—C426/AE/A64; C426/AE/A250; C426/AM/A400; C426/AE/B50; C426/AM/B500; C426/CF/F25; C426/AM/C40; C426/AE/C250; C426/CE/F125; C425/AF/D25; C426/CE/D320; C425/CL/F10; C425/AL/E2.5; C425/AL/E16; C425/CF/F10; C426/CE/E200; C426/CM/E200; C426/CM/E100; C426/AM/E200: **CASH WITH ORDER. SAME DAY DESPATCH.**

EURAMASIA LIMITED
3 POPLAR COURT PARADE,
RICHMOND RD., TWICKENHAM,
MIDDX. POP 6689.

advised to convert this to that of Fig. 2. This is very straightforward, layout is non-critical and the AC128 (or equivalent) switching transistor and its few associated components can be tucked into any available free corner of the equipment. Before replacing a seriously fluctuating motor in a recorder using the arrangement of Fig. 1, try conversion to Fig. 2. This is simpler and cheaper than a motor replacement in many cases and very often leads to good performance for a long spell of continued operation with a centrifugal contact already too burnt to operate correctly in the circuit of Fig. 1. If a motor is so far damaged in Fig. 1 as to need definite replacement on all accounts, simultaneous conversion to Fig. 2 (which is always possible) is strongly recommended or even replacement with the new Bühler r.f.-stabilised motor (if mechanically practicable in the particular instrument).

If a centrifugal contact has already been burnt so badly in Fig. 1 that performance in Fig. 2 is still not quite as desired, it is possible to add a second transistor as emitter-follower in order to reduce contact loading still more. Any small a.f. type with a current gain of 20 to 30 in the grounded emitter circuit is satisfactory. The R-C combination of 1·5kΩ and 0·1μF from the centrifugal contact shown in Fig. 2 must then go to the base of this second transistor, whose emitter is taken to the base of the AC128. The collector of the additional transistor is taken to the negative end of the 2,500μF electrolytic shown in Fig. 2. No other changes are necessary. If even this two-stage cascade circuit fails to operate stably then the motor is definitely too far gone and needs replacement. The two-stage circuit, although actually adopted by a few commercial recorders, is hardly necessary with the new replacement motor, with which the single-stage circuit of Fig. 2 is normally quite adequate.

Even the circuit of Fig. 2 proved to be much more prone to trouble than the motor itself, i.e. the life of the centrifugal contact system was nearly always much shorter than that of the motor bearings, commutator and armature.

CONTACT BURN-UP

Troubles were still merely ones of gradual burn-up of the contact and wear on the sliprings. Even the slightest interrupted current—as little as a few microamps—suffices to burn up the contact gradually to the extent of forming a minute surface film of oxidation. It was thereupon realised that an ultimately reliable motor (in the sense that the service life of the centrifugal contact system is at least as great as that of the motor itself) is possible only if the centrifugal contact *never interrupts any current whatsoever*, i.e. if no voltage at all is ever present across it at the moment it opens (conditions at the moment of closing are unimportant since there can then be no significant arcing). Also complete obviation of any sliprings is essential, i.e. a radiative or inductive method of transfer for the signal is highly desirable.

These conditions led to the ingenious and surprisingly simple solution adopted in the highly successful Bühler r.f.-stabilised motor whose full operating circuit is shown in Fig. 3a. These motors, developed by Messrs. Bühler Motors, of Nuremberg, West Germany, are now used in the better quality portable tape recorders of Messrs. Grundig and all

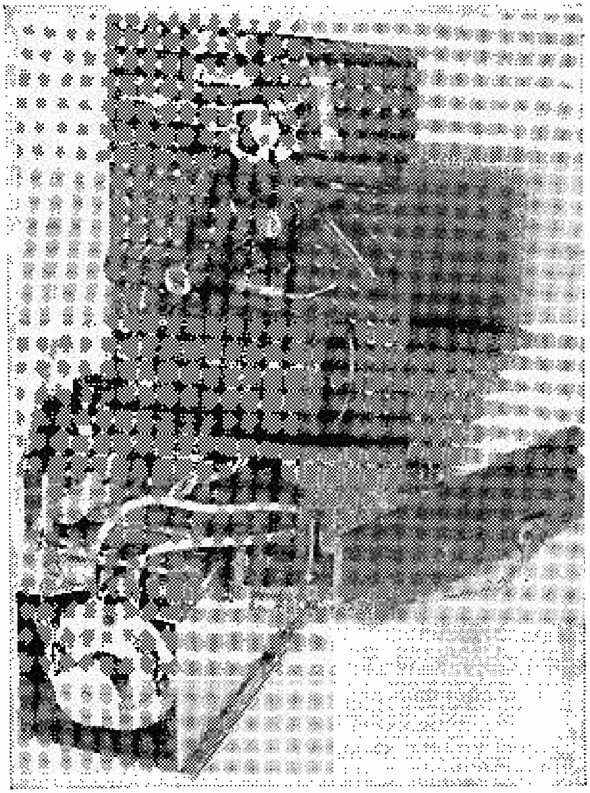


Fig. 4: Demonstration unit using the circuit of Fig. 3a. The motor supplied stabilises at 3,000 r.p.m. within the limits shown in Fig. 5.

other leading manufacturers. They have proved highly successful and are apparently free at last from all the shortcomings of previous arrangements. Fig. 5 shows some performance data of this novel motor which is seen to be really excellent. The useful life of all parts of this motor is very long, the motor runs exceptionally quietly and smoothly and the power conversion efficiency is so good that rugged mechanisms can be driven without uneconomical battery consumption.

THE BÜHLER MOTOR

The front end, i.e. drive mechanism, of the motor is conventional, using an ordinary d.c. arrangement of wound armature and commutator with a permanent magnet field as heretofore. All battery motors for this type of equipment should use permanent magnet fields to save expensive battery power otherwise uselessly wasted in energising a solenoid field.

The rear end of the motor shaft carries the same type of centrifugal switch as previously but this is now connected across a rotating coil of many turns of fine wire wound on a ferrite mushroom rigidly attached to the motor shaft and rotating with it Fig. 3a. There are no external connections to this system, which rotates within a fixed bobbin near the rear bearing of the motor shaft, carrying a stationary oscillator and pick-up sensing winding as well as a stationary ferrite ring around the bearing to complete the magnetic path. The larger winding of the stationary coil is connected as oscillator coil in a conventional transistor oscillator circuit around Tr1 in Fig. 3a. The pick-up sensing coil of fewer turns is connected to a detector diode D1 which develops a positive rectified output at its cathode (applied to the base of Tr2) whenever the oscillator is actually oscillating and no output when it is muted.

As long as the motor is still running too slow the large rotating coil is shorted out by the centrifugal contact. Provided that the reaction control is set correctly (VR1) the oscillator is therewith damped so heavily that it is unable to oscillate at all. The base of Tr2 receives sufficient bias via R3 under these conditions to fully open the emitter collector path of Tr2 and allow the motor to draw full current and gather speed. As soon as it reaches the correct speed the centrifugal contact opens. Since the oscillator is still dead at this moment the contact breaks neither voltage nor current, so that there is no spark whatsoever developed and electrical wear is nil. But the damping of the oscillator is therewith removed and it bursts into oscillation at once. The oscillation picked up by the sensing coil is immediately rectified by D1 to give a positive backing bias cutting Tr2 off at its base. The motor current is therefore reduced to a low value magnitude. When the motor has lost sufficient speed again for the centrifugal contact to close, the oscillator ceases to oscillate abruptly (if not, reaction applied via VR1 is excessive and must be reduced accordingly.

The cut-off bias developed by D1 vanishes, Tr2 can open again and restore full motor current so that the motor can gather speed again. It is necessary to give slight additional delay above that imposed on the motor speed response by the mechanical inertia (flywheel or turntable mass) so that centrifugal contact can fully open and fully close on each action cycle without fluttering in order to provide clear-cut keying of the oscillator Tr1, leading to a positive action. This is achieved largely with C6, which multiplies itself by the familiar Miller effect as a virtual capacitor β times as large between the base of Tr2 and chassis, where β is the current gain of Tr2. This virtual large capacitor acts as time-delay reservoir for the control bias developed by D1.

ADJUSTMENTS

If the motor is heard to "sing", i.e. to run up to an excessively high speed, and an oscilloscope connected to the anode of D1 (use a probe) reveals no oscillation, check the transistor connections and all other wiring. If this leads to no cure, the current gain of Tr1 may be too low. Select a transistor with a higher current gain after first trying an increase of C2 and reduction of C3 (say 50% or even 100% in each case). Check that the coils blue/grey and yellow/red have not been confused, although individual coils may be connected any way round.

Once oscillation is evident at the anode of D1 stop the motor pulley with the fingers and adjust reaction with VR1 such that residual oscillation just vanishes. Then release the motor pulley and allow the motor to run up to full speed until the centrifugal contact intermittently opens and observe the 100% arbitrary interval square wave amplitude modulation of the oscillation on the slowest timebase speed available on the oscilloscope. Observe that the oscillation is absent only for very brief intervals, and present most of the time, when the motor is running light off load. Then apply increasing friction with

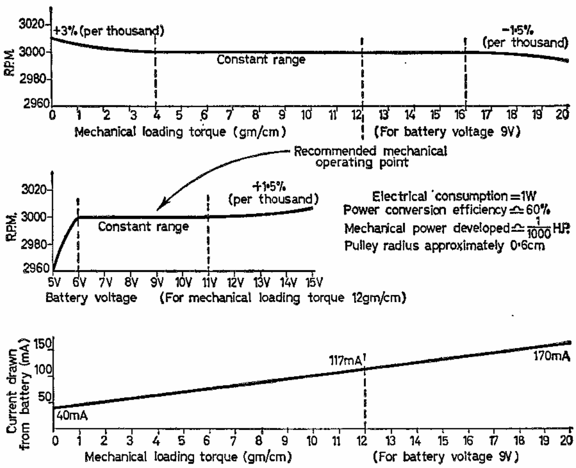


Fig. 5: The performance characteristics of the Bühler r.f. stabilised motor in the circuit of Fig. 3a.

a finger held against the rim of the pulley and note that the oscillation gaps progressively increase until finally only very brief bursts of oscillation remain and very long intervals. If these brief bursts are of lower amplitude than the longer ones, or of variable amplitude reaction is insufficient. If the modulation is not 100%, i.e. if the oscillator commutates between a low and a high level without ever muting completely, reaction is excessive.

Once the oscillator gating is correct in the manner described make a recording of a fixed sinewave of, say, 1 kc/s from an a.f. signal generator with the motor driving the tape desk mechanism in the machine with which it is to be used (or play a standard frequency record if a record player is involved). Study the effect of changes of value of C6 and R5 upon wow and flutter in the output aurally or, if available, with special test equipment. As an intermediate between these extremes jitter of the playback display may be observed empirically on a weakly synchronised oscilloscope (sync control near minimum). Make sure that C6 is definitely smaller and R5 definitely greater than those values for which serious wow and flutter commences.

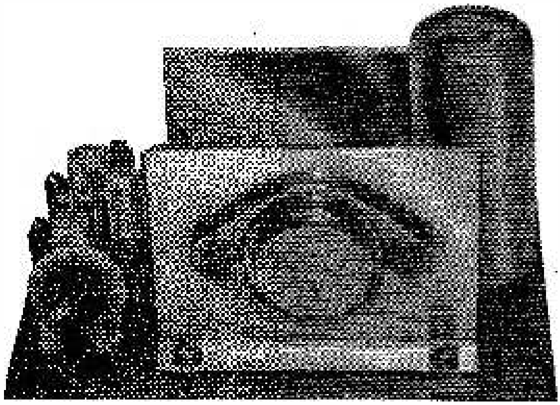
The oscillator frequency should lie between 50kc/s and 100kc/s. If strange interferences or distortion in conjunction with inversion beating with higher audio frequencies in the a.f. signal being recorded or replayed with the instrument are observed, shift the oscillator frequency to a higher value than that prevailing by reducing C4 until such interference disappears. Before undertaking such measures carry out some experiments to determine the best position for the Veroboard. If necessary interpose an aluminium screen or surround the Veroboard completely with a metal can grounded to the main chassis.

Further possibilities of beat frequency interference can arise in a tape recorder if the difference between the bias and erase oscillator frequency on the one hand and the motor control on the other hand lies within the audio passband of the machine. Good mutual screening may already effect a cure and, if not, suitable increase of motor control oscillator frequency (reduce C4) will again remove the trouble.

—continued on page 418

5-WATT AMPLIFIER

f. l. thurston



THIS amplifier has no transformers and gives an output of up to approximately 5 watts into a 3 ohm loudspeaker. The amplifier is sufficiently versatile to be able to feed into almost any speaker impedance, without the use of a matching transformer, but with the higher impedance speakers, the maximum available output is less. The amplifier built by the author measures $3\frac{1}{2} \times 2\frac{1}{4} \times 2\frac{1}{4}$in., but these dimensions could be reduced with little difficulty, if required. Total building costs should be less than £3.

Although the unit is designed to work from a 12V supply. it will work perfectly well within the range of 9 to 18V without need for any component value changes.

Circuit Description

A circuit diagram of this five transistor unit is shown below in Fig.1. Tr1 is wired as a conventional common emitter amplifier, with collector load R4. The input signal is connected to Tr1 base via C1, and R1-R2 are the base-bias resistors. The collector circuit of Tr1 is directly coupled to the bases of Tr2 and Tr3. Tr2 can also be regarded as a conventional emitter follower, operating from approximately half supply potential, the lower end of R6 will therefore be approximately 6V negative. Being an emitter follower it gives a high input and low output impedance, and gives unity voltage gain with zero

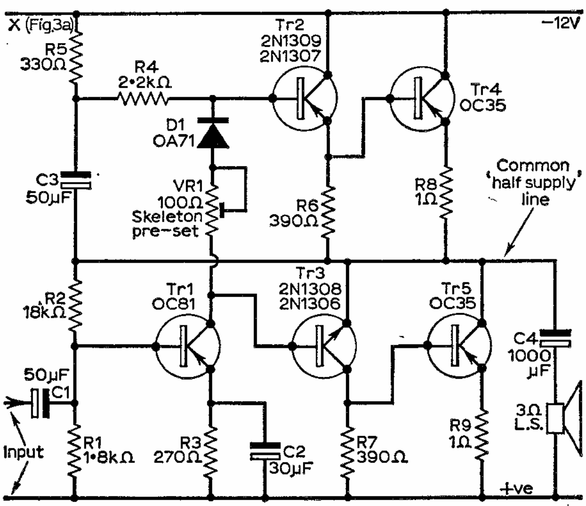


Fig. 1: Circuit diagram of the amplifier.

phase shift between input and output.

Tr3 is wired as an n.p.n. common emitter amplifier with 100% (voltage) negative feedback; in this case the circuit gives a high input and low output impedance.

The circuit again gives unity voltage gain, but in this case 180° phase shift occurs between the base and output collector. Thus, when a common input signal is applied to the bases of Tr2 and Tr3, the output signals at Tr2 emitter and Tr3 collector are of similar form but are of opposing phase.

Both of these transistors operate at approximately half supply potential, and the input signal from Tr1 collector operates at the same mean level, so that, when negative going inputs are applied, Tr2 conducts and Tr3 is cut off, and vice versa.

The signal at the emitter of Tr2 is directly coupled to the base of Tr4, an emitter follower, so that the signal at Tr4 emitter, and thus at the common "half supply" line, follows the signal at Tr1 collector.

The signal at the collector of Tr3 which is in anti-phase to that at Tr1 collector, is directly coupled to the base of Tr5; being connected as a common emitter amplifier, with 100% (voltage) negative feedback, giving unity voltage gain between base and collector but 180° phase change, so that Tr5 collector, and the common "half supply" line, again follows the signal at Tr1 collector.

When negative going signals are available at Tr1 collector, Tr2 and Tr4 conduct and Tr3 and Tr5 are cut off. When positive going signals appear at Tr1 collector, Tr2 and Tr4 are cut off and Tr3 and Tr5 conduct. The common "half supply" line follows the signal at Tr1 collector, but at a very low impedance level signals fed to the external speaker via C4. Thus, the circuit acts as a single ended Class-B push-pull amplifier.

To minimise cross-over distortion in the amplifier, a small bias voltage is applied between the bases of Tr2 and Tr3. This bias voltage should be compensated against changes in temperature and diode D1 and variable resistor RV1, in the collector line of Tr1, are used for this purpose. Ideally, a special compensating diode should be used, but since are quite expensive, a semiconductor diode OC70 and variable resistor have been used instead to give results that, although not perfect, are quite acceptable.

Resistors R8 and R9 give a degree of stabilisation to the two power transistors, Tr4 and Tr5.

It is important to the operation of the circuit

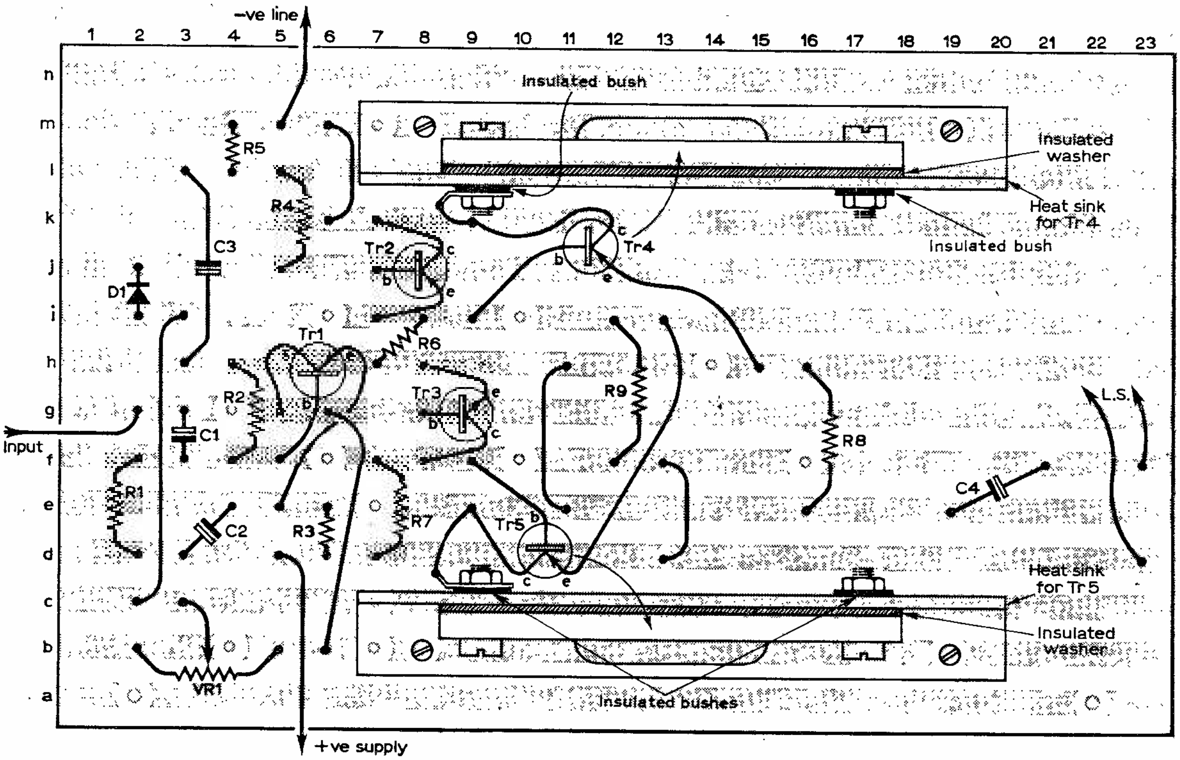
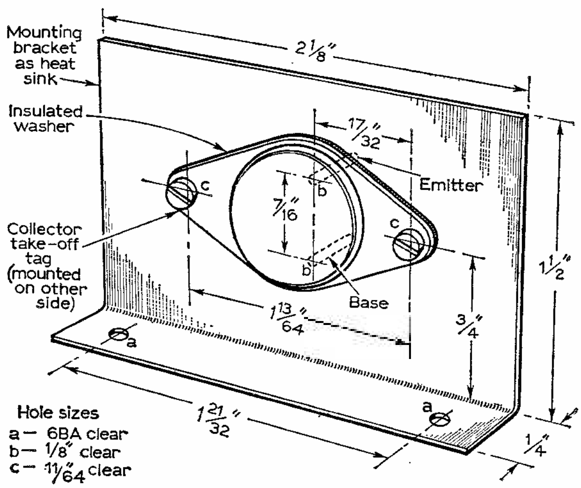


Fig. 2: Constructional details. Above is a component layout and wiring diagram of the Veroboard panel. The illustration below gives drilling and mounting details for the heat sinks.



that the common "half supply" line be kept at approximately half the supply line voltage, and with this in mind the circuit is d.c. stabilised by feeding the Tr1 base-bias resistor, R2, from the common line.

To obtain the maximum possible voltage gain from Tr1, the collector load should be as large as possible, but unfortunately the d.c. requirements limit the value of the load to about 2·5kΩ. Fortunately, it is possible to increase the *effective* value of the collector load without increasing the *actual* value. This is achieved by inserting R5 between the negative supply line and the main collector load, R4, and feeding the full a.c. signal from the common "half supply" line to the R4-R5 junction via C3. Thus, when a signal appears at Tr1 collector, almost identical signals appear at *both* ends of R4, and therefore only a small signal flows in this resistor, which thus appears to the a.c. signal to be of a far greater resistance than it really is. This technique is known as "bootstrapping" and has many applications.

Construction

The unit is built up on a single piece of Veroboard measuring $3\frac{1}{2} \times 2\frac{1}{4}$in. with 0·15in. hole spacing. Start construction by cutting out two heat sinks from 18 s.w.g. aluminium sheet for the power transistors, Tr4 and Tr5. Bend and drill the sinks as shown in Fig. 2a. When the heat sinks are completed, bolt the two power transistors in place, using insulated washers and spacers which should be supplied with the transistors. A small solder tag should be secured behind one of the nuts that is used to hold the transistor in place, this solder tag being insulated from the heat sink, but in electrical contact with the body of the transistor to give a collector take-off point. Cut the Veroboard panel to size shown in Fig. 2, and break the copper strips where indicated. Eight small holes should now be drilled in the panel; four of which will be used for securing the heat sinks. The others are for mounting the completed amplifier.

Turn the panel over and start fitting the components and wiring up as shown in Fig. 2. If space is at a premium it is best to mount all the components vertically. Before attempting to fit

VR1 in place, the diameter of its mounting legs should be filed so that they fit easily into the holes in the Veroboard panel.

When complete, the wiring should be double checked, and if satisfactory, the unit can then be checked as follows: with no external speaker connected, connect a 12V supply to the unit, taking care to monitor the current taken from the supply, and adjust VR1 to give a reading of 8 to 15mA. This reading should remain steady over a test period of a few minutes. Now connect an external speaker. There should be no appreciable increase in the mean current, apart from a small "flick" that may occur at the instant that the connection is made.

If these tests are satisfactory, an input can be connected to the unit and a functional check carried out. The amplifier should be run at fairly high volume; the current will fluctuate considerably with volume level, but should fall back to the 8—15mA level whenever the input signal falls to zero. The final value of the zero signal current should be adjusted to give minimum cross-over distortion, but shoud be within the limits set above.

The unit is now complete and ready for use.

★ components list

Resistors:

R1	1·8kΩ	R6	390Ω
R2	18kΩ	R7	390Ω
R3	270Ω	R8	1Ω 3W 5%
R4	2·2kΩ	R9	1Ω 3W 5%
R5	330Ω		

All resistors 10% ½W unless otherwise stated.

Capacitors:

C1	50μF 15V	C3	50μF 15V
C2	30μF 6V	C4	1000μF 15V

Semiconductors:

Tr1	OC81	Tr4	OC35
Tr2	2N1309, 2N1307	Tr5	OC35
Tr3	2N1308, 2N1306	D1	OA71

Miscellaneous:

Insulated mica washer and spacers for OC35's. 3Ω loudspeaker, Veroboard 3½ x 2¼ in., 18 s.w.g. aluminium sheet for heat sinks, wire, sleeving, etc.

Adding a Pre-Amp

The sensitivity of the unit should be adequate for most purposes at it stands, but, should extra sensitivity be required, the pre-amplifier shown in Fig. 3 may be used. Note that the polarity of C1, shown in Fig.1, should be reversed if the pre-amplifier is to be used. C7 and R14 act as a decoupling network between the main amplifier and the pre-amplifier, and prevent instability.

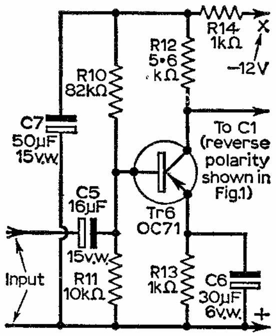


Fig. 3: Pre-amplifier designed to work with main amplifier.

If required, this pre-amplifier can be built into the main amplifier by slightly increasing the size of the basic Veroboard panel.

Power Supply

A suitable mains power supply unit (12V output) for use with the amplifier, is shown in Fig. 4. The 2·5A fuse is fitted to protect the power unit should a fault occur.

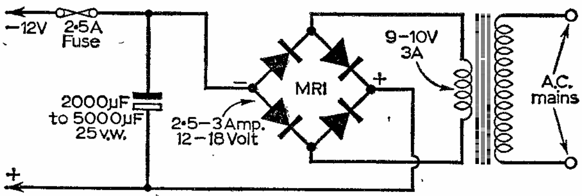


Fig. 4: A power supply suitable to drive the main amplifier and the pre-amp.

If alternative power supply voltages are to be used with the amplifier, VR1 should be adjusted to give the no signal currents already stipulated. ■

EXPERIMENTERS' CORNER

—continued from page 425

Fehling's-Formaldehyde Copper Bath.

Rochelle Salt (Sodium Potassium Tartrate) ..225 gms./litre.

Sodium Hydroxide (DANGER-CAUSTIC!) ..32 gms./litre.

Copper Nitrate, $Cu(NO_3)_2$, $3H_2O$ 125 gms./litre.

This solution is made up, filtered, and added to an equal volume of 37% formaldehyde solution just before use. It deposits at about the same rate as the nickel solution and is fairly stable, as copper baths go, over a period of several hours. It can be replenished by adding the first mixture in small quantities to the bath.

Finally the most important part of the process is the initial catalysing operation. The board must be cleaned and degreased, and washed well with water, finishing up with demineralised water. One popular catalyst is Gold Chloride, 0·1% $AuCl_3$ by weight. As this is not a solution to throw around in experiments, a less reliable alternative is;

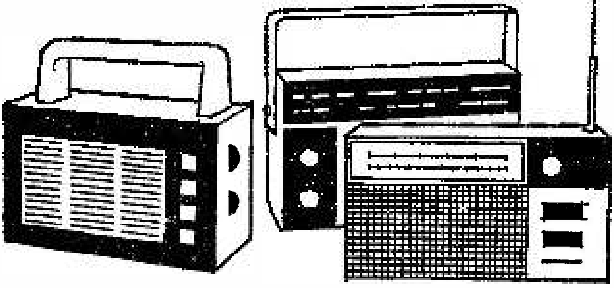
Stannous Chloride, $SnCl_2$ ....5 gms.

Sodium Hydroxide, 300 g./1 Sol'n ......25 mls.

Rochelle Salt, 346 g./1 Sol'n ....25 mls.

These solutions are made up with thickening agents as inks, one useful thickener is "Polycell", and you can always paper the room after plating your circuits! Easier still, if you can get hold of finely powdered metals, is to make up thick "inks" of the appropriate metal, stirring well before use. The metal powder should be of 200 mesh or finer.

Important: Hands should be washed immediately after handling any chemicals. All liquids, particularly those containing caustic, should be poured gently to avoid splashing. A bowl of clean water should be to hand. If any chemical splashes into the eyes, plunge the head immediately into the water and blink rapidly. ■



IMPROVING T P

MANY of the smaller transistor radios are designed and built down to a price. They contain the minimum number of components assembled around the simplest basic circuit. Results can be quite satisfactory but it is possible in many cases to improve on the original design. Modifications can range from simple improvements to a.g.c. circuits, to methods of battery economy and adding r.f. and a.f. stages.

Before making any alterations, it is advisable to study the circuit and familiarise oneself with the physical layout. A typical circuit for a six transistor superhet is shown in Fig. 1. The components in this type of receiver are often assembled on both sides of a printed panel.

Difficulty may be experienced in locating the connections to individual parts. Holding the panel before a bright light can help to outline the wiring. If this method fails, one can mark the component terminal wires with coloured spots of paint. Quick drying aero-model dope in a wide range of bright colours is available from model shops in ninepenny tins.

Begin by identifying the output transistor terminal solder blobs on the underside of the printed panel. Using a pointed match stick drop a spot of red paint on each collector blob, yellow on each base terminal and blue on each emitter. Repeat this colour code on the remaining transistors. Locate the i.f. transformers and enclose the terminals in squares of white dope. Repeat this code on the driver and output transformer, where fitted, using green dope. This speeds up the actual time spent on modifications and helps later when service may be required.

★ IMPROVING A.G.C.

In the circuit shown in Fig. 1 a.g.c. is fed back from the top of the volume control through an 8·2kΩ resistor to the secondary winding of i.f.t. 1 as a control voltage for the base of the following i.f. transistor. This provides for normal signal variations such as night fading but is insufficient to deal with strong transmissions. Additional control can be added as in Fig. 3. To incorporate this modification the primary winding of i.f.t. 2 is disconnected from the negative h.t. line. Cutting the metal on the printed panel may be necessary in order to isolate the relevant i.f.t. terminal. Having isolated the transformer, add a 1·8kΩ resistor between the former earth terminal and the negative line and by-pass the resistor with an 8μF capacitor to the positive line. Next connect an 820Ω resistor in series with an OA91 diode from the same terminal on i.f.t. 2 to the oscillator tapping on i.f.t. 1. Note the diode polarity.

In operation bias across the 1·8kΩ resistor keeps the diode from conducting until a strong signal is tuned in. On strong signals, the diode conducts and feeds back part of the signal to reduce the gain of the second i.f. transistor. The effect is best appreciated when the set is used travelling in a car.

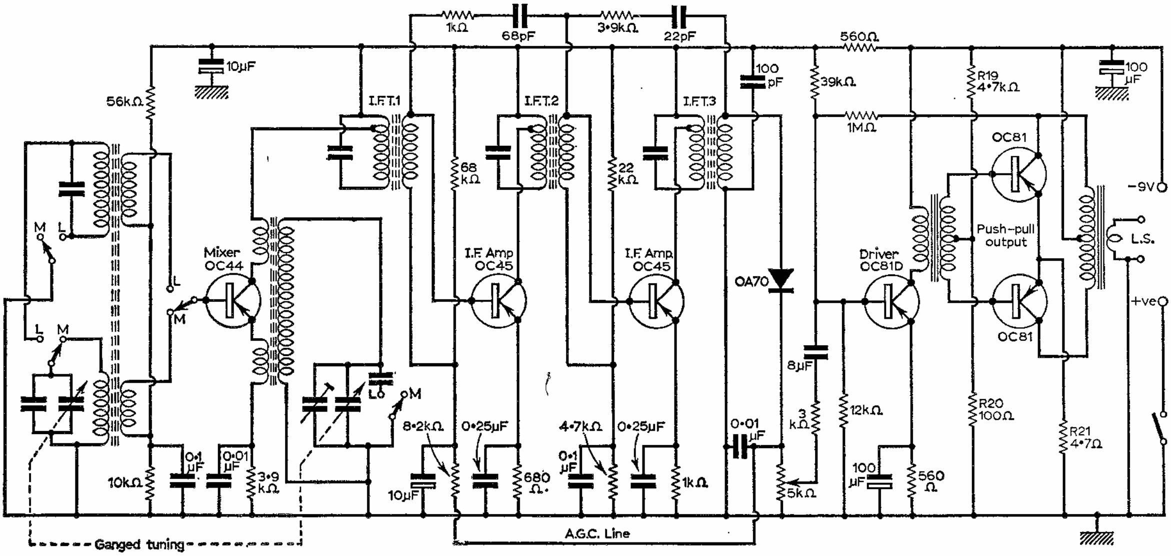
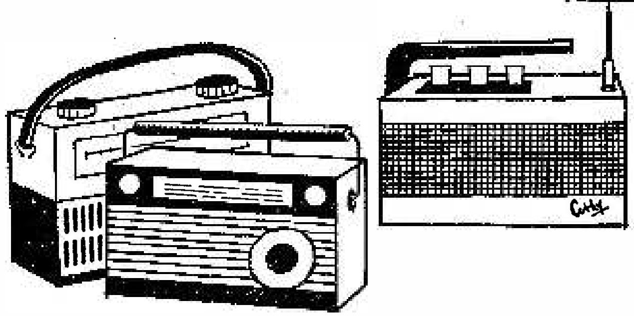


Fig. 1: Circuit diagram of a typical six transistor superhet.

RANSISTOR ORTABLES



by John Law

★ ADDITIONAL AERIAL SOCKET

When operating a portable receiver in a car the internal ferrite rod aerial is not always satisfactory. Provision for a car aerial can be made relatively simply by adding an aerial coupling coil to the ferrite rod. Wrap six turns of gummed paper round the centre of the rod to make a former for the extra turns; avoid sticking the former to the rod. Now wind about forty turns of coil wire on to the former and secure with a quick drying adhesive. The aerial socket will depend on the plug on the aerial lead but, assuming it is a standard coaxial type, mount it on to the back or side of the cabinet, whichever is most convenient. Solder the leads from the aerial coil to the centre and body of the socket leaving a little spare wire. With the aerial connected and a weak signal tuned in, move the coil along the ferrite rod for maximum volume. If the receiver covers more than one waveband it may be necessary to find a compromise position for the coil. Finally, cement the former to the ferrite rod. See Fig. 2.

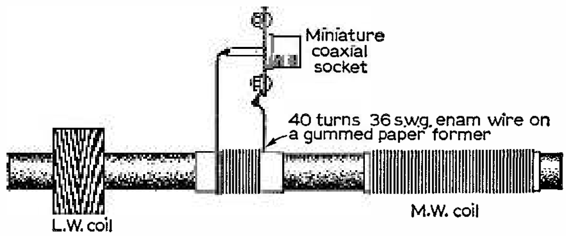


Fig. 2: Details of a car aerial coupling coil on the ferrite rod.

★ DIODE OUTPUT SOCKET

Since most small portables are fitted with small loudspeakers and have a fair amount of distortion in the output stages, output from the loudspeaker jack socket (where fitted) is not all that suitable for feeding tape recorders and the like. The output from the detector diode, however, is relatively pure and provides an ideal take-off point (see Fig. 4). As with the aerial socket modification, a miniature jack socket can be fitted to the rear or side of the cabinet. The circuit arrangement is such that plugging in the jack plug will mute the internal speaker. This is useful if the output is being fed to an amplifier; most tape recorders today have facilities for monitoring the input.

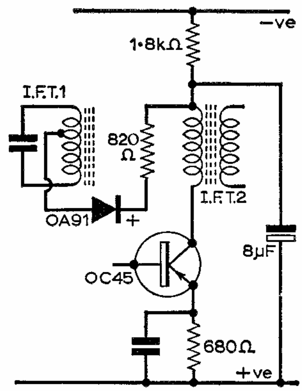


Fig. 3: Improving a.g.c. by the addition of an a.g.c. clamp diode.

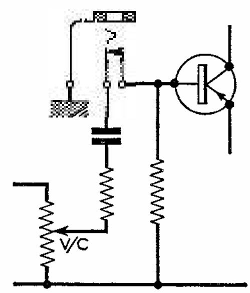


Fig. 4: Adding a tape recorder output facility with muting jack socket.

★ ADDITIONAL AUDIO STAGE

In a few cases the output from the diode detector may not be sufficient to load an external amplifier or tape recorder. To overcome this difficulty an additional amplifier stage will have to be added. Fig. 5 shows a low noise audio stage that will meet most requirements.

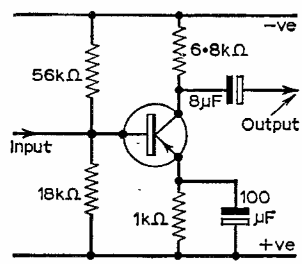


Fig. 5: Circuit of a suggested low-noise audio stage.

★ ADDITIONAL R.F. AMPLIFIER

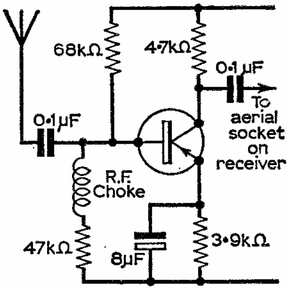
An additional tuned r.f. amplifying stage for a transistor radio is complicated by the need for tuned circuits and separate controls. An untuned aperiodic stage is, however, capable of giving useful amplification. A circuit is given in Fig. 6. In conjunction with an external aerial it can enable satisfactory signals to be picked up from weak stations.

★ BATTERY ECONOMY CIRCUIT

With push pull output stages it should be remembered that the greater the volume the greater the current and, hence, the larger the drain on the battery. It is surprising how much longer the battery will last with careful use of the volume control at all times. The ear is very tolerant and quite a small signal satisfies its requirements. Louder noises are tolerated, as it were, by the ear's own a.g.c. control.

A system of automatically biasing the push pull output stage which enables the battery to be used beyond the period when distortion would appear was introduced by one of the major manufacturers some years ago. This circuit is shown in Fig. 7. R19 in Fig. 1 is replaced by a variable 15kΩ resistor and R20 with a diode shunted by a 560Ω resistor. The diode used by the author was, in fact, the base and emitter of a NKT259 transistor. To set up the circuit for use it was necessary to connect a meter in series with the centre tap of the output transformer primary and battery negative, and adjust the variable resistor to give a reading of 4mA with no signal input.

Battery economies are associated mainly with the driver and output stages in transistor radios since the current drawn by the r.f. stages is only a few milliamps. If heavy current drain is suspected it is advisable to check the values of all resistors in the



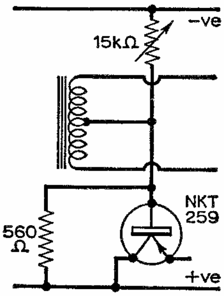


Fig. 6 (left): Periodic r.f. stage.

Fig. 7 (right): A battery economy circuit. The 15kΩ resistor replaces R19 and the diode replaces R20 in the circuit of Fig. 1.

audio stages. For example, R21 has a critical value of 4·7Ω. Some of the cheaper sets omit this resistor with the result that the current is needlessly high. The presence of R21 also ensures a measure of thermal stability keeping the output transistors within their current and heat ratings.

Resistors R19 and R20 determine the biasing of the output transistors. Any change in their ratio will alter the bias and therefore the current consumption of the transistors. Should R19 drop in value or R20 increase in value the battery drain will be increased. An increase in the value of R19 or decrease in R20 can result in distortion and an increase in battery consumption. ■

SPEED STABILISATION

—continued from page 412

It is thus seen that all possible sources of interference are avoided by assuring that the motor control oscillator frequency is sufficiently high, preferably double that of the erase oscillator. In general do not change the frequency of the erase oscillator, since this would bring dangers of audio distortion. The bias and erase circuits are critically adjusted in good commercial tape recorders and should not be tampered with unless one has some experience and the necessary test equipment to hand—or at least the maker's instructions for the particular model. All necessary adjustments of frequency to avoid spurious beat interference should be made to the motor control oscillator or to the screening.

CONVERSION

Whilst conversions from Fig. 1 to Fig. 2 are normally possible in any tape recorder or record player without mechanical changes, conversion from Fig. 2 to Fig. 3a requires a change to a different motor, with accompanying problems of mechanical accommodation, and possibly a change of reduction ratio is necessary if the new motor pulley speed (3,000 r.p.m. at about 6mm radius) differs from that of the former motor. This will require some skill and ingenuity on the part of the experimenter.

It is possible to convert a motor of the type used in Figs. 1 and 2 for r.f. speed stabilisation without resorting to the new motor with integrated coils. This may in some practical cases be more feasible than the mechanical complications of changing the motor type. A complete three-winding coil in a completely enclosed miniature " ferrite pot " core should then be mounted additionally on the spare copper strips of the Veroboard card with the damping coil connections taken out through the Veroboard socket to the centrifugal contact sliprings of the existing motor. About 100 turns of fine wire for the oscillator coil, 30 turns for the pick-up coil and 100 to 300 turns for the damping coil should be tried. Some experiments are required according to type and size of pot core, varying the relative and absolute number of turns until smooth action is obtained. Such a system will give very long contact life because the contact loading is nil, but the sliprings may continue to be a source of trouble. However, since these now carry only very small high-frequency a.c. currents instead of d.c., their life is improved, so that experiments along these lines to obtain r.f. speed control of conventional motors are well worthwhile.

Finally, on the subject of commercial conversion kits, these usually comprise a new Bühler motor, a set of mechanical fittings for installing this motor in place of the former one and a " partial " circuit card containing the part of Fig. 3a to the left of the dotted dividing line. This is in keeping with the fact that most recorders are already fitted with the motor current switch transistor Tr2 operated from the centrifugal contact in the arrangement of Fig. 2, and the conversion to the Bühler r.f. system merely needs Tr1 and D1 circuitry of Fig 3a to change control of Tr2 over to the oscillator sensing coil instead of directly from the centrifugal contact of the rejected motor. ■

practically wireless commentary by HENRY

Intelectronics

NEWS items come in complementary pairs. Right after the report that the vicar has not been in his customary pew for a fortnight we find a non-committal mention of Miss Golightly's surprise holiday in Majorca, coupled with some difficulty in tracing the Death-Watch Beetle Fund that was in her keeping.

Right beside an uncaptioned pin-up, some malignant sub-editor pastes a story with the headline: *'Cows run wild on Slopcomb beach.'* And with almost inevitable certainty, after reading a sensational report from America (well, where did you think?) about electronic brain-washing of animals, and the prospect (more Orwellian than 1984) of induced personality changes in human beings being *'necessary to counter-effect the unchained use of atoms if the human race is going to survive'*, we come across its exact opposite.

Cows run wild on Slopcomb beach.

This is a forecast by the British International Worldwide Information Network (BIWIN—why didn't they call it Brit. Int. Knowledge & Inf. Net. Inc.? and form a more familiar title?) They say that by 1980 computers will have taken over the vast 'middle range' of human activity. Machines will make all routine decisions, take and put out telephone calls, make business appointments and so on.

More important, a new race of computers will develop. These will be programmed to 'learn' in the same way that we acquire skills, by instruction, trial and error. The fantastically rapid assessment of the possibilities means that Black Box 'X' will knock up a constructakit in less time than it takes us to decipher the title page of the instruction manual.

A more sophisticated group of machines will be employed on design work, using past methods as launching pads, and ironing out all the snags before production is more than a gleam in the managing director's eye. Happy accidents, like the discovery of penicillin, are strictly for the history books, it would appear.

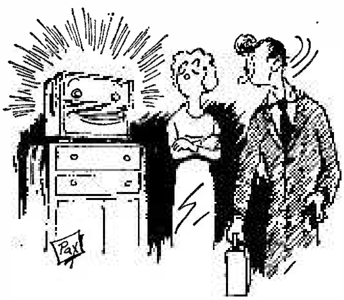
Henry has his doubts. Experience of the thin end of the electronic wedge engenders a healthy scepticism in any engineer.

Most of us have met the set with an inbuilt intelligence—usually directed, like a fallen angel's, to dastardly ends.

The field engineer regards such equipment as a normal part of his work. The customer has telephoned seven times while the girl in the shop feverishly tried to contact old Joe and re-organise his priorities. Each call became more desperate, each description of symptoms more alarming. It was not certain whether an engineer or a midwife would be more appropriate in this emergency.

Eventually Joe turns up, is re-routed, and casually slides back into his sagging van-seat. He reaches the customer as she slams the telephone on its rest for the eighth time, follows her into the lounge and—yes, you have guessed it—there is the receiver, an innocent smirk all over its gilt-trimmed fascia, belting forth Radio Concubine as if it had never had an intermittent pain in its intestines.

The constructor is even more familiar with the phenomenon. He takes up his copy of the latest *Practical* ———, roots in his spares box for the parts the author blithely assumes every enthusiast has been saving for just this occasion, and begins to build his Taj Mahal.



An innocent smirk.

No matter how assiduously he follows the instructions, something is not quite right, and he casts the attempt to one side to pen a 'Disgusted' letter to the Editor. Then some well-meaning Mr. B. type comes to borrow a piece of insulating tape, says: *'That looks interesting'*, plugs it in and gets perfect results.

Henry would not want to be thought a stick-in-the-mud. Progress is inevitable. But he is convinced that the glittering new world of the future will also spawn a new breed of computers — the electro-neurologist machines, adapted to doctor the temperamental monster we have attempted to mould after our own fashion.

Dr. Jose Delgado, of Yale, facing a charging bull, armed only with a small transmitter which sent impulses that diverted the beast by 'twitching' its brain is not so far removed from Spallazini, trying to trap bats in his tangle of wires.

The logical outcome is the computer which experiments on us!

Details on the 1155

I REFER to Mr. R. E. Robinson's cry for mods on the 1155. A great deal has been said about this receiver in the past.

In the July 1946 issue of "Wireless World," there were full circuit details of this set, together with an a.c. power pack and output stage. In the November 1947 issue of "Short Wave Listener," there was a noise limiter for it and in April 1949 "S.W.L.," a 10 meter converter. The April 1965 issue of PRACTICAL WIRELESS gave a s.s.b. detector for the 1155, and the November 1961 issue of "P.W." gave details of a "Q" multiplier which could be used on same.

John Tye.

Dereham,
Norfolk.

An Exchange

IN the July issue of PRACTICAL WIRELESS, reader R. E. Robinson, of Darlington congratulates contributor S. Simpson on his modifications to the No. 19 Set. If he would be interested in obtaining a Mk. III 19 set in exchange for the 1155, would he please contact me at the address below.

A. G. Ward.

Collingwood,
Blackwater,
Truro,
Cornwall.

Can anyone help ?

I HAVE a Taylor Valve Tester model No. 45b, and although I have written to the makers to try to obtain a copy of the manual and instruction book, they tell me that they are out of print. I wonder, therefore if any readers would have a copy that I could purchase or borrow to make a copy from.

H. C. Evans.

70 Seaforth Road,
Seaforth,
Liverpool, 21.

Tapespondent wanted

I WOULD like to tapespond with anyone of my own age (14-15 years) living in Europe or Australasia who has an interest in Short Wave Listening and Pop Music. I have a two track $3\frac{3}{4}$ i.p.s. recorder taking up to 5in. spools.

R Baker.

488b Lady Margaret Road,
Southall,
Middlesex.

NEWS AND..

WORLD'S SMALLEST POCKET MICROPHONE?

What is believed to be the world's smallest single unit pocket radio telephone is now being manufactured at the Welwyn Garden City factory of Bush Murphy Electronics. Including its slide-on battery it is about the size of a medium packet of five cigars or little bigger than a pocket diary.

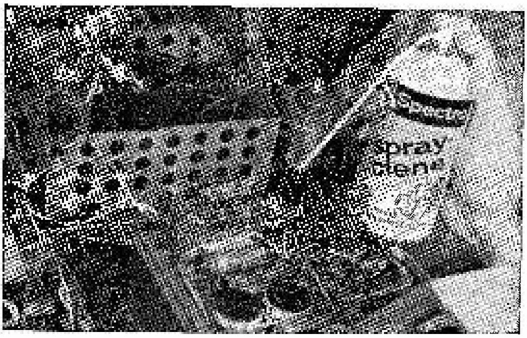
The Mitre, as it is known (derived from Miniature Individual Transmitter-Receiver Equipment) offers four channels of f.m. communication in the 68–100Mc/s or 145–174Mc/s bands. Channel spacing is 25kc/s.

Completely transistorised, the device gives half a watt of r.f. output and 100mW of audio. Designed to slip into a uniform pocket, it has a thickness of only $\frac{13}{16}$in. (2·48 cms). The height is $5\frac{3}{16}$in. (13·18 cms) and the width $3\frac{3}{4}$in. (9·53 cms). These dimensions include the slide-on battery.

A sealed nickel-cadmium battery supplies power for the transciever. This is rechargeable and may be instantly changed by means of a quick-action slide. A specially designed mains operated charger is available which will accommodate up to twelve batteries simultaneously.

A miniature loudspeaker-microphone unit fitted with "press-to-talk" is used which can be clipped to the inside pocket enabling the operator to hear incoming calls. Alternative ancillary equipment is also available.

NEW CLEANER/LUBRICANT



Spectra Chemicals Limited of Caterham, Surrey, are now offering two new grades of Spray-Clene safety solvent containing lubricant. While the original Spray-Clene cleans and degreases, the new grades clean and lubricate in one operation.

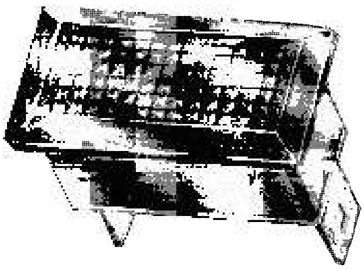
Besides cleaning all electrical switches and relays without fire risk from the ignition of flammable vapours by arcing, Spectra Spray-Clene with Switch Lubricant prevents tarnish and corrosion and provides excellent mechanical lubrication. It is harmless to most commonly used insulating materials.

Spectra Spray-Clene with Instrument Lubricant will clean precision mechanisms down to watch size leaving a fine film of highly refined colourless, odourless oil to lubricate moving parts and protect from corrosion.

All grades are supplied in 12 oz. aerosols fitted with angled extension tubes giving "one hand reach anywhere" action at full pressure. This facilitates cleaning without dismantling, while low toxicity and non-inflammability permits use in most situations. Price: Standard Spray-Clene 7/6d. each. Spray-Clene with either lubricant 8/- each.

...COMMENT

ARCOLECTRIC NEON INDICATOR



Recent additions to Arcolectric's range of neon indicators include Cat. No. SL.59.

This is designed for snap in fixing, having integral spring clips in the polycarbonate lens-body. Colours available are red amber, clear or green. The indicator can be fitted with either tab terminals (SL.59) or flexible leads (SL.59/WL).

PRESENTATION TO BICC BY LORD DERBY

The emblem of the Queen's Award to Industry, together with a Grant of Appointment bearing the signatures of H.M. The Queen and the Prime Minister, were presented on July 18 by the Earl of Derby, M.C., Lord Lieutenant of Lancaster, to Lord McFadzean, Chairman of British Insulated Callender's Cables Limited.

From among nearly 1000 concerns who applied BICC are one of 115 organisations to win the distinction. This is conferred for outstanding export achievement or technological innovation or both. BICC were among the select few—18 firms in all—who won Queen's Awards in both categories.

In direct exports BICC's figures in 1965 reached a record level of £40 million—an increase of 47% over 1964. At £77 million sales by overseas companies in 1965 showed an increase of 25% over 1964. From many examples of BICC technological innovation, three were submitted under the terms of the Queen's Award. These were: bulk power transmission by both land and submarine cables; railway electrification; and magnet wires and strips.

NEW HEATHKIT CATALOGUE

Daystrom Ltd., Gloucester, announce their new Heathkit catalogue No. 86/3. It covers their range of kits and includes some new models, such as the model EC-1U Analogue Computer Kit, and De-luxe Transistor f.m. Tuner Kit.

WIREWOUND POTENTIOMETERS FOR PRINTED CIRCUITS

W. Greenwood (London) Ltd., 21 Germain St., Chesham, Bucks., introduce a new wirewound adjustment potentiometer specifically designed for direct mounting on to printed circuit boards.

This precision component is a single turn potentiometer with outstanding humidity performance. It has a power rating of 1½ watts at 50°C. and is available in a resistance range from 10Ω to 50kΩ. The solder pins are gold plated.

The potentiometer is one of a comprehensive range manufactured by Contelec of Switzerland.

It is a competitively priced component and delivery is ex stock.

RADIO CLEARANCE UNDER NEW MANAGEMENT

Radio Clearance (1965) Ltd. (retail sales of radio-electronic and electrical components) 27 Tottenham Court Rd., W.1, are now under completely new management. All items as previously advertised will be available plus a much wider range of items. Shop hours are 9-6 Monday to Friday, 9-1 Saturday (MUS 9188).

Great Circle Calculations

USERS of the formula 2b for Azimuth of bearing should be warned that the formula is a classic example of the "ambiguous sine". The value of the sine *C* so calculated applies equally to two angles, *C* and 180−*C*, and there is nothing to show which is the right one for the case being worked. It will be seen in Fig. 1, page 261, August, 1966, that a circle of radius *a* and centre *C* will cut the meridian of *B* in two places. Hence the two values of *C*. A further point is that it is unnecessary to limit the calculations to places in the same hemisphere. For myself, I prefer to use the fundamental formula 1, using the polar distances 90−lat for *b* and *c* or, other-hemisphere, 90+lat.

F Hilton.

Cranmore,
Isle of Wight.

Any ideas ?

I HAVE a unit—presumably a receiver—with the following details on the case: R-89/ARN 5 A. 24V D.C. CRO 0825 DAY 44. PL 284. There is a two pin input socket and a ten pin socket below this. There are three crystals marked KC6497·9, KC6522·9, and KC6547·9.

I would be very pleased to hear from anyone who could give me any help at all on this, especially a circuit or instruction book.

Roger Sheppard.

122 Gloucester Avenue,
Regent's Park,
London, N.W.1.

Letter of thanks

I WOULD like to thank all those who replied to my letter "Can anyone Help?" in the August issue of PRACTICAL WIRELESS. I have had 50 replies and now have the set working.

I could not agree more with H. S. Barkin's letter "Save the Grand Old Sets" and the saying "they don't make 'em like they used to" applies more than ever these days.

G. Wright.

East Lothian,
Scotland.

Issues for disposal

DUE to storage problems, I am obliged to sell March 1965—July 1966 issue of PRACTICAL WIRELESS with blueprints, etc. If anyone is interested, I will be pleased to let them know any further details.

B. Wilson.

37 Gladys Street,
Clifton,
Rotherham,
Yorkshire.

MW—DX

by Ken Brownless

SOME of us who do not devote much time to short wave listening find that there is a different kind of challenge in looking for and listening to DX on the medium waves, which makes an interesting change from what can be heard on short wave. It is most fascinating to be able to eavesdrop on the domestic radio stations of other countries. The challenge lies in the fact that medium wave DX is much harder than that on short waves, calling for considerably more patience, care and accuracy when listening.

Receivers and aerials

The choice of receiver is often governed by the amount of cash available. The most frequently used surplus receivers are the AR88, CR100 and R1155, all of which give satisfactory results. Commercial communications receivers will also give excellent results. The good class valve domestic receivers will give fair results, as will the better transistor receivers. In all cases some form of antenna is a definite advantage for medium wave DX'ing, the most useful type being a loop, details of which will appear next month.

If a "long wire" aerial is preferred, a length of 50 feet or more of wire is recommended, but even a length of wire strung round a picture rail can be of some help. However, the loop, with its excellent signal-to-noise ratio and directional properties, is the superior antenna for medium wave DX. The use of an earth is also to be recommended.

What to expect

The last two seasons (autumn to spring 1964/5 and 1965/6) have given us interesting reception from coast-to-coast of North America and South America (mainly the northern part). We had indications of this during the spring of 1966 and we can expect this pattern of reception to continue with a gradual decrease in the number of North American loggings as we approach the next sunspot maximum. The last two seasons produced excellent Asiatic reception in the afternoons and evenings, which should continue during this autumn, winter and spring.

Recommended time for North America is from 01.00 G.M.T. when there is less European QRM. The following are easy ones: CBA (1070 kc/s), Sackville, N.B., often heard under Paris and then in the clear after Paris signs off at 23.00; CJCB (1270 kc/s), Sydney, N.S., often the first North American audible in the U.K. from 20.00; both the aforementioned stations have also been heard at 08.00.

Some frequently heard North Americans are CBN (640 kc/s), St. John's, Nfld.; WNBC (660), New York City; WOR (710), N.Y. City; WHDH (850), Boston; WCBS (880), N.Y. City; CJON (930), St. John's, Nfld.; WINS, N.Y. City and CFRB, Toronto, both on 1010; WNEW (1130), N.Y. City; WCAU (1210), Philadelphia, best heard after the B.B.C. Light Programme signs off at 02.02.

The H.F. end is also productive: WMEX (1510), Boston; WKBW (1520), Buffalo; WCKY (1530), Cincinnati, and WQXR (1560), New York, which is often the best in this range.

Easy South Americans are *Radio Americas*, Swan Island (1157); YVNZ (1020), *Radio Calendario*, Maracaibo, and LR1 (1070). *Radio El Mundo*, Buenos Aires, often heard under CBA.

Easy Asiatics include the 1,000 kW V.O.A. stations on Okinawa (1178) heard afternoons up to 16.30 sign off; also the high powered Western China relay of Peking's Russian Service (1525) between 15.00 and 22.00. Another interesting channel is 1250 where two Asiatic signals have been heard around 15.30, the dominant signal is Vladivostok and All India Radio, Sangli, has been heard with news in English at 15.30.

Useful guides

Three useful helps to medium wave listening are published by World Publications in Hellerup, Denmark, and may be obtained through local booksellers. These are (1) "World Medium Wave Guide" which includes a listing of North American stations by frequency, call-letters and also by location, (2) "World Radio and TV Handbook" and (3) "How to Listen to the World."

Genuinely interested M.W. DX'ers will also be interested in the newsletter edited by the author. Details from: K. Brownless, 7 The Avenue, Clifton, York.

TEST GEAR!

You can't afford to miss the special programme of constructional articles just starting in Practical Television! We kick off in the October issue with:

A PRECISION R-C BRIDGE WITH RELIABLE NULL INDICATION AND NEGLIGIBLE ZERO DISPLACEMENT WHEN CHECKING LOW VALUE CAPACITORS. FACILITIES FOR MATCHING EXTERNAL IMPEDANCES ARE ALSO PROVIDED.

PLUS–of course–all the regular features and many other articles.

Future articles in this programme will be publicised in P.W.—but be sure of your copies by placing your orders now with your newsagent!

OCTOBER PRACTICAL TELEVISION IS OUT ON SEPTEMBER 22nd.—only 2/-

SELECTED BARGAINS FOR YOU FROM CONCORD!

SOLID STATE "7"

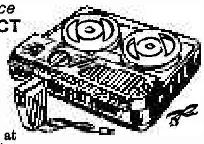
Direct Import Scoop. 2 complete crates only with 1750 of these amazing 7 TRANSISTOR full variable waveband radios.

You could pay 6 gns. for this performance.

OUR CRAZY PRICE 58/6

Your chance to own this remarkable FULL SIZE 7 TRANSISTOR PORTABLE at the lowest ever price. The improved internal ferrite aerial—works in car, boat or plane—pulls in loud and clear all the programmes—B.B.C., Luxembourg, Pirates etc. the full sized speaker gives high sensitivity and room filling volume. Brand New and Boxed in Maker's carton—1750 only at 58/6 plus 4/6 p. & p. (Carrying case, Battery and Earpiece 7/6 extra). Demonstrations Daily.

New Sensational Price Breakthrough **DIRECT IMPORT 1000 only High powered PORTABLE TAPE RECORDERS**



You've seen recorders at more than twice our price

NOW ONLY £5.19.6

At last a highly sensitive full-sized tape recorder at a price you can afford. "NOT A TOY" — but a beautifully designed instrument which is solidly assembled on a rigid steel chassis. You'll be amazed at the fine reproduction of sound for all purposes including dictating, notes, party fun, etc. Fingertip control for volume and selector switch. Hand Microphone has unique REMOTE CONTROL on/off switch for accurate recording and playback. 1000 only at £5.19.6, plus 5/6 p. & p. (Tape, Spare Spool, Microphone, Batteries and Earphone 15/- extra.)

Miraculous Scoop from Swiss Mnfr.

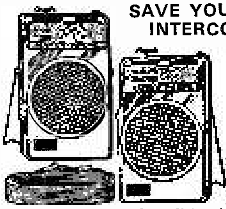
Limited Shipment NEW

23 JEWELLED DIVER'S WATCH

with Rotating Timing Bezel. **Staggering price reduction—compare prices locally. 950 only at 97/6**

Make a genuine LARGE CASH SAVING on this high-quality watch, 200 vacuum tested for depth. 23 Jewelled movement. Shock-proof, electronically timed, lum. dial and hands. Ideal for skin-divers, sailing, motoring, research work for accuracy. FULLY GUARANTEED. Send only 97/6 plus 4/6 p. & p. TEST AT HOME. Money back guarantee. (Rot-proof strap 7/6 extra.) STAINLESS STEEL expanding bracelet 12/6 extra.

SAVE YOUR LEGS! INTERCOM OUTFIT & BABY ALARM



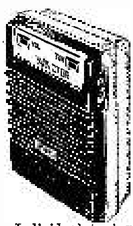
Ready Built

Only 52/6

Save £3.16.6.

Robustly made. brand new current models. You get 2 separate fully transistorised intercommunicating sets—each can speak or listen to the other—complete with 60ft. connecting wire. **Fixed in a flash.** Ends baby-crying worries. Ideal for Workshop to House, Sickroom, hundreds of uses! Hangs on wall or stands up. **Our absurd price 52/6, battery 2/6 extra. Post, etc. 3/6. Money back guarantee.**

NEW FULLY TRANSISTORISED PORTABLE RADIOS

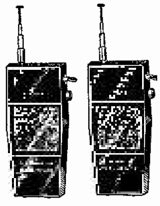


with Full Variable waveband. NOW A FRACTION OF THE NORMAL PRICE

ONLY 35/-

WHY PAY MORE? All the latest refinements are packed into this new MULTI-STATION ALL Transistor radio—the internal aerial picks up even the remote stations and the powerful built-in speaker gives room filling volume. Individual tuning, first-class reception. Purchase with confidence—packed in original manufacturer's cartons. (*Personal earpiece and battery* 4/6). Send 35/- plus 4/6 p. & p.

Frustrated Import Shipment OFFERED BELOW HALF PRICE TO CLEAR



500 only

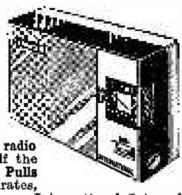
5 TRANSISTOR PERSONAL TRANSCEIVER SETS

OUR PRICE £7.19.6

You've heard about them—You've read about them. NOW YOUR CHANCE TO OWN THEM. Highly sensitive two-way transistor transceiver sets have individual volume control and talk-listen switch. Telescopic aerial pulls in the voice from the other set over tremendous distances—no wires—a genuine transceiver as used by official bodies and forces. 500 sets only at £7.19.6 plus 5/6 p & p. (Batteries, leather cases, etc. 10/6 extra.) Money back if not delighted with the performance. These cannot be operated in the U.K.

Limited Import Shipment

INTERNATIONAL SATELLITE 8 PORTABLE Transistor RADIO



2 Full Wave Bands Why Pay 12 gns.?

NOW ONLY 72/6

Famous Satellite portable radio now offered well below half the price of comparable models. **Pulls in your favourite stations.** (Pirates, B.B.C., Luxembourg, etc.)—even International. Internal aerial, larger speaker, combine to give crystal clear reception INDOORS and OUT. Why pay 12 gns.? **Send 72/6 plus 4/6 p. & p.** (Cowhide carry case, earpiece, battery etc. 8/6 extra.)

Complete unopened crate of 1,000 only superb 1966 full variable waveband 6-transistor full-size portables worth £6.

Half Price Offer 1,000 Only **44/6**

Your chance to own one of these famous RADIOS—as make recommended on TV April 7th. Amazing new-type internal ferrite aerial—works in car, boat or plane—pulls in all your favourite programmes, B.B.C., Pirates and Luxembourg. Gives room-filling volume and amazing tone from famous "Foster" speaker. 1,000 only. Brand New with 6 Months Guarantee at 44/6 plus 4/6 p. & p. for 7 days' free trial—*your money back if it doesn't out-perform sets costing treble.* (Carrying case, etc. Battery, Earpiece, etc. 7/6 extra). Demonstrations Daily.

3500 Bought at "Rock Bottom" off Leading British Maker

REAL EPISCOPE PROJECTOR

Only 45/-

No more to pay! Projects FULL SIZE magnified PICTURE on to your wall or screen in BLACK and WHITE or COLOUR with CRYSTAL CLARITY ANY PHOTOGRAPH, picture, drawing, stamp, etc. Hundreds of uses in home, office, schoolroom, etc. FULL SIZE precision made WITH REAL GLASS REFLEX LENS. *Sturdy, reliable.* Even a Child can use it—plugs in to standard mains. BRAND NEW with cable, lamp, etc. *Offered a fraction of real worth at 45/- plus 3/6 P. & P. Satisfaction or money back.*

Make 5 different TRANSISTOR RADIOS for

35/- No Experience Necessary

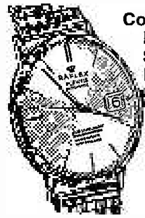
No soldering. Only 8 connections for first radio to work. Just look, you get Easy ABC Plans, Cabinet, Loudspeaker (alone 17/6). Earphone, 4 Semi-conductors, Coils, Condensers, Resistors, Tuner, Switch, Screws, etc. **YES—EVERYTHING!** Loud clear English and Foreign reception. As supplied to Educational Authorities, H.M. Forces, etc. TESTIMONIALS GALORE. **Mr. R. O'D of Londonderry,** writes: "*. . . I received your components and I must say that I am very satisfied with them, I have it already set up! . . .*" **COMPLETE HOME/RADIO COURSE.** Originally £6 **SEND ONLY 35/-,** plus 3/6 post etc. Parts available separately.

NO SOLDERING AMAZING CIGARETTE RADIO

ONLY 25/-

Yes a perfectly ordinary packet of cigarettes! But watch your friends astonishment on hearing it fetch in station after station, loud and clear! Still holds 10 cigarettes—yet cleverly conceals highly sensitive, fully transistorised circuit **(including tiny battery).** Even a young boy can assemble it in under 2 hours. **No soldering. No experience necessary. Only 16 connections to make.** Ideal for taking to work with you. From our bulging testimonial file. **Mr. D. B. of Huddersfield, writes:** "*. . . I have fitted the parts in it and it is working wonderfully . . .*" ALL PARTS including Semi-Conductors, ABC Plans, etc. **ONLY 25/-. plus 2/6 post, etc.** *Parts Available Separately.*

Scoop at the Docks—a Complete Unopened Crate FULLY AUTOMATIC SELF-WINDING 21 JEWELLED DATE WATCHES



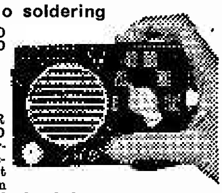
Originally 12 Gns.

NOW ONLY 98/6 *You save £7.13.6*

1,500 only to be cleared at below half price. Gent's calendar watch by reputable Swiss maker. Luxurious gold finish, stainless steel screw back—shock resistant, anti-magnetic, water resistant. Unbreakable mainspring—21 Fully Working jewels. Electronically timed. Send 98/6, plus 4/6 p. & p. Matching expanding bracelet 10/6 extra. **Brand New with guarantee.**

NEW RADIO No soldering

VOLKSRADIO ANYONE CAN BUILD IN 2-3 HOURS



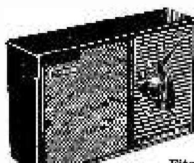
ONLY 25/-

EVEN THE OLDER CHILDREN BUILD THEM! . . . no soldering—only 16 connections! then hear it reach out bringing in station after station, loud and clear. Palm-of-hand size 4¾ x 2¾ x 1¼in. Many Testimonials: **M. H. of Bradford writes:** "*. . . I have just completed one of your sets successfully, it is the first time I have ever tackled anything like radio, and I must state here and now, I am amazed how easy it is to a layman like me. Your instructions and plan have obviously been very carefully thought out so that even the most dim can follow them . . .*" **Direct from Manufacturers to You. Send 25/- plus 2/6 post, etc.**

PARTS AVAILABLE SEPARATELY.

TRANSISTOR POCKET RADIOS with Loudspeaker.

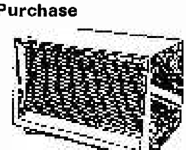
Bulk Purchase Enables us to Make this Fantastic Offer



Only 32/6 *No more to pay*

The "SAN REMO" so tuned that it brings the voices of star vocalists dramatically to life — in your home, office, etc. Only 4¾ x 2¾ x 1¼in. Fits easily into your pocket or handbag. Works for months off 1/2d. battery. **Should last a lifetime, anyone can assemble it in an hour or two with our easy plan.** Miniature speaker—everything, only **32/6.** 2/6 p. & p. (Parts can be bought separately). Limited supply—so rush your order before it's too late.

Miraculous Import Purchase 200 Only NOW HAVE MUSIC IN EVERY ROOM Extension speaker



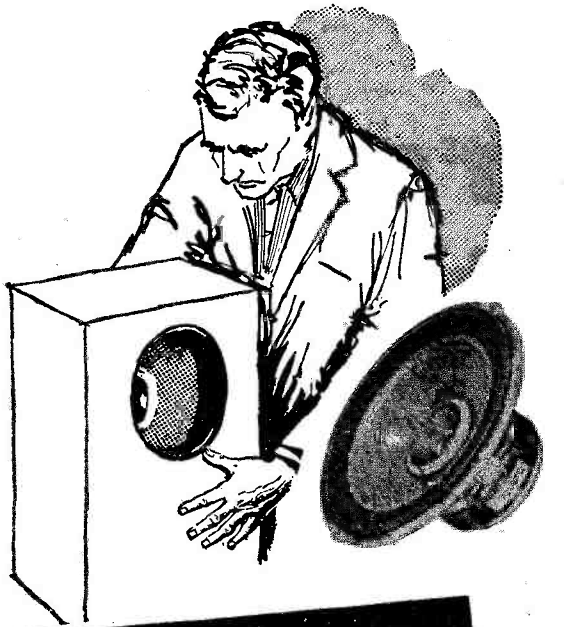
More than doubles the value of your radio.

For Only 29/6 Complete

Just place this ultra modern extension speaker in any room and tune in to your favourite programmes—Now you can relay even from HI-FI radiograms down to transistor portables. Simply place in position or fix on wall and plug in the long lead supplied. What could be easier? DON'T MISS THIS AMAZING BARGAIN, remember 200 only at this price 29/6, plus 3/6 p. & p. Money instantly refunded if not worth more than double.

CONCORD ELECTRONICS LIMITED (P.W.32) 87-89 TABERNACLE ST., LONDON, E.C.2. Callers Welcome, Open all day Saturdays

STAFF WANTED: Youth 17-21 (with radio knowledge), Sales Assistant 25-50, Junior Shorthand Typist 17-20. Ring Mr. Long, CLE 0862/9028.



USE A WHARFEDALE SPEAKER

...IT SOUNDS BETTER

SUPER 8/RS/DD

Undoubtedly the best and most popular 8″ unit ever made in this Country.
Frequency range 40 c/s — 20,000 c/s
Impedance 10/15 ohms.
Power handling capacity 6 watts (12 watts peak).

£7 (inc. 20/- p.t.)

In your next system use world famous Wharfedale Super Range Loudspeakers – there's no better value for money – anywhere. Each is fitted with roll surround for low resonance and double diaphragm assembly for extended H.F. response.
Send today for further details of these units plus free cabinet construction leaflets to enable you to build a top quality Hi-Fi loudspeaker system.

RANK WHARFEDALE LTD
IDLE, BRADFORD,
YORKSHIRE
Tel Bradford 612552/3
Grams 'Wharfdel' Bradford

WHARFEDALE

FREE
CONSTRUCTION LEAFLETS
Complete this coupon for 8 page booklet on Wharfedale Speaker units plus FREE CABINET CONSTRUCTION LEAFLETS for your own Hi-Fi system.
(Dept, PW.10.)
NAME__________
ADDRESS__________
____
TOWN__________
COUNTY__________

THE Radio Constructor

BUILD THESE STAR FEATURES

★ V.H.F./F.M. FEEDER UNIT
★ 6BW6 POWER AMPLIFIER
★ 12 VOLT ADDING MACHINE

Many other first class articles

Avoid Disappointment
BUY YOUR COPY NOW!

SEPTEMBER ISSUE 2/6

THE Radio Constructor

For quick, easy faultless soldering

ERSIN Multicore 5 CORE SOLDER

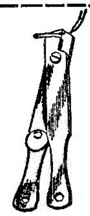
THE QUEEN'S AWARD TO INDUSTRY 1966

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.

HANDY SOLDER DISPENSER
Contains 12 ft. of coiled 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)



BIB MODEL 3 WIRE STRIPPER AND CUTTER
Strips insulation without nicking the wire, cuts wire and splits plastic twin flex.
4/- each

From Electrical or Hardware shops. If unobtainable write to:
MULTICORE SOLDERS LTD., Hemel Hempstead, Herts.
M 29

EXPERIMENTERS CORNER

AUTOCATALYTIC PLATING

K. T. WILSON

ELECTROPLATING is such a widespread and well-known method of producing a metal coating on a conducting surface that we tend to forget the much more ancient and delicate art of "Immersion", or, more correctly, Autocatalytic plating.

In principle, the process is remarkably simple. The object to be coated may be metallic (with certain exceptions) or non-metallic. The coating is uniform, irrespective of the shape of the object, and well bonded, and plating is carried out simply by immersing the object in the plating solution. The earliest known process of this type is the technique of silvering mirrors; a process familiar to any schoolboy who has added ammonia solution dropwise to silver nitrate solution until the precipitate which forms has just redissolved, then warmed gently with formaldehyde (about three drops of 2% solution) until a bright mirror of silver appears on the test-tube.

What is fortunately not so familiar is that the by-products of the reaction are explosive if allowed to dry; they should be washed off immediately plating is complete.

Autocatalytic Reduction

Chemically, the reaction is known as an "Autocatalytic Reduction". The reduction part of it is the conversion from metal ions in solution to solid metal, the Autocatalytic part implies that the reaction requires a catalyst to start it and keep it going, and that the catalyst for such a reaction is the metal which it produces. This raises the very reasonable question: *"How does such a reaction start in the first place?"*

This depends on the object being plated. Many metals other than the one being plated may act as catalysts for the process. Even if only the slightest reaction is promoted, this will be sufficient to start autocatalysis. In other cases a thin film of the autocatalytic metal may be deposited by displacement, the process by which iron filings placed in a copper sulphate solution acquire a coating of copper; note that this process stops whenever the iron is fully covered, whereas the autocatalytic process goes on until the solution is exhausted.

Printed Circuits

Non-metals must be primed, that is, coated with a readily reduced salt of a metal which will catalyse the main reaction. Since this implies that the metal will not be deposited at any point not properly primed, the process has an obvious application to printed circuits.

Suppose we have a clean grease-free board of Paxolin or similar material. We then print or draw on this board a circuit, using as our ink, a solution of suitable primer. We then immerse the board in the autocatalytic plating solution to deposit metal over the drawn lines.

In practice, of course, it is not quite so easy as it sounds. The surface of the board must be chemically clean and absolutely free from grease. The containers for the solutions must also be scrupulously clean. One of the most annoying experiences of autocatalytic plating, and one which haunts the worker who uses insufficiently cleaned glassware, is to find that a plating solution which perversely refuses to deposit on a well-primed board will instantly react on a beaker which has one minute speck of dirt on it.

Temperature is critical for some solutions. Some can be regenerated, with care, almost indefinitely, others last only a few hours.

Plating Solutions

The best-known chemical plating solutions are those for nickel and copper. The nickel solution actually deposits an alloy of nickel and phosphorus. Virtually every workable solution and variation thereon has at some time been patented, and no immunity from patent restrictions can be guaranteed for the formulations given, but this should not be any barrier to experimenters; firms wishing to use such processes can sort out the patent situation for themselves.

ACID NICKEL BATH

Nickel Chloride, NiC_2, $6H_2O$ .... 30 *gms./litre*
Sodium Hypophosphite, NaH_2PO_2, H_2O 10 *gms./litre*
Sodium Hydroxyacetate, $NaC_2H_3O_3$ .. 10 *gms./litre*

Used at a temperature of 210°F., 99°C., this bath deposits at a rate of 0·0005″ per hour. Heating up to the working temperature should be done slowly and the solution should be thoroughly filtered before heating. Soft or demineralised water is recommended for making up solutions.

It is possible to preserve this solution, like so many other nickel solutions, by cooling rapidly after use and filtering into a clean bottle. Loss of active ingredients can be compensated by adding small quantities of the first two ingredients in solution to the cold mixture. Never add powdered ingredients or the bath will at once shed all its nickel.

—*continued on page 415*

GETTING GOING ON VHF

J.P. BILLINGHAM G8AAC

BY international definition the v.h.f. (very high frequency) bands extend from 30Mc/s to 300Mc/s (10 metres wavelength to 1 metre). These include Band I and Band III television as well as Band II f.m. broadcasting. Also in this part of the radio spectrum there are four bands allocated to amateur radio. These are known as 6, 4, 2 and 1½ metres. Of these, only 4 metres and 2 metres may be used for transmission in the United Kingdom and Eire. The details of the British licensing conditions are given in Table I.

TABLE I British Licensing Conditions for v.h.f.

Band	*4m*	*2m*
Frequencies Mc/s	70·1—70·7	144–146
Maximum D.C. Power Watts	50	150

Types of emission allowed:
CW MCW AM SSB DSB NBFM FSK

Special notes

4m The section 70·35—70·4 Mc/s. only can be used for emergency purposes. North West of the line from the Firth of Lorne to the Moray Firth only the frequencies 70·3—70·5 Mc/s. may be used.

2m The frequencies 144·0 144·09 144·18 144·27 144·36 144·45 144·54, 144·63, 144·72, 144·81 and 144·9 Mc/s. must be avoided.

It is generally thought that v.h.f. communication is limited to line of sight. In other words, the two stations in contact must be able to see each other. This is not strictly true, although the range is limited. However, unless there is a large amount of intervening high ground, stations with medium power and modest aerials can maintain regular contact up the about 30 to 40 miles. Contacts over much larger distances can be made as explained in later paragraphs.

Although communication is somewhat restricted, the v.h.f. bands have several advantages. Among these are: much greater bandwidth (hence less congestion); virtually no atmospheric noise; virtually no interference from non-amateur stations; minimal t.v.i. problems; ease of making and erecting good aerials due to their small size.

The days have gone when the amateur wishing to go on to v.h.f. had to improvise and to use unsuitable equipment. The components from any television set capable of receiving Band III (ITV) signals are suitable, and since so many are made, are now no more expensive than the components used for medium wave broadcast reception.

Six Metres

The six metre band extends from 50Mc/s to 54Mc/s and is used mainly on the American and African continents, although there are a few other places where operation is permitted.

Like the other v.h.f. bands, use is mainly confined to a limited radius. However, in some respects 6 metres is similar to 10 (28Mc/s-29·7Mc/s).

During periods of sunspot activity parts of the 'E' layer of the ionosphere become very highly ionised This causes it to reflect radiation of a much higher frequency than normal. This effect is usually short-lived and is known as "sporadic 'E'." Spordadic 'E' usually occurs during mid-morning or late afternoon in the summer, and quite often over the equator. This means that African stations may be heard in Europe quite often.

Transatlantic contacts have been made by the cross-band technique, that is, American stations have transmitted on 6 metres and the British stations on 10 metres.

Four Metres

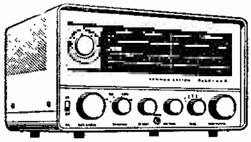
The 4 metre band extends from 70·1 to 70·7Mc/s and is a British and Irish only band. Consequently, the true DX properties are not really known, although it is hoped that 4 metre/6 metre QSO's will be achieved nearer the sunspot maximum.

This band is becoming more popular for local "nets" and in some areas has replaced top band for popularity. It is also very popular for mobile working since many commercial car radio aerials can be used as a quarter wave ground plane aerial.

Two Metres

The 2 metre band extends from 144-148Mc/s, although in Europe the range 144-146Mc/s only is used. This is the only world-wide v.h.f. amateur band, and tends therefore to be the band on which there is the greatest concentration on DX.

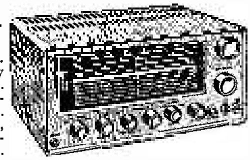
As with 4m, 2m is used mainly for local working. Since the level of activity is relatively high, a



LAFAYETTE HA-63 COMMUNICATION RECEIVER

7 valves plus Rectifier. 4 Bands, 550 kc/s-31 Mc/s. "S" Meter—BFO—ANL—Bandspread Tuning. 200/250v. A.C. Brand New **24 Gns.** Carr. paid.

LAFAYETTE KT-340 COMMUNICATION RECEIVER SEMI-KIT

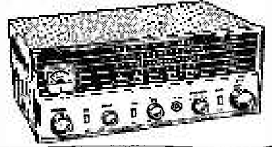


Build this wonderful receiver and save pounds. Supplied semi completed, main components ready mounted, R.F. section already wired and aligned. Full and precise instructions supplied. Specification:—8 valves+rectifier, 4 bands covering 550Kc/s. 30Mc/s. Incorporates 1 R.F. and 2 I.F. stages, 'Q' multiplier,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

LAFAYETTE HA-55A AIRCRAFT RECEIVER

108-136 Mc/s. High selectivity and sensitivity. Incorporates 2 RF stages including 6CW4 Nuvistor 8 tubes for 11 tube performance, solid state power supply, adjustable squelch control, slide rule dial, built-in 4in. speaker and front panel phone jack. 220/240V. A.C. Supplied brand new and guaranteed **£19.7.6.** Carr. 10/-. 108-176 Mc/s Ground Plane Antenna **59/6.**

HAM-1 COMMUNICATION RECEIVER



5 valve superhet receiver covering 550 kc/s—30 Mc/s on 4 bands. Special features include slide rule dial. Bandspread tuning. 'S' Meter. B.F.O. Built-in 4in. speaker. Operation 220/240 v. A.C. Brand New with handbook. **16 GNS.** Carr. 10/-. S.A.E. for details.

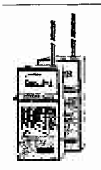
MAIN LONDON AGENTS FOR CODAR EQUIPMENT

All items available as advertised.

SINCLAIR TRANSISTOR AMPLIFIERS

Z12 Amplifier **89/6**; PZ3 Power Pack **79/6**; X10 Amplifier Built **£6.19.6.** Kit **£5.19.6**; X10 Power Pack **54/-**; X20 Amplifier Built **£9.19.6.** Kit **£7.19.6**; X20 Power Pack **£4.19.6.** Micro FM Radio Kit **£5.19.6.** Micro 6, **59/6**; Micro amp **28/6**; Micro Injection **27/6.** Post paid.

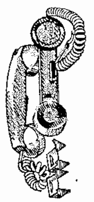
LAFAYETTE 2-WAY RADIOS



Super quality. Brand new and guaranteed.
3 transistor **£7.10.0 pr.**
6 transistor **£17.10.0 pr.**
10 transistor with range boost **£22.10.0 pr.**
Post extra.

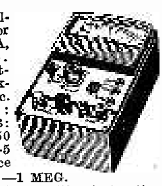
These cannot be operated in U.K.

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 full-est 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.

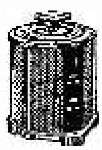
AMERICAN TAPE

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

3in., 225ft. L.P. acetate	4/-
3¼in., 600ft. T.P. mylar	10/-
5in., 600ft. std. plastic	8/6
5in., 900ft. L.P. acetate	10/-
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/-
7in., 2,400ft. D.P. mylar	25/-
7in., 3,600ft. T.P. mylar	58/6

Postage 2/-. Over £3 post paid.

VARIABLE VOLTAGE TRANSFORMERS



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.**

SILICON RECTIFIERS

200v. PIV, 200mA	2/6
200v. PIV, 6 amp	5/6
400v. PIV, 3 amp (SCR)	10/-
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/-

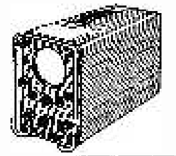
Discounts for quantities. Post extra

CALLERS WELCOME !

Open 9 a.m. to 6 p.m. every day Monday to Saturday. Trade supplied.

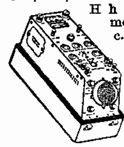
TEST EQUIPMENT

PORTABLE OSCILLOSCOPE CT-52



A compact (9in. x 8in. x 16½in.) general purpose 'scope T/B 10c/s-40 kc/s. Band width 1 M/cs. 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.

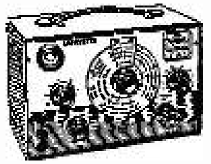
OS/8B/U OSCILLOSCOPES



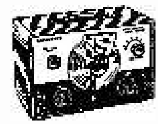
High quality Portable American Oscilloscope, 3in. c.r.t. T/B 3c/s-50kc/s X Amp: 0-500 kc/s Y Amp: 0.2 Mc/s. Power requirements 105-125v. A.C. Supplied in brand new condition. Fully tested. **£25.** Carr. 10/-. Suitable 230-115 v. Transformer, **15/6.**

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. Carriage 20/-. **£22.10.0**



TE-20 RF SIGNAL GENERATOR

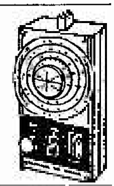


Accurate wide range signal generator covering 120 kc/s-260Mc/s on 6 bands. Directly calibrated. Variable R.F. attenuator. Operation 200/240v. A.C. Brand new with instructions. **£12,10.0.** P. & P. 7/6. S.A.E. for details.

LAFAYETTE TE-46 RESISTANCE CAPACITY ANALYSER

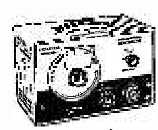
2 PF—2,000 MFD, 2 ohms—200 Megohms. Also checks impedance, turns ratio insulation 200-250 v. A.C Brand New **£15.** Carr. 7/6.

LAFAYETTE NUVISTOR GRID DIP METER



Compact, true one hand operation. Frequency range 1.7 - 180 Mc/s. 230v. A.C. operation. Supplied complete with all coils and instructions. **£12.10.0.** Carr. 5/-.

TE22 SINE SQUARE WAVE AUDIO GENERATORS

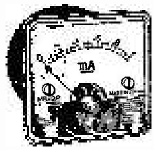


Sine: 20 cps to 200 kc/s. on 4 bands. Square: 20 cps to 30 kc/s. Output impedance 5,000 ohms. 200/250v A.C. operation. Supplied Brand New and Guaranteed with instruction manual and leads. **£15** Carr. 7/6.

NOMBREX EQUIPMENT

Transistorised Audio Generator 10-100,000 c/s. Sine or square wave. **£16.15.0.**
Transistorised Signal Generator 150 kc/s. 350 Mc/s. **£10.10.0.**
Transistorised resistance capacity bridge 1Ω. 100 MegΩ. 1pF-100µF. **£9.0.0.**
Transistorised Induction bridge, 1µN-100H. **£18.** Mains operated Transistor power supply unit, output 1-15v. up to 100mA. **£6.10.0.**
All above post paid with battery.

CLEAR PLASTIC PANEL METERS

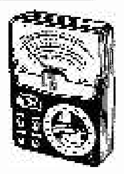


First grade quality, Moving Coil panel meters, available ex-stock. S.A.E. for illustrated leaflet. Discounts for quantity. Available as follows: Type MR, 38P, 1 21/32in. square fronts.

		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

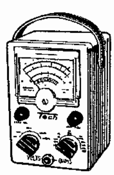


0 / 6 / 60 / 120 / 1,200V. A.C. 0 / 3 / 30 / 60 / 300 / 600/3,000V. D.C. 0 / 60µA / 12 / 300 MA. D.C. 0 / 60K / 6 Meg.Ω **85/-.** P. & P. 2/6.

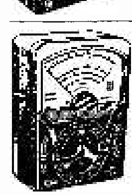
MODEL TE-12

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. 0/60XA/6/60/600 mA. 0/6K/600K/6 Meg./60 Meg.★. P.F. —.2 MFD. **£5.19.6.** P. & P. 3/6.

MODEL PV-58 VALUE VOLTMETER



11 meg. input. 7 D.C. volt ranges. 1.5-1,500 v. 7 A.C. volt ranges. 1.5-1,500 v. 4,000 Peak to Peak. Resistance .2 ohm to 1,000 megohm. Decibels — 10db to +65db. Supplied brand new with instructions, leads and probe. **£12.10.0.** P. & P. 3/6.



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 MegΩ. **£8.17.6.** Post paid.

G.W. SMITH & CO (RADIO) LIMITED

Phone: GERRARD 8204/9155
Cables: SMITHEX LESQUARE
3-34 LISLE STREET, LONDON, W.C.2

Make Your Ability PAY

UNLIMITED OPPORTUNITIES exist today for "getting on" . . . but only for the fully trained man. Let ICS's tuition develop *your* talents and help you to success.

STUDY IS EASY with ICS guidance. The courses are thorough. Printed manuals, fully illustrated, make study simple and progress sure.

YOUR ROAD TO SUCCESS can start from here—today. Complete this coupon and post it to us, for full particulars of the course which interests you. MODERATE FEES INCLUDE ALL BOOKS.

Take the right course now . .

ADVERTISING & ART
Copywriting, Cartooning
Layout and Typography
Commercial Illustrating
Oil & Water Colour

BUILDING & CIVIL ENG'NG
Architecture, Bricklaying
Building Construction
Builders' Draughtsman
Builders' Quantities
Interior Decoration
Quantity Surveying
Heating & Ventilation
Carpentry & Joinery

COMMERCE
Book-keeping
Accountancy & Costing
Business Training
Office Training
Purchasing, Storekeeping
Secretaryship
Shorthand & Typing
Computer Programming
Small Business Owners

DRAUGHTSMANSHIP
Architectural, Mechanical
Drawing Office Practice

ELECTRONICS
Computers
Electronic Technicians
Industrial Electronics

FARMING
Arable & Livestock
Pig & Poultry Keeping
Farm Management & Accounts

GENERAL EDUCATION
G.C.E. subjects at Ordinary & Advanced Level
Good English
Foreign Languages

HORTICULTURE
Home Gardening
Park Gardening
Market Gardening

MANAGEMENT
Business Management
Hotel Management
Industrial Management
Office Management
Personnel Management
Public Relations (IPR)
Transport Management
Works Management
Work Study
Foremanship

MECHANICAL & MOTOR ENG'NG
Engineering Maths.
Diesel Engines, Welding
Industrial Instrumentation
Workshop Practice
Refrigeration
Motor Mechanics, etc.

POLICE
Entrance Examination
Police Promotion (Educ. Subj.)

PHOTOGRAPHY
Practical Photography

RADIO, TV & ELECTRICAL
Servicing & Engineering
Radio Construction (with Kits)
P.M.G. Certificates
Telecommunications
Electricians'
Electrical Contractors'

SELLING
Company Reps.
Sales Management
Marketing

WRITING FOR PROFIT
Television Scriptwriting
Short-story Writing
Free-lance Journalism

INTENSIVE COACHING for all principal examinations—G.C.E., Secretaryship, Accountancy, Engineering, Work Study, Management, Radio, Architecture and Surveying. Special course for G.C.E. French Oral Test.

Member of the Association of British Correspondence Colleges

Start today the I.C.S. way!

INTERNATIONAL CORRESPONDENCE SCHOOLS
(Dept. 172)
Intertext House, Parkgate Rd., London, S.W.11

Send FREE book on ....

Name ....

Address ....

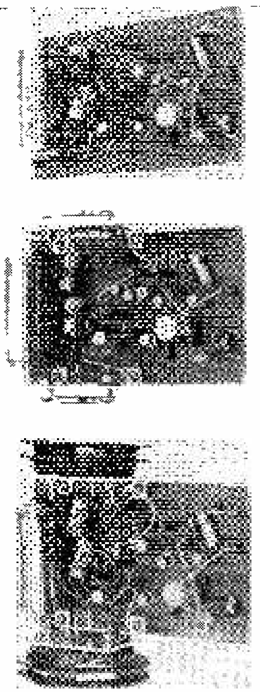
....

Occupation 10.66

INTERNATIONAL CORRESPONDENCE SCHOOLS

KEDOCO Adams-Norken

THERE IS AN ADAMS-NORKEN SOLID STATE MODULE TO SUIT ANY HI-FI OR TAPE REQUIREMENT



6/12

12/12

20/24

The photograph illustrates three modules from our range, three main amplifiers, fully transistorised, providing a choice of power from normal domestic listening to P.A. systems. 20/24 20 watts at **£6.19.0.** 12/12 12 watts, **£4.9.0.** 6/12 4 watts **£3.9.0.**

LEADERSHIP IN SOLID STATE TECHNOLOGY

Send 9d. to cover cost of postage for illustrated brochure describing in detail the Adams-Norken system and giving specifications circuits etc. of the whole range.

KEDOCO ELECTRONICS

Subsidiary of Adams-Norken Limited.
Sales and Showroom, Dept. P.W., 76 Victoria Road, Swindon, Wilts.
Open 9 a.m. to 6.30 p.m. Weds. early closing.
Personal callers welcome.

Telephone: Swindon (OSW3) 27660.

All our products are fully guaranteed. Should you not be completely satisfied we will refund your money in full without question.

voluntary band plan has been drawn up by the RSGB (Table II) and amateurs in Britain in general keep to this.

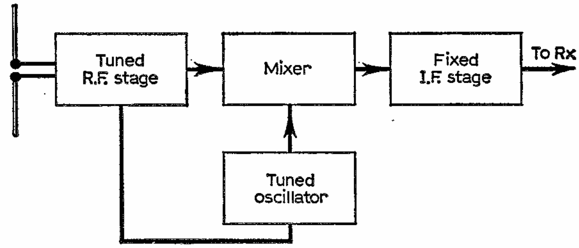
Various methods of propagation are used for long distance QSO's on two. Probably the most imaginative to date is Earth-Moon-Earth (E-M-E, or more popularly "Moonbounce"). The enormous problems involved have been overcome to a large extent by a few dedicated amateurs, and inter-continental DX has been achieved.

Transatlantic QSO's were made using the Oscar III satellite, and some of these were reported in PRACTICAL WIRELESS. Since Oscar, there have been some translator balloon tests in Europe. Some amateurs regard these as cheating, though, since they involve retransmission of signals.

Another exotic "space-age" method used is known as "meteor-scatter". Signals are reflected from ionised meteor trails in the upper atmosphere. As these occur at about 60 miles up, this gives an average maximum range of about 1,400 miles. The best time of day for this activity is at about 6 a.m. Signals have also been bounced off aurorae. However, all of these methods, so far, have used c.w. only as a means of contact.

TABLE II RSGB Voluntary Band Plans

4 METRES	
70·1—70·175 Mc/s	Northern England, North Wales.
70·175—70·3 Mc/s	Free.
70·26 Mc/s	Mobile calling frequency.
70·3—70·35 Mc/s	Isle of Man, Northern Ireland, Scotland
70·35—70·4 Mc/s	Free (R.A.E.N. Priority).
70·4—70·45 Mc/s	S.W. England, South Wales, Channel Islands.
70·45—70·625 Mc/s	Free.
70·625—70·7 Mc/s	South and S.E. England.
2 METRES	
144·0—144·1 Mc/s	Nationwide CW only.
144·1—144·25 Mc/s	Cornwall, Devon, Somerset, Berks, Dorset, Hants, Wilts and the Channel Islands.
144·25—144·5 Mc/s	Brecon, Cardiganshire, Carmarthenshire, Glam, Glos, Herefordshire, Mon, Pembrokeshire, Radnor, Worcs.
144·5—144·7 Mc/s	Kent, Surrey and Sussex.
144·7—145·1 Mc/s	Beds, Bucks, Essex, Herts, London and Middlesex.
145·1—145·3 Mc/s	Cambs, Hunts, Leics, Norfolk, Northants, Oxon, Rutland, Suffolk and Warwickshire.
145·3—145·5 Mc/s	Anglesey, Caernarvonshire, Ches, Denbighshire, Flints, Merionethshire, Montgomeryshire, Salop and Staffs.
145·41 Mc/s	Nationwide SSB spot frequency.
145·5—145·8 Mc/s	Derbys, Lancs, Lincs, Notts and Yorkshire.
145·8—146 Mc/s	Scotland, N. Ireland, Isle of Man, Cumberland, Co. Durham, Northumberland, Westmorland.



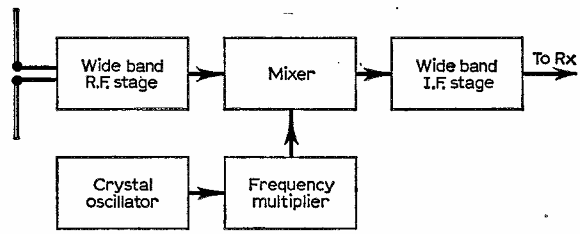


Fig. 1: Top—Tuneable converter producing fixed i.f.
Fig. 2: Bottom—Crystal controlled converter tuned i.f.

Tropospheric Refraction

The most common method of DX propagation is by tropospheric refraction. This occurs rarely at frequencies below 100Mc/s. The mechanism involved is similar to that by which mirages are seen. The radiation path is bent by the lower layers of the atmosphere, and in some cases can be "ducted" above the ground for a considerable distance before it is bent back again. This way, two-way contacts of over 1,000 miles have been achieved. Tropospheric refraction normally occurs when the pressure and humidity are high. The usual indications of this are fine muggy weather.

"Sporadic E" propagation rarely occurs on this band, but an outstanding opening occurred over Europe on the morning of July 4, 1965, when British and Irish stations were able to work as far as Italy and Yugoslavia.

There are several beacon stations on 2 metres which give indications of openings. Some of these are listed in Table III.

1½ Metres

The 1½ metre band extends from 220-225Mc/s and is used in America. The characteristics of this band are very similar to 2 metres.

Techniques

The v.h.f. bands, from the technical point of view, can be divided into two sections: 30-100Mc/s and 100-300Mc/s.

In the first of these, h.f. techniques can still be used, and the majority of valves and many transistors will function effectively. However, the section from 100-300Mc/s represents a transition from "normal" circuit techniques to the specialised techniques of v.h.f. and microwave work. Components have to be selected with great care. Consideration will now be given to the various pieces of equipment used.

Aerials

Although on 6m. and 4m., and occasionally on 2m., scaled down versions of h.f. aerials are used, by far the most popular aerial is the Yagi array, the familiar TV aerial.

Horizontal polarisation is almost universal on 6m., 2m. and 1½m., but there is a tendency to use vertical polarisation on 4m. This has come about because of the availability of surplus transceivers (the B44). These run on 12V d.c. and are compact and thus are ideal for mobile use.

Receivers

In the early days of v.h.f. the super regenerative receiver was the most popular. However, since this type of receiver is notorious for re-radiation, and since the 2m. band is also used by aircraft, it has dropped out of favour. Most amateurs nowadays use a converter, the output from which feeds into a short wave or communications receiver. There are also receivers which tune the v.h.f. bands, such

TABLE III VHF BEACON STATIONS

Band	FREQUENCY Mc/s	Call Sign	Approximate Location	Operating Period[1]	Mode	R.F. Power (W)	Aerial	Direction
6m	50·046	ZE1AZC	Salisbury, Rhodesia	Continuous[2]	Not known	40	Ground Plane	All
4m	70·100	GB3ANG	Dundee, Angus	Continuous[3]	Call sign A1 each minute	15	4 element Yagi	S
	70·305	GB3LER	Lerwick, Shetland	Continuous	Call sign A1 each minute	15	Two 4 ele Yagis	NNE, S
	70·695	9H1MB	Malta	Continuous[3]	Call sign A1 each minute	15	4 ele Yagi	Towards London
2m	144·005	OE5THL	Linz, Austria	Daily 0700—1900 GMT	Call sign A1 30 per minute[4]	0·4	Ground Plane	All
	144·010	SP7VHF	Kielce, Poland[5]	All times, except Monday	A1/A2/A3 "de SP7VHF"	50	Dipole[6]	Not known[7]
	144·100	GB3CTC	Redruth, Cornwall	Continuous	Call sign A1 each minute	25	6 over 6 Yagi	ENE
	144·150	OE7IB/P	Innsbruck, Austria	Continuous[2]	Not known	5	Vertical	All
	144·250	GB3GW	Swansea, Glamorgan	Continuous[8]	Not known	Not known	Not known	Not known
	144·500	GB3VHF	Wrotham, Kent	Continuous	Call sign F1 each minute[9]	50	5 ele Yagi	N
	144·929	OH3VHF	Tampere, Finland	Continuous	Not known	80	Six 4 over 4 Yagis	Varies
	145·000	SM4UKV	Orebro, Sweden	Daily 0600—2400 GMT[10]	Not known	90	Crossed Dipole	All
	145·150	LA1VHF	Rjukan, Norway	Continuous	Not known	≃20	Crossed Dipole	All
	145·200	LA2VHF	Trondheim, Norway	Continuous	Not known	20	Crossed Dipole	All
	145·250	LA3VHF	Harstad, Norway	Continuous	Not known	20	Crossed Dipole	All
	145·300	LA4VHF	Bergen, Norway	Continuous	Not known	20	Crossed Dipole	All
	145·900	DL0SG	Straubing, Niederbayern, Germany	Not known[11]	Not known	12	Not known	All
	145·985	GB3ANG	Dundee, Angus	Continuous	Call sign A1 each minute	15	5 ele Yagi	S
	145·987	OZ7IGY	Copenhagen, Denmark	Daily 1100—2300 GMT[2]	Not known	Not known	Not known	All
	145·990	GB3GI	Strabane, Co. Down	Continuous	Not known	15	Two 5 ele Yagis	Not known
	145·990	YU1VHF	Yugoslavia	Continuous	Not known	50[12]	Four 4 ele Yagis	NW, W, NNE, SE
	145·995	GB3LER	Lerwick, Shetland	Continuous	Call sign A1 each minute	15	6 over 6 Yagi	S
	145·995	OE5THL	Linz, Austria	Daily 0700—1900 GMT	Call sign A1 30 per minute[4]	0·4	Ground Plane	All
	146·000	YU2VHF	Yugoslavia	Continuous	Not known	50[12]	Four 4 ele Yagis	NW, SW, NE, SE
	In the range 145·95—146	OE1XAA	Wein, Austria[5]	Continuous	Unmodulated carrier, call sign A2 each minute	1	Halo	All
	Not known	OH8VHF	Oulu, Finland	Continuous[13]	Not known	Not known	Not known	Not known

1 The operating period refers to the times when the beacons are operational.

2 These beacons operated as part of the IQSY programme. It is not certain whether they operate now or are likely to do so again.

3 These beacons await licensing.

4 This beacon transmits for 30 seconds on one frequency then QSY's to the other.

5 These beacons are due to be removed to better sites.

6, 7 This aerial is due to be replaced by an omni-directional stack.

8 These beacons are licensed but not yet operational.

9 400 c/s shift.

10 Temporarily QRT. Operation is hoped to be resumed in the Autumn.

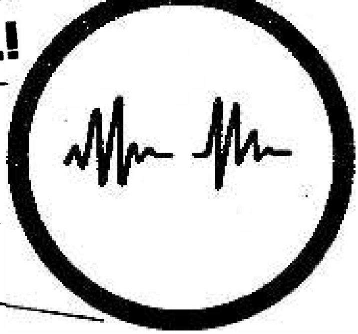
11 It is not certain whether this beacon now functions.

12 Final D.C. input power.

13 During test operation, the call sign used is OH8AA.

LOOK!

PRACTICAL!
VISUAL!
EXCITING!

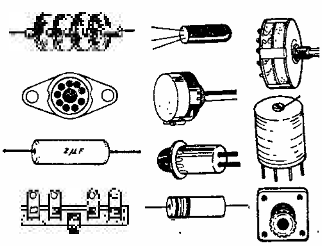


a new 4-way method of mastering

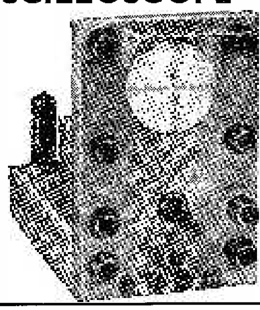
ELECTRONICS

by doing — and — seeing . . .

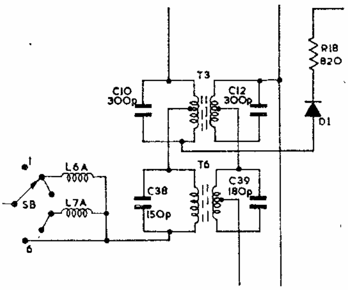
1 ▶ OWN and HANDLE a
complete range of present-day **ELECTRONIC PARTS** and **COMPONENTS**



2 ▶ BUILD and USE
a modern and professional **CATHODE RAY OSCILLOSCOPE**



3 ▶ READ and DRAW and UNDERSTAND CIRCUIT DIAGRAMS



4 ▶ CARRY OUT OVER 40 EXPERIMENTS ON BASIC ELECTRONIC CIRCUITS AND SEE HOW THEY WORK . . . INCLUDING . . .

- VALVE EXPERIMENTS
- TRANSISTOR EXPERIMENTS
- AMPLIFIERS
- OSCILLATORS
- SIGNAL TRACER
- PHOTO ELECTRIC CIRCUIT
- COMPUTER CIRCUIT
- BASIC RADIO RECEIVER
- ELECTRONIC SWITCH
- SIMPLE TRANSMITTER
- A.C. EXPERIMENTS
- D.C. EXPERIMENTS
- SIMPLE COUNTER
- TIME DELAY CIRCUIT
- SERVICING PROCEDURES

This new style course will enable anyone to really understand electronics by a modern, practical and visual method—no maths, and a minimum of theory—no previous knowledge required. It will also enable anyone to understand how to test, service and maintain all types of Electronic equipment, Radio and TV receivers, etc.

FREE POST NOW for BROCHURE

or write if you prefer not to cut page

To: BRITISH NATIONAL RADIO SCHOOL, READING, BERKS. Please send your free Brochure, without obligation, to: *we do not employ representatives*

NAME .... BLOCK CAPS

ADDRESS ....PLEASE **PW10**

BARGAIN XTAL PICK-UP ARM Complete with ACOS LP-78 Turnover Head and Styli 20/-; Stereo 30/-.
SPEAKER FRET Tygan various colours, 52in. wide from 10/- ft.; 26in. wide from 5/- ft. Samples S.A.E.
EXPANDED METAL Gold or Silver 12×12in. 6/-.
NEW GARRARD GRAM MOTORS 100-130v. A.C. 15/- pair for 200/250v. (in series), or 10/- each Post Free).

FULL WAVE BRIDGE SELENIUM RECTIFIERS: 2, 6 or 12 v. outputs, $1\frac{1}{2}$ amp., 8/9; 2 a. 11/3; 4 a., 17/6.
CHARGER TRANSFORMERS. Tapped input 200/250 v. for charging at 2, 6 or 12 v., $1\frac{1}{2}$ amps., 15/6; 2 amps., 17/6; 4 amps., 25/-. Circuit included. Amp meter 5 amp., 10/6.

MOVING COIL MULTIMETER TK 25. 0-1,000v. A.C./D.C., ohms 0 to 100k. etc. **47/6**
MOVING COIL MULTIMETER EP10K. 0-1,000v. A.C./D.C., ohms 0 to 3 meg. etc., **79/6**
MOVING COIL MULTIMETER EP20K. 0-2,500v. D.C. 20,000 ohms per volt. 0-1,000v. A.C. Ohms 0 to 6 meg. 50 Microamps full scale. **99/6**

NEW MULLARD TRANSISTORS

OC71 6/-; OC72 7/6; OC81D 7/6; OC81 7/6; AF115 10/6; AF114 11/-; OC44 8/-; OC45 8/-; OC171 9/-; OC170 8/6; AF117 9/6. OC26 12/6; Transistor Holders 1/3.

VALVE HOLDERS. EA50 6d. MOULDED Int. Oct. 6d. Mazda Oct. 6d.; B7G, B8A, B8G, B9A, 9d.; B7G with can 1/6. B9A with can 1/9. Ceramic OCTAL, EF50, B7G, B9A, 1/-. Valve base plugs B7G, B9A, Int. Oct., 2/3.

TRANSISTOR MAINS ELIMINATORS 29/6

PP1-6 volt, PP9-9 volt (All same sizes as batteries) 80mA. DOUBLES 42/6. PP1+PP1, PP9+PP9, PP11—$4\frac{1}{2}+4\frac{1}{2}$. SPECIAL 9v. 300 mA. Full wave. Fully smoothed 45/-.

WEYRAD P50 — Transistor Coils

RA2W 6 in. Ferrite Aerial with car aerial coil....12/6	Spare Cores ....6d.
Osc. P50/1AC..........5/4	Driver Trans. LFDT4....9/6
470 kc/s I.F.P50/2CC ..5/7	Printed Circuit, PCA1..9/6
3rd I.F. P50/3CC........6/-	J.B. Tuning Gang......10/6
	Booklet 2/-

Volume Controls

Long spindles. Midget Size 5 K. ohms to 2 Meg. LOG or LIN. L/S 3/-. D.P. 5/-.

Stereo L/S 10/6. D.P. 14/6. Linear or Log Tracks.

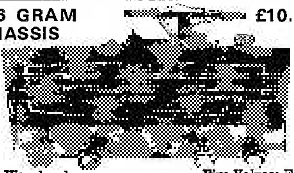
80 Ohm Coax 6d yd.

Semi-air spaced Cable 40 yd. 17/6. 60 yd. 25/-.

LOW LOSS 5dB. per 100ft. at 500 Mc/s. Ideal 625 lines **1/6** yd.

COAXIAL PLUG 1/-. PANEL SOCKETS 1/-. LINE SOCKETS 2/-. OUTLET BOXES, SURFACE OR FLUSH 4/6. BALANCED TWIN FEEDERS 6d. yd., 80 or 300 ohms. TELESCOPIC CHROME AERIAL. 12in. extends to 33 in. 6/6.

1966 GRAM CHASSIS **£10.10.0**



Three Wavebands: Long., Med., Short. Five Valves: ECH81, EF89, EBC81, EL84, EZ80, 12-month guarantee. A.C. 200-250 v. Ferrite Aerial 5 watts 3 ohm. Chassis $13\frac{1}{2}$in. ×7in.×5in. dial size 13in.×4in. Two Pilot Lamps. Four Knobs. Aligned calibrated. Chassis isolated from mains. **£10.10.0**

AM TUNER MEDIUM WAVE Three Transistor Superhet. Ready built. Printed circuit. Ferrite aerial. Size $5\frac{1}{2}$ x $3\frac{1}{2}$ x $1\frac{1}{2}$in. Ideal for Tape Recorders, 79/6.
FM TUNER 88-108Mc/s. Six Transistor, Superhet. Ready built. Printed circuit. Calibrated slide dial tuning. Size 6 x 4 x $2\frac{1}{2}$in. £8.
3 WATT QUALITY AMPLIFIER 4 Transistor. Push-pull. Ready built, with volume control. 75/-.

HIGH GAIN TV. PRE-AMPLIFIER BAND I B.B.C. Tunable channels 1 to 5. Gain 18 dB. ECC84 valve. Kit price 32/6 or 55/- with power pack. Details 6d. BAND III I.T.A.—same prices. Tunable channels 7 to 13. Band I or III. Coils and circuit only, 9/6. Chassis 4/9. BBC2 Super Booster. UHF Transistor Model ready made 75/-

BLANK ALUMINIUM CHASSIS. 18 s.w.g. 4 sides, riveted corners, lattice fixing holes, $2\frac{1}{2}$in. sides, 7×4in., 5/6; 9×7in., 6/6; 11×3in. 6/6; 11×7in. 7/6; 13×9in. 9/6; 14×11in. 12/6; 15×14in., 15/-.
ALUMINIUM PANELS 18 s.w.g. 12×12in. 5/6; 14×9in. 4/6; 12×8in. 3/6; 10×7in. 2/9; 8×6in. 2/-; 6×4in. 1/6.

STELLA RECORD PLAYER AMPLIFIER

4 watt. 2 stage. 3 to 7 ohm. Neg. feed back. UCL82, UY85. 200-250v. A.C. tapped input. Chassis size 8 x $2\frac{1}{2}$ x 4in. high. Gold/Walnut knobs. Volume and Tone controls on separate Polished Wood Panel 6 x 2in. Brand new with makers guarantee. Bargain price 78/6. P. & P. 1/6.

ADD-ON BABY ALARM UNIT

All Transistor. For any make of T.V. or Radio. Only three connections. Made by K.B., R.G.D. and Regentone. Circuit provided and instructions for use with all makes. No battery required. Ready built and guaranteed. Complete with microphone. Bargain price 30/-. Post free.

NEW MANUFACTURERS SURPLUS UHF BBC-2 AERIALS

BBC-2 Double Gold Ring Set Top,	22/6.
BBC-2 Five Element Loft Model,	32/6.
BBC-2 Five Element Outdoor Wall Mounting,	42/6.

★ RADIO BOOKS ★ (Postage 9d.)

Radio, T.V. Valves, Diodes, Transistor equivalents	10/6
High Fidelity Speaker Enclosures and Plans	5/-
Transistor Superhet Commercial Receivers	7/6
Mullard Audio Amplifier Manual	8/6
Radio Valve Guide, Books 1, 2, 3, 4, or 5	each 5/-
Practical Radio Inside Out	4/6
TV Fault-Finding, fully illustrated	6/-
Transistor Audio Amplifier Manual	6/-
Shortwave Transistor Receivers	5/-
Transistor Communication Sets	6/-
International Radio Stations List	2/6
Modern Transistor Circuits, for Beginners	7/6
Sub-Miniature Transistor Receivers	5/-
How to Receive Foreign TV	5/-

JACK SOCKETS Std. open-circuit 2/6, close-circuit 4/6. Chrome lead socket 7/6; Grundig 3-pin 1/3; Lead 3/6. Phono Plugs 1/-. Socket 1/-. Banana Plugs 1/-. Sockets 1/-. JACK PLUGS STANDARD. Chrome 3/-. Grundig 3-pin 3/6.
RESISTORS. Preferred values, 10 ohms to 10 meg. $\frac{1}{4}$ w., $\frac{1}{2}$ w., 1 w., 20% 4d.; $1\frac{1}{2}$ w. 8d.; 2 w. 1/-; $\frac{1}{2}$ w. 10% 6d. HIGH STABILITY. $\frac{1}{2}$ w. 1% 2/-. Preferred values. 10 ohms to 10 meg. Ditto 5%, 10 ohms to 22 meg., 9d.

WIRE-WOUND RESISTORS

5 watt	0.5 to 8.2 ohm 3 w.	1/6
10 watt	WIRE-WOUND RESISTORS	1/9
15 watt	10 ohms to 6,800 ohms	2/-

10K, 15K, 20K, 25K, 10W. 3/-
MAINS DROPPERS. Midget. With sliders. 0.3 a., 1K., 0.2 a., 1.2 K., 0.15 a., 1.5 K., 0.1 a., 2 K., 6/- each.
LINE CORD 100 ohms ft. twin plus resistance 1/- ft.

ALL PURPOSE TRANSISTOR PRE-AMPLIFIER

14 db gain. 250v. or 9v. input. Ready built with Mu Metal matching transformer for Mikes, Pick-Ups, Radio Tuners. Instructions and circuit supplied. 15/- Post Free.

WIRE-WOUND 3-WATT POTS. Miniature T.V. Values 10 ohms to 30K, 3/3. Carbon 30K, to 2 meg., 3/-.

WIRE-WOUND 4-WATT STANDARD SIZE POTS. LONG SPINDLE VALUES 50 OHMS to 100 K, 7/6.

ARDENTE TRANSISTOR TRANSFORMERS
D3035, 7.3 CT : 1 Push Pull to 3 ohms for OC72, OC81..11/-
D3034, 1.75 : 1 CT. Push Pull Driver for OC72, OC81..11/-
D3058, 11.5 : 1 Output to 3 ohms for OC72, OC81....11/-

C.R.T. BOOSTER TRANSFORMERS

for heater cathode short or failing emission. 25% and 50% boost. 200/250v. A.C. input. State tube voltage required. **PRICE 15/6**

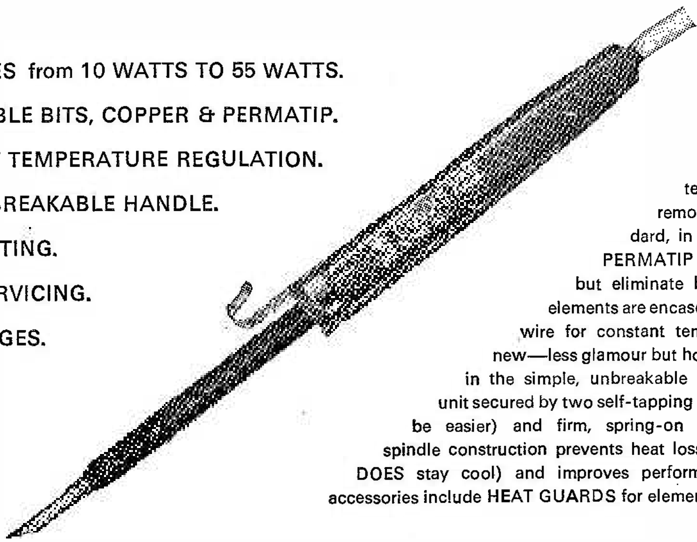
RETURN OF POST DESPATCH *Minimum P.P. Charge 1/6 per order unless otherwise stated. Full List 1/- C.O.D 2/6 extra.* ***CALLERS WELCOME***

RADIO COMPONENTS SPECIALISTS 337 WHITEHORSE ROAD, WEST CROYDON

Written guarantee with every purchase. (*Export—send remittance and extra postage, no C.O.D.*) Buses 133, 68 pass door, S.R. Stn. Selhurst. Tel: **THO 1665**

LITESOLD SOLDERING INSTRUMENTS

- SEVEN SIZES from 10 WATTS TO 55 WATTS.
- REPLACEABLE BITS, COPPER & PERMATIP.
- EXCELLENT TEMPERATURE REGULATION.
- COOL, UNBREAKABLE HANDLE.
- RAPID HEATING.
- SIMPLE SERVICING.
- ALL VOLTAGES.
- LOW COST.



LITESOLD instruments are compact and nicely balanced. Bits are spring-collet mounted for firmness and easy removal. Copper bits are standard, in sizes from $\frac{3}{32}$" to $\frac{1}{32}$" dia. PERMATIP bits are slightly slower, but eliminate bit face wear. LITESOLD elements are encased in specially pre-oxidised wire for constant temperature regulation from new—less glamour but honest design, also apparent in the simple, unbreakable handle, with the element unit secured by two self-tapping screws (servicing couldn't be easier) and firm, spring-on clip. LITESOLD hollow-spindle construction prevents heat loss into the handle (which DOES stay cool) and improves performance. Useful LITESOLD accessories include HEAT GUARDS for elements, and BENCH STANDS.

Free details of the whole wide range of LITESOLD and ADAMIN soldering equipment in brochure SP10.

LIGHT SOLDERING DEVELOPMENTS LTD.

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

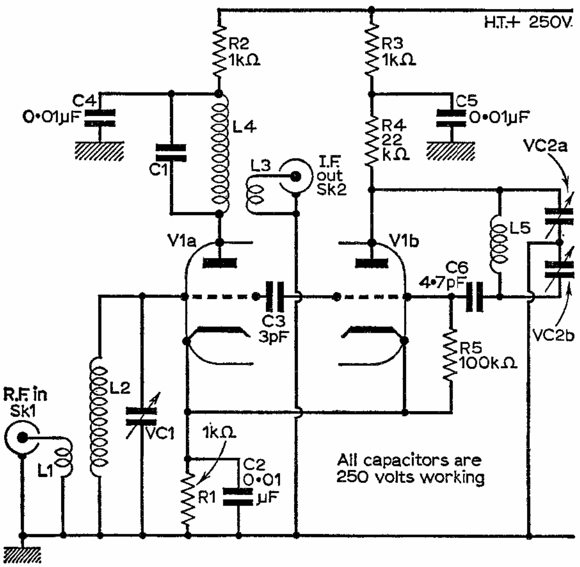


Fig. 3: Example of a typical simple tunable converter. The tuned circuits VC1/L2 and VC2a—VC2b/L5 are arranged to produce the desired intermediate frequency.

as the surplus R1392.

There are basically two types of converter. There is the tunable converter which produces fixed i.f. The RF24, 25, 26 and 27 units are examples of these. There are also converters which have a fixed frequency oscillator, usually crystal controlled, where the i.f. is tuned by the receiver.

Block diagrams of the two types of converter are shown in Figures 1 and 2, and typical circuits are shown in Figures 3 and 4.

The best converters always include a stage of r.f. amplification and a stage of i.f. amplification. Although the tunable converter is the simpler to build, the crystal controller converter is more popular because of its advantages. These are: It is easier to tune to a specific frequency accurately; signals on adjacent channels can be separated more easily; stability is adequate for s.s.b. and c.w. signals to be read; a long warming-up period is not necessary.

Receiver noise is a serious problem, and a low noise front end is essential for receiving weak signals. Consequently, for the best results, special valves are used. These are almost all triodes. Examples of these are Nuvistors such as the 6CW4 and 6DS4, double triodes designed for cascode operation such as the ECC88, and special valves for grounded grid operation such as the A2521, EC88 and 6AM4.

Semiconductors

Now that v.h.f. transistors are at reasonable prices, these are tending to replace valves as they have lower noise figures. The AF139, AF186 and GMO290 are very popular, all priced about £1. Because of noise considerations the first mixer is usually a triode rather than a multigrid valve, although once again transistors are proving advantageous.

Choice of a suitable i.f. is important, as it is desirable to avoid powerful broadcasting stations, since these may break through. The most popular ranges for i.f.'s are: 2-5Mc/s, 12-14Mc/s, 24-30 Mc/s, which are covered by most communications

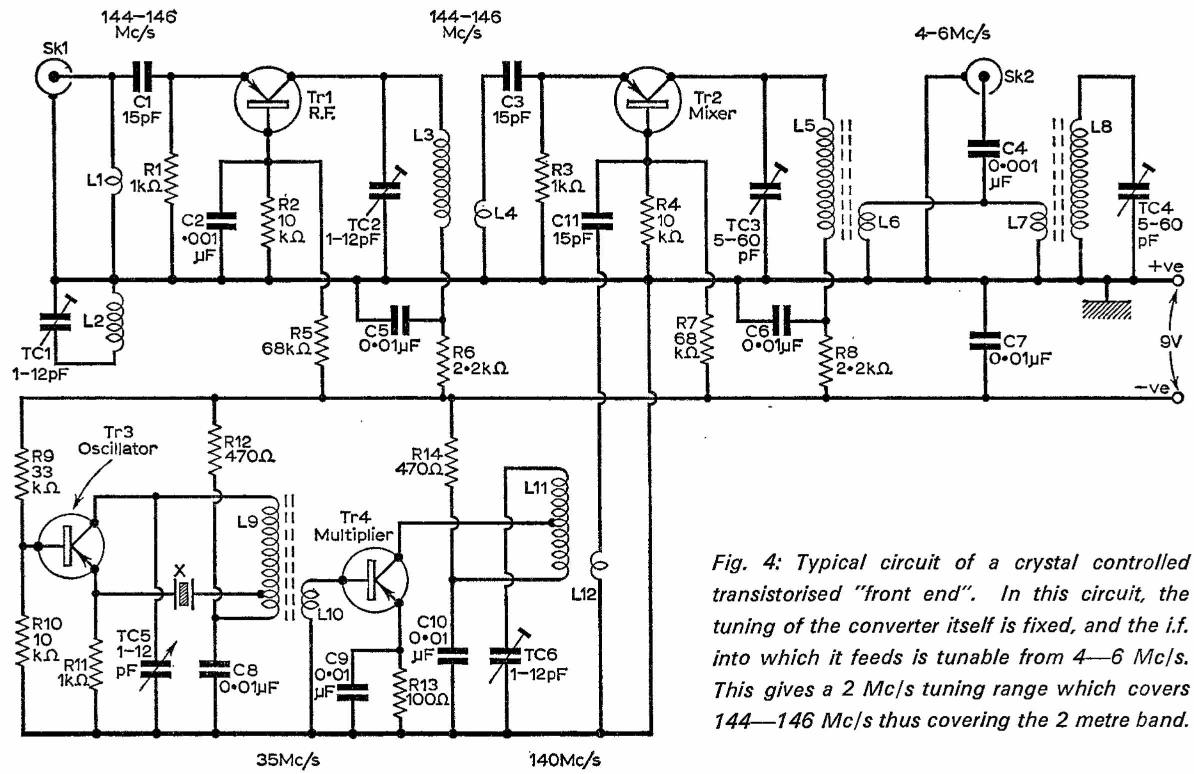


Fig. 4: Typical circuit of a crystal controlled transistorised "front end". In this circuit, the tuning of the converter itself is fixed, and the i.f. into which it feeds is tunable from 4—6 Mc/s. This gives a 2 Mc/s tuning range which covers 144—146 Mc/s thus covering the 2 metre band.

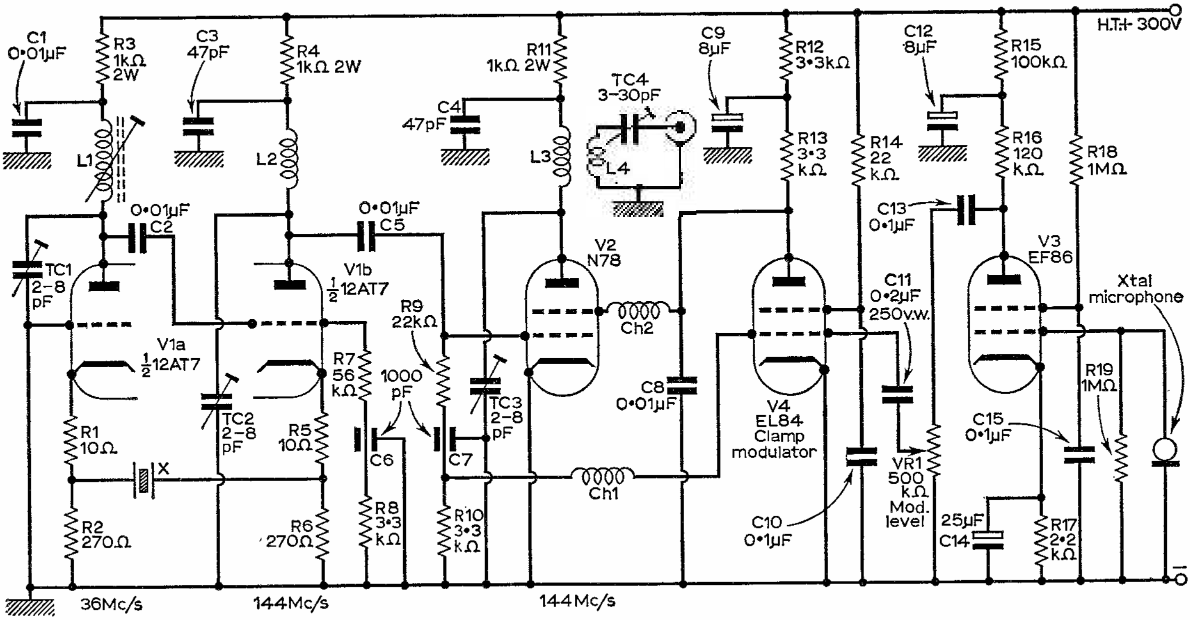


Fig. 5: Circuitry for a simple two metre transmitter. This is a typical circuit, V1, V2 forming the r.f. section and V3, V4 the modulator.

receivers. There is no doubt, though, that the range 30-40Mc/s is the best as there is very little activity in this region, and there are some surplus receivers, the R1466 (34-40Mc/s) available at almost give away prices.

Too low an i.f. should be avoided since this may give rise to poor image response and increased noise. In general, the minimum i.f. for 6m. and 4m. should be 1Mc/s, for 2m. 2Mc/s, and for 1½m. 3Mc/s.

In some areas, television receivers can be used. When conditions allow, and there is not a local transmitter on the channel, 6m. signals may be heard on channel 2 and possibly channel 3, if a horizontally polarised aerial is used. Also some receivers, when tuned off channel 5, will pick up 4m. signals.

Transmitters

Transmitters are almost universally crystal controlled, since v.f.o. stability is not good enough. (A drift of one part in 10,000 [0·01%] on 2m. is over 14kc/s.). Consequently the operating technique is to call on one's own frequency and then to tune the band for replies. This technique simplifies construction to some extent since the complication of a v.f.o. and tuning the power stages does not occur.

On 6 and 4m. most available transmitting valves can be used, even the 807, although its efficiency is well down and many receiving valves are suitable. For instance, the ECL82 is often used in the p.a. of a 4m. transmitter.

On 2m. some receiving valves can be used, but generally special valves are required. Double-beam tetrodes such as the 832, QQVO3-10 and the QQVO6-40 are very popular for medium and high power rigs.

Figure 5 shows a circuit for a typical simple low-powered crystal controlled transmitter.

Throughout the v.h.f. bands, tuned circuits may be made, using capacitively tuned coils. However, for frequencies above 100Mc/s tuned transmission lines can be used, and usually are in high-power stages. The use of non-inductive capacitors and resistors is advisable. Insulators should be ceramic or p.t.f.e., although losses in Paxolin are not serious up to 150Mc/s. ■

PRACTICAL WIRELESS

BINDERS

A first class magazine deserves first class treatment. Store your copies of *Practical Wireless* with a new Easi-binder, specially designed to hold 12 copies of the new large size. It has a special pocket for storing those blueprints and data sheets too. Yours for 14/6d. from: Binding Dept., George Newnes Ltd., Tower House, Southampton Street, London, W.C.2. **Note.** Please state the volume number required otherwise a blank cover will be sent.

INDEX

No more frantic searching for that particular article which appeared in that past issue. For 1/6d. you can be the proud possessor of a *Practical Wireless* index to volume 40. This price includes postage, and the index is available from our Post Sales Department, George Newnes Limited, Tower House, Southampton Street, London, W.C.2.

Sample Veroboard

FREE

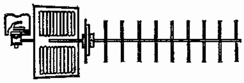
with the October issue of

PRACTICAL ELECTRONICS

SIX MINIBOARD PROJECTS **YOU** CAN BUILD IF YOU ORDER YOUR COPY NOW . . .

OUT 15 SEPTEMBER 2s. 6d.

TELEVISION AERIAL for fringe area BBC-2



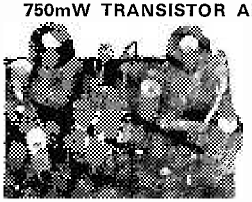
Directors and reflector mat—a really efficient model by one of our most famous makers—must improve results—**45/-** plus 3/6 post and ins. Low loss co-ax cable **1/6** yd. B.B.C.2 aerial amplifier **£4.4.0.**

STEREO DE-LUXE HEADPHONES

Even good music is not everybody's cup of tea—and if your family is in this group then you need these superior phones. Alternatively if you've not experienced the exhilerating sensations these phones can supply from stereo recordings then you are missing one of the fine pleasures available today at low cost.

Complete with cushioned ear pads. Bargain price **75/-** plus 2/9 post and ins.

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**; 6in. × 4in. **14/6.**

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 ¼ of list price includes carriage by B.R.S.
8 ft. **30/-**; 10 ft. **36/-**; 12 ft. **42/-**
Also in twin assemblies (one pipe above the other). 4ft. **40/-**; 5ft. **46/-**; 6ft. **52/-**.

Simmerstat Heater Regulator

Suitable to control elements, heater, soldering irons and boilings rings up to 2,500 watt. Complete adjustable, normal price 55/- each, special snip price **12/6** plus 2/- postage and insurance.

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 1,000°F. Suitable for controlling furnace, oven, kiln, immersion heater or to make flamestat or fire alarm, **8/6** plus 2/9 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 a standard refrigerator thermostat. Spindle adjustments cover normal refrigerator temperature, **7/6** plus 1/- P. & P.

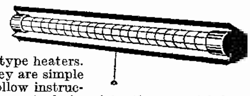
SEMI-CONDUCTOR BARGAINS

Type No.	*Price*	*Type No.*	*Price*	*Type No.*	*Price*
2N1727	15/-	MAT101	8/6	OC71	4/-
2N1728	100/-	MAT120	7/9	OC72	5/-
2N1742	25/-	MAT121	8/6	OC75	6/-
2N1747	25/-	OA5	5/-	OC76	5/-
2N1748	10/-	OA10	6/-	OC77	7/-
AC107	9/-	OA47	3/-	OC78	5/-
AC127	9/-	OA70	2/-	OC78D	5/-
ACY17	8/6	OA79	2/6	OC81	5/-
ACY18	5/6	OA81	2/6	OC81D	5/-
ACY19	6/6	OA85	3/-	OC82	5/-
ACY20	5/6	OA90	2/6	OC83	5/-
ACY21	6/-	OA91	2/6	OC84	6/-
ACY22	4/6	OA200	3/3	OC139	8/6
AF114	7/-	OA202	4/3	OC140	12/6
AF115	6/6	OC22	10/-	OC170	5/-
AF116	7/-	OC23	17/6	OC171	6/-
AF117	5/-	OC24	22/6	OC200	9/-
AF118	12/6	OC26	7/6	OC201	12/6
AF139	17/6	OC28	15/-	OC202	13/6
AF186	19/6	OC29	17/6	OC203	12/6
AFZ12	15/-	OC35	12/6	OCP71	19/6
ASZ21	15/-	OC36	15/-	ORP12	8/6
BC107	14/6	OC42	6/6	ORP60	5/-
BY100	5/6	OC44	5/-	SB078	6/6
BYZ13	7/6	OC45	4/-	SB305	8/6
MAT100	7/9	OC70	4/-	SB251	10/-

SPECIAL BARGAIN

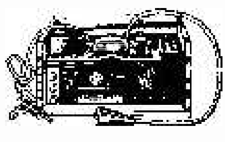
Special set for amplifier or for output stage comprises OC81D and match pair OC81 only **12/6**, post free.

INFRA-RED HEATERS



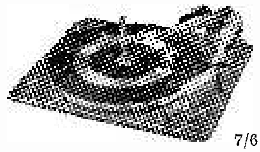
Make up one of these latest type heaters. Ideal for bathroom, etc. They are simple to make from our easy-to-follow instructions—uses silica enclosed elements designed for the correct infra-red wavelength (3 microns). Price for 750 watts element, all parts, metal casing as illustrated, **21/6**, plus 3/6 post and ins. Pull switch 3/- extra.

FIELD TELEPHONE UNIT



Officially known as remote control units No. 1, essentially these are telephones with additional facilities—each unit contains magneto type ringer and bell—as well as transformer—relay and switches. A pair of these will give you two way communication over distances up to five miles—unused and in good condition, **39/6** each plus 7/6 carriage and insurance.

FINE RECORD PLAYERS



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 insurance

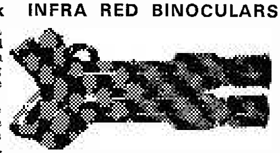
1000	£5. 5.0	AT60	£11.11.0
2000	£6. 9.6	SP25	£10. 9.0
3000	£7.19.6	LAB80	£25. 0.0
SRP12	£3.9.6		

Complete with service sheet and template.

THIS MONTH'S SNIP
ELECTRIC BLANKET OUTFIT

A thirteen yard, 70 watt waterproof element with temperature control by Thermal balance—and a double pole blanket switch in pastel blue bakelite—with enclosed neon ON/OFF indication—both items ideal for renovating a defunct or doubtful blanket—supplied complete with layout and other instructions only **12/6** plus 1/6 post and ins.

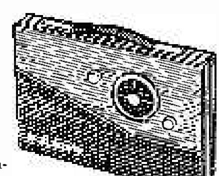
See in the dark INFRA RED BINOCULARS



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 lens for T.V. cameras—light cell, 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/- carriage and insurance. Handbook 2/6.

GOOD COMPANION Mk. V

Saves you work— It's partly built.



Like its predecessors this latest Companion has full fi performance—such as only a good wooden cabinet and bi-flux speaker can give, and due to its being partly built you will have it going in an evening. Note these features:

- All Mullard Transistors including 3 x AF117.
- Two tone Cabinet, size 11 x 8 x 3in.
- All circuit requirements Push Pull output—A.V.C. and feed back etc.
- Printed circuit board all wired only connections, e.g., to Volume control—WIC. Switch and Tuning Condenser.
- Pre-aligned IF stages complete with full instructions. Price only **£4.12.6** plus 6/6 post and insurance.

DEAC RECHARGEABLE BATTERIES

These nickel cadmium cells have negligible internal resistance. Will deliver current you require, reduce distortion and are completely reliable. They may be re-charged indefinitely. Replacements for PP3 **37/-**, U7 **12/6**, U2 **32/-**, U11 **23/-**, or send for list.
Note charger for these types available, **22/6.**
Cells for building into tape recorders and other equipment: Heavy duty 1.25v. type **8/8.** Heavy duty 9v. type **44/-.** Charger that will deal with both together or separately, **£4.15.0.**

SUMMER SALE
BARGAINS UNLIMITED

MINIATURE RELAYS with removable covers. Very sensitive (will close on only 20 mA). Coil resistance 10,000 ohms—contacts are three sets; triple set for change over pair to open circuit and the third pair to close circuit—perfect order unused (removed from equipment), **7/6** each.

MAINS TRANSFORMER. Upright mounting with primary tapped 200, 220, 240 v. H.T. secondary is 250-0-250 v. at 100 mA. and it has two L.T. secondaries of 6.3 v. 1½ amp.—unused (removed from equipment), **15/-** plus 3/6 post and insurance.

MULLARD SILICON RECTIFIERS. 350 v. 100 mA. Removed from unused equipment, perfect. Ref. BY100, **4/6** each.

REED SWITCHES. A pair of contacts sealed into a glass tube. When a magnet comes close the contacts close immediately and the circuit is switched. For burglar alarms on doors or windows—moving displays for advertising—rev. or batch counting—relay circuits. New and perfect, price is **6/6** each. Magnets from 1/- each.

½ MEG. POTS. By Erie, standard ¼in. spindle, 1in. long, **7d.** each in doz. lots, otherwise **10d.**

½ MEG POTS WITH D.P. SWITCH. Again by Erie. Standard size spindle 1in. length. **10d.** each in doz. lots, otherwise **1/3** each.

MINIATURE PICK-UP. For pop records—this is made by Cosmocord—has a crystal cartridge and long play sapphire stylus—offered for less than the wholesale price of the stylus only—namely **3/9** each or **36/-** doz.

SYNCHRONOUS METER MOTOR. This is self starting and has a cog ended spindle—add a train of gears and you have a clock or hours elapsed meter, or it would drive a little fan to keep equipment cool or similar job. Brand new and perfect, **5/6** each, **54/-** per doz.

RELAY SWITCHES. These enable micro switches, delicate thermostats or other low current devices to control up to 30 amps.—ideal to switch thermal storage heaters—motors, etc., made by the famous A.E.I. group these are listed at £25 each—you can buy if you hurry at a very keen price of **39/6** each and we will include diagrams and data. Mounted on panel size approximately 6 × 7 × 2in. deep.

MAINS FROM CAR BATTERY. Rotary generators 12 v. input, 240 v. output, 110 mA. **£2.** 300 mA. **£5.** plus 5/- post.

H.R.O. POWER PACK. Suitable 240 or 115 volt mains, gives 250 v. H.T. and 6.3 v. L.T. Unused but soiled and less rectifier valve, **19/6,** plus 6/6 post.

A.C./D.C. AMMETER. 2½in. flush mounting. 0.9 amps. but external shunt easily removed. Offered at silly price, **8/6** each, **£5** doz.

"C" CORE POTTED OUTPUT TRANSFORMER. Made by the famous "Parmeko" company these are the best money can buy—we can offer a bargain 15 watt rating, centre tapped primary with secondary for 3 ohm speaker. Potted and in black stove enamelled case for upright mounting these will make your amplifier or rig look perfect at only **12/6** plus 3/6 carriage and insurance—hurry for these.

FLUORESCENT LIGHT KITS. Comprising choke, lampholders, starter and two chrome tube clips. 40 watt **11/6** 80 watt **17/6**, 65 watt **17/6**, 20 watt **19/6**, plus 3/6 post and insurance.

6.3 v. HEATER TRANSFORMERS, 1½ amps., 5/6.

ARDENTE HEARING AID

If not wanted as hearing aid these could be the basis of radio control units—pocket transmitter—staff locators etc. They are beautifully made little units and they contain many subminiature parts including crystal microphone, on/off switch—volume control with on/off switch—inter-stage transformer—Mullard valves types DL 66 and DF 64 (2 of). All parts in good order, in fact hearing aids believed to be in working order but not guaranteed so—complete in plastic case with pocket clip only **27/6** (earphone not included).

MEDRESCO HEARING AID

Also available similar condition to above used but believed working, only **18/-** each.

Wall Mounting Thermostat

By Satchwell, intended for use to control tubular or any type of space heaters indoors or in a greenhouse—adjustable over 40/80 complete with mounting screws, **29/6**, plus post 2/9 (normal price is at least twice this).

MAINS POWER PACK

MAINS POWER PACK designed to operate transistor sets and amplifiers. Adjustable output 6v.-9 to 12 volts for up to 500mA (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.

Where postage is not definitely stated as an extra then orders over **£3** are post free. Below **£3** add 2/9.

ELECTRONICS (CROYDON) LIMITED

102/3 TAMWORTH ROAD, CROYDON, SURREY *(Opp. West Croydon Station)*
***post orders to:* Dept. PW, SPRINGFIELD ROAD, EASTBOURNE, SUSSEX**

RADIONIC

RADIO & ELECTRONIC CONSTRUCTION SYSTEM

ABSORBING
and
EXCITING!

Unique and brilliantly simple. Hundreds of educational establishments—Universities, Technical Colleges, Schools, the Armed Forces—are already using Radionic for electronic instruction. Enthusiastic owners range from 9 to 82 years of age. Selected by the Council of Industrial Design for all British Design Centres. Featured in Sound and Television broadcasts.

The system is beautifully engineered from top quality British components. No soldering. No mains. No prior knowledge needed. Simply arrange components on perforated transparent panel, position brass connecting strip underneath fix with 6BA nuts and circuit works with full efficiency. You can then dismantle and build another circuit. Your results are guaranteed by our Technical Department and News Letter Service. All parts available separately for conversion or expansion of sets.

NEW! Our "No soldering" printed circuit board for superhet portable. Simply insert components and tighten nuts.

No. 1 Set	£5.18.6	14 Circuits (Earphone)
No. 2 Set	£6.19.6	20 Circuits (Earphone)
No. 3 Set	£10.19.6	22 Circuits (7 x 4in. Loudspeaker output)
No. 4 Set	£14.19.6	26 Circuits (include 6 Transistor and reflex superhets)

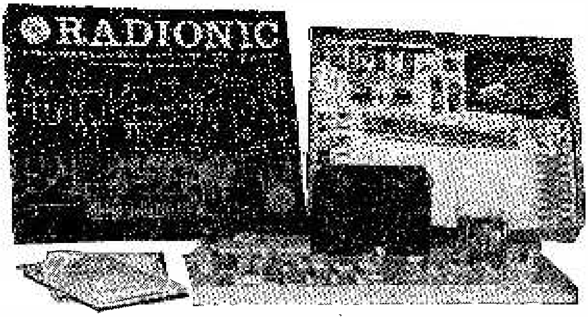
Prices (Post Free)

(Plus P.T. increases of 1/8; 1/11; 3/1; 4/2d respectively.)

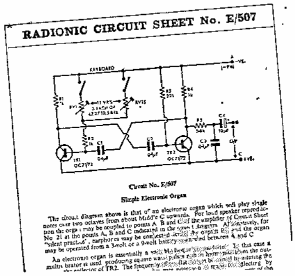
Full details from:

RADIONIC PRODUCTS LIMITED
STEPHENSON WAY, THREE BRIDGES
CRAWLEY, SUSSEX

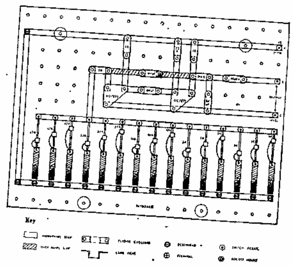
Tel. CRAWLEY 27028 (Trade Enquiries invited)



A No. 4 SET and 6-TRANSISTOR SUPERHET



Theoretical Circuit



Practical Layout

Our 'E' Series of basic electronic circuits is available separately. Send for details of E/508 our do-it-yourself computer

A New Martin Recordakit

designed specially for the MAGNAVOX 363

3 WATTS OUTPUT

●

OUTLET FOR HI-FI AMP

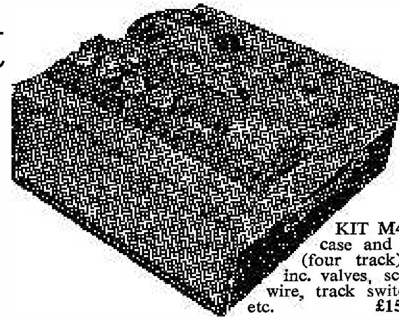
●

SOLDERING NOT NECESSARY

●

SEPARATE RECORDING LEVEL AND VOLUME CONTROLS

Get the best out of your MAGNAVOX STUDIOMATIC TAPE DECK with a Martin Recordakit assembly. This comprises everything you want to make a superb two or four track 3-speed recorder (taking 7 in. reels) at a price that will save you pounds. The basic Martin units are assembled and tested, making it necessary for you simply to fit and connect them together in accordance with the detailed instructions book supplied. When built, your Martin Recorder appears as shown here. The lid is detachable. Case with speaker, and deck also available. Details on request. MARTIN RECORDAKITS have long been famous for their high performance standards, quality of materials, simplicity and dependability. The latest is the best yet.

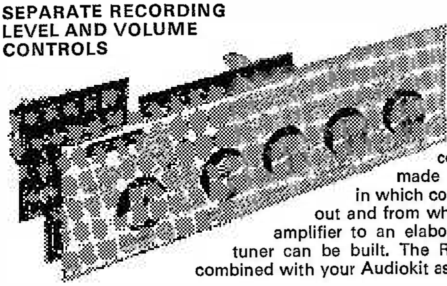


KIT M4 less case and deck (four track) but inc. valves, screws, wire, track switching etc. **£15.19.6**

KIT M2 *less case and deck (two track) but incl. valves, wire, screws, etc.* **£14.19.6**

Martin Audiokits for Hi-Fi

The uniquely reliable kits with "Add-on-ability"



No other system allows you to enlarge your installation stage by stage as Audiokits do. They comprise a wide range of very well made prefabricated transistorised units in which connections are standardised throughout and from which anything from a simple straight amplifier to an elaborate hi-fi stereo amplifier with FM tuner can be built. The Recordakit described above can be combined with your Audiokit assembly if you wish.

● 5-stage input Selector	£2.7.6
● Pre-amp/vol. control	£1.17.6
● Pre-amp/tone controls	£3.2.6
● 10 watt amp. (3 ohms)	£5.12.6
● 10 watt amp. (15 ohms)	£6.12.6
● Mains power supply	£2.15.0

FROM PRE-AMP TO A HI-FI STEREO/FM ASSEMBLY

Martin Recordakits and Audiokits are obtainable from good stockists everywhere. In cases of difficulty please write direct. Trade enquiries invited.

MARTIN ELECTRONICS LTD 154/155 HIGH ST., BRENTFORD, M'SEX *Phone:* ISLeworth 1161/2

MARTIN ELECTRONICS LTD.,
154 High St., Brentford, Middlesex

Full details of ☐ Recordakits ☐ Audiokits please

NAME ....

ADDRESS ....

....

(Block letters) P.W.10

new books

NETWORK ANALYSIS FOR TELECOMMUNICATIONS AND ELECTRONICS

By R. A. Lampitt, M.Brit. I.R.E. Published by Iliffe Books Ltd.
263 pages. 8$\frac{1}{2}$ins. x 5$\frac{1}{4}$in. Price 63s.

THIS book is intended to be used as a text for advanced students of Telecommunication and Electronic Engineering and aims at the fourth and fifth year level of the appropriate courses in preparation for entry to the Graduateship Examination of the Institution of Electronic and Radio Engineers and the City and Guilds of London Institute supplementary studies in Advanced Telecommunications and Electronic Principles.

It is envisaged that the book is appropriate to students holding H.N.C. or equivalent and is thus not suitable for beginners or novices. Briefly the volume deals with the mathematical treatment of the principles involved in the field of telecommunications and electronics and forms firm ground on which to base further studies of the many special applications of the subject.

The first chapter offers useful revision and introduction to the subject. This leads to the chapter on basic networks and thence to transmission properties of four-terminal networks. Further chapters on tuned circuits and wave filters, followed by transmission lines and an introduction to the Fourier analysis of waveforms, completes what is thought to be a useful contribution towards providing the student with essential material for study.—*LSA*.

TRANSISTOR ELECTRONIC ORGANS FOR THE AMATEUR

By Alan Douglas and A. Astley. Published by Sir Isaac Pitman & Sons Ltd.
70 pages. Size 8$\frac{1}{2}$in. x 5$\frac{1}{2}$in. Price 18s.

TO those interested in electronic organs the name of Alan Douglas will be well known. In this book, in conjunction with A. Astley, the accent is entirely on solid state construction.

Chapters include: Organs and Their Terminology, Introduction to Transistors, Transistorised Organ Circuits, All-transistor Amplifiers and Power Supplies, and Semi-conductor Keying and Special Effects. In addition there is a complete chapter devoted to the design and construction of a transistorised two-manual pedal organ.

An extremely useful book for the practical enthusiast, it commences with a discussion on transistors and how they work, including characteristic curves, etc., and even contains a circuit for a simple transistor tester. The chapter on the two-manual organ depicts chassis layouts, wiring layouts, diagrams of commercial and home-made contact blocks and photographs of the various sections. For those building an organ of this type the book is a good buy for this one chapter alone.

The remainder of the book is liberally endowed with circuits, nearly all with values. These useful diagrams include such things as a light-operated volume control, tone filters, vibrato oscillators and frequency dividers.—*DLG*.

HAM ANTENNA CONSTRUCTION PROJECTS

By J. A. Stanley. Published by W. Foulsham & Co. Ltd.
160 pages. Size 8$\frac{1}{2}$in. x 5$\frac{1}{4}$in. Price 24s.

ESSENTIALLY this is a book for the practical man. It concerns itself, as the title implies, with the numerous aerials suitable for use on the amateur bands. It is perhaps somewhat refreshing to find a book almost devoid of mathematics on a subject which can be quite complex.

In place of "pi" and $\log_e$ Mr. Stanley offers "*length of wire*", "*number of turns*" and "*tuning up procedures*". Let's look through this tome of down-to-earth, uncomplicated collection of aerials. Briefly there are chapters on Verticals, Horizontals, Multi-element Beams, Vertical Beams, Long Wires—Short Wires, Indoor Antennas, V.H.F. and Special Purpose Aerials. As an added attraction an entire chapter is devoted to using antenna test equipment—g.d.o's, s.w.r. bridges, etc.

If you wish to erect an aerial which will receive and/or transmit signals efficiently without the mathematical analysis of why, then this 24 shilling work is an investment.—*DLG*.

KNOW YOUR SIGNAL GENERATORS

144 pages. Size 8$\frac{3}{4}$in. x 5$\frac{1}{2}$in. Price 20s.

KNOW YOUR SQUARE-WAVE AND PULSE GENERATORS

144 pages. Size 8$\frac{3}{4}$in. x 5$\frac{1}{2}$in. Price 21s.
Both by Robert G. Middleton. Published by Foulsham-Sams Ltd.

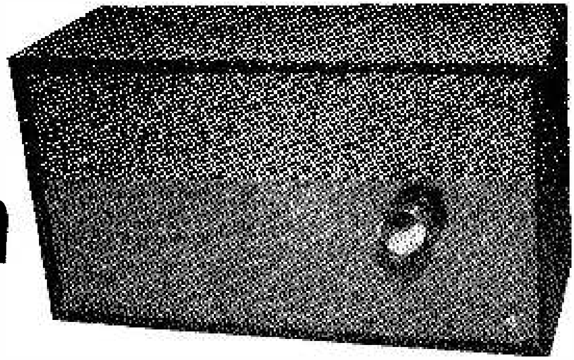
THESE two both deal at some length with the design, application and employment of particular pieces of test equipment. The author bases his work firmly on a practical knowledge of servicing. There are many "throwaway" hints and tips in these pages, and the illustrations are lavish, including many photographs of oscilloscope traces.

SIGNAL GENERATORS starts by defining the instrument and describing the various types, discusses accuracy and calibration and the various methods of modulation. Descriptions of specialised generators include u.h.f. and audio generators, analysers and transistor instruments and something we will all need to know about soon—the F.M. Stereo Multiplex generator.

In PULSE GENERATORS the technique of square-wave testing, extremely useful in audio work, is fully discussed, with a wealth of diagrams. As a departure from the usual method, Mr. Middleton describes the circuit and construction of many of the instruments he is discussing, and adds the bonus of a final chapter focused entirely on a laboratory-type pulse generator, going through its circuit and application step-by-step. One learns more by this spotlight method than in volumes of generalised description.

It goes without saying that this author wastes no words. The text remains readable, although its information content is formidable. Even if one should never run to the type of test gear he is describing, the circuits on which it is used become much more familiar after a careful study of this recommended bench-side reading.—*HWH*.

* A SENSITIVE baby alarm



BY F. GATE

THIS device consists of an extension amplifier, complete with loudspeaker and should be suitable for most homes, since it has an output in excess of 200mW. A moving coil loudspeaker may be used as a microphone and can be coupled to the amplifier with unscreened cable.

A view of the interior of the amplifier is shown below (Fig. 1) and the circuit diagram is illustrated opposite (Fig. 2).

Circuit Description

Signals are picked up by the 3Ω moving coil loudspeaker, which is used as a microphone, and fed directly to the emitter of Trl, a grounded-base amplifier. The collector load Rl of the first transistor is in series with the emitter load—the microphone. Now, although R1 and the speaker are effectively in series as far as the current is concerned, the internal characteristics of the transistor change the apparent values of these two components, effectively increasing the values of both, but increasing the apparent value of the emitter load to a greater degree than it increases the apparent value of the collector load. The voltage gain of the circuit is thus lower than might at first be expected. Actual voltage gain is approx. 120 times.

One of the snags with transistor circuitry is that, when a number of stages are used, the low impedance input of the following stage effectively shunts the collector load of the preceding stage, so that, although a collector load of (say) 5·6kΩ may be used, the *effective* value of the load is reduced to less than 1kΩ, and gain is thus reduced. In this amplifier it is overcome by direct coupling the collector of Tr1 to the base of Tr2, which is wired as an emitter follower. This gives a high input impedance and a low output impedance, and is thus able to feed following stages with minimum loss of signal, while at the same time placing a negligible load on the preceding circuit.

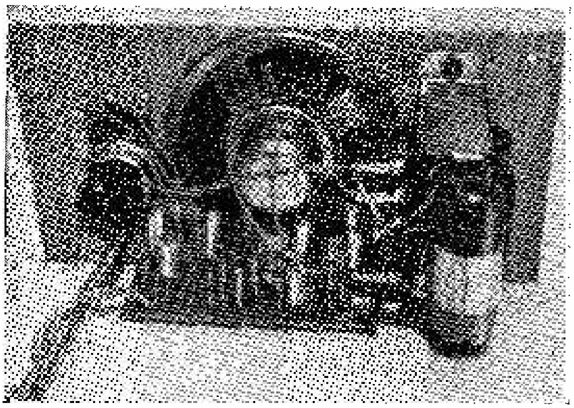


Fig. 1: Interior view of the amplifier.

D.C. negative feedback is applied to Tr1-Tr2 to stabilise the operating points, Tr1 base-bias being derived from Tr2 emitter. The major part of the emitter load of Tr2 is made up by VR1, which is used as a volume control in the completed unit.

The amplified signal appearing at the slider of VR1 is fed, via C3, to the base of Tr3; as a conventional common emitter amplifier, with collector load R6, base-bias network R4-R5, and emitter load R7 decoupled by C4. Again an emitter follower, (Tr4), is used as a buffer between Tr3 and Tr5.

The amplified signal appearing at the emitter of Tr4 is applied, via C6, to the power amplifier stage. Here, three transistors are used, Tr6 (p-n-p) and Tr7 (n-p-n) being the actual output transistors, and Tr5 being the driver. For all practical purposes, Tr5 can be considered as conventional common emitter amplifier. Tr6 can be regarded as an emitter follower, with its base directly coupled to the collector of Tr5, and with Tr7 as its emitter load. Similarly, Tr7 can be regarded as an n-p-n emitter follower, but in this case with Tr6 as its emitter load. Thus, the junction of the two emitters is at low impedance, and feeds the 25Ω speaker via C8. This common junction is at roughly half supply volts, and when a positive going signal from Tr5 collector is fed to both Tr6 and Tr7 bases, Tr6 is cut off and Tr7 conducts; when the applied signal is negative going, it is the n-p-n transistor, Tr7, which is cut off and Tr6 that conducts. Thus, the circuit acts as a class-B push-pull amplifier. With this circuit, it is essential that the potential at the junction of the Tr6 and Tr7 emitters stays at a mean level of approx. half the supply potential, and with this in mind the base-bias to Tr5 is stabilised by the d.c. feed-back loop from the Tr5 collector junction to R13. R11 is used to give a degree of base-bias to Tr6 and Tr7, to minimise cross-over distortion.

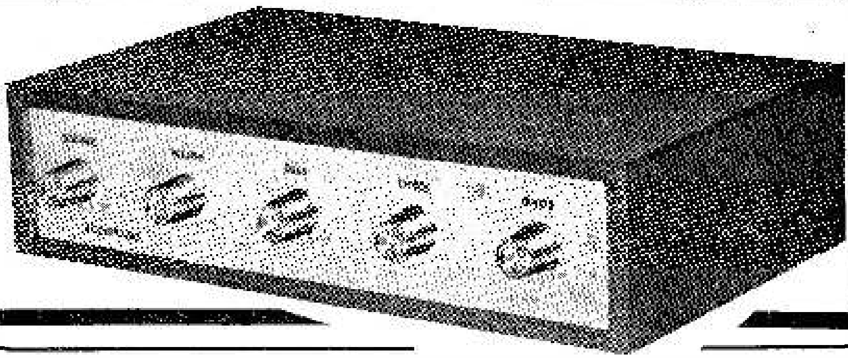
To prevent instability, decoupling networks R3-C2 and R9-C5 are interposed in the supply line between the major sections of the amplifier.

Construction

Start by cutting the Veroboard to size as shown in Fig. 3, and break the copper strips where indicated. Now drill the two mounting holes in the panel, drilling through from the copper side.

Next, wire up the components on the panel, and connect all leads where indicated. Note that all components are mounted vertically. Assembly is best carried out progressively, starting at the left

1st Class Performance Quality & value



STEREOSOUND S.S10.

TRADE MARK

PRICE £18.18.0 Complete

A superior Solid State Stereophonic Amplifier with sound quality equal to more expensive equipment. Six watts output, more than adequate for normal room requirements. Ten Mullard transistors—4 x AC128, 2 x AC127, AC176 and OC75. Two LF chokes. Five controls: bass, treble, volume, balance and mains on/off. Stereo/mono switch. Stereo/mono inputs for gram, radio or tape. Input impedance 1 megohm. Input sensitivity for full output 560m/v. Bass boost 10db lift at 50c/s. Treble cut, 10db at 9k/cs. Full wave selenium bridge rectifier providing 24 volts to amplifier. Speaker outlets 15ohms impedance. Exceptional appearance in teak veneered case with aluminium facia and matching machined alloy control knobs. Printed circuit construction. Size: 13¼ x 8½ x 3½in. 200/250 volts AC. Fully guaranteed.

Stereosound

Equipment is available from all retailers, stores and hi-fi specialists. Write manufacturers for leaflets or about any supply difficulty.

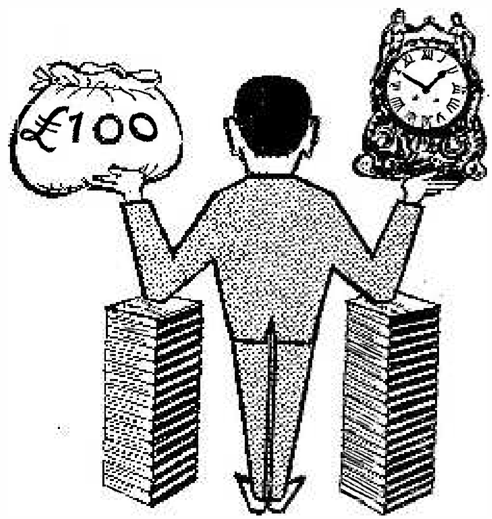
STEREOSOUND PRODUCTIONS LIMITED, Capital Works, Wakefield Road, Brighouse, Yorks. LONDON DISTRIBUTORS: Highgate Acoustics, 71/73 Great Portland Street, W.1

HOME RADIO LTD. **Dept. PW, 187 London Road, Mitcham, Surrey** *Phone* **MIT 3282**

What is your time worth per hour?

No doubt you value your time at not a penny less than *five pounds* per hour . . . but let us settle for an extremely conservative estimate of *five shillings* per hour! You could save this and much more, on your very first order to Home Radio Ltd. by using our world-famous Component Catalogue. In fact, the time and trouble this catalogue can save you is worth a fortune . . . ask the other 80,000 or so contented customers.

You can save in another way too—although the catalogue costs 7/6 plus 1/6 for post and packing, every copy contains five vouchers each worth 1/- when used as directed. Reprint No. 12, now ready, is bigger and better than ever—it lists more than 6,000 items, over 1,000 of them illustrated. Send the coupon today with your 9/- cheque or postal order.



Please write Name and Address in block capitals

NAME ....

ADDRESS..

....

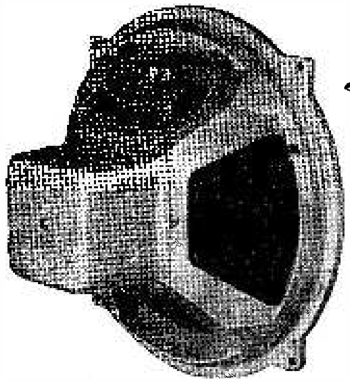
....

Home Radio Ltd., Dept. PW, London Rd., Mitcham, Surrey

WHITELEY ELECTRICAL RADIO CO. LTD.

HIGH FIDELITY SPEAKERS

Whiteley Stentorian Speakers incorporate 40 years of development in acoustic technology. Their frequency response is exceptionally wide, and their overall performance is outstanding. Few speakers can equal, and none can excel the superb reproduction of the high fidelity speakers in the Whiteley Stentorian range.



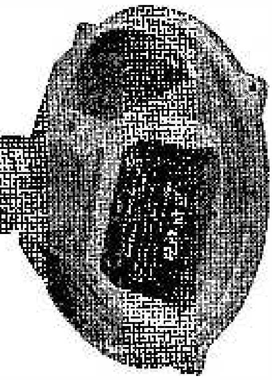
Stentorian

MODEL H.F.1016 MAJOR

10″ Die-Cast Unit, incorporating 16,000 gauss magnet system and has a 15 ohms impedance speech coil. Handling capacity 10 watts. Frequency response 30-16,000 c.p.s. Bass resonance 39 c.p.s.

PRICE: £11.8.3.

Plus P.T. surcharge of 3/4d.



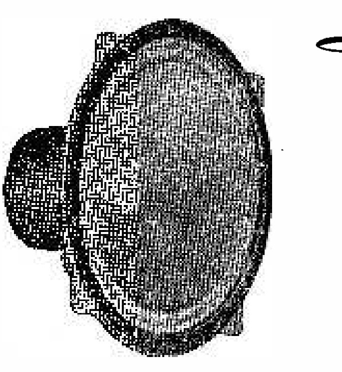
Stentorian

MODEL H.F.1012

10″ Die-Cast Unit, incorporating 12,000 gauss magnet. Handling capacity 10 watts. Frequency response 30 c.p.s. to 14,000 c.p.s. Bass resonance 35 c.p.s. Fitted with cambric cone and universal impedance speech coil providing instantaneous matching at 3, 7.5 and 15 ohms.

PRICE: £5.11.6.

Plus P.T. surcharge of 1/7d.



Stentorian

MODEL H.F.816

8″ P.M. Unit, 16,000 gauss magnet. Handling capacity 6 watts. Frequency response 50 c.p.s. to 15,000 c.p.s. Bass resonance 63 c.p.s. Fitted with cambric cone, die-cast chassis and universal impedance speech coil providing instantaneous matching at 3, 7.5 and 15 ohms.

PRICE: £7.12.6.

Plus P.T. surcharge of 2/2d.

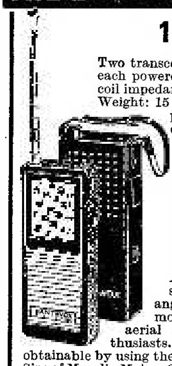
Ask your dealer for full details of the Stentorian range or write to

WHITELEY ELECTRICAL RADIO CO. LTD

MANSFIELD · NOTTS · ENGLAND Tel: Mansfield 1762/5
London Office: 109 KINGSWAY, W.C.2 Tel: HOLborn 3074

THE ELECTRONICS & SCIENTIFIC CENTRE

10 TRANSISTOR TRANSCEIVERS

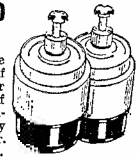


Two transceivers in modern robust cases with built-in telescopic aerials each powered by eight 1½v penlite cells. 2¼″ speakers with 8 ohm voice coil impedance, ten transistor circuit. Dimensions: 7⅝″ x 2⅝″ x 1¼″. Approx. Weight: 15 oz. Operate 5 miles. Volume controls, noise limiter switch, push to talk controls. Complete with genuine leather carrying case, earphones and shoulder straps. Today's value 30 gns.

OUR PRICE 24 GNS

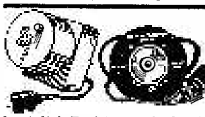
P. & P. 6/- (These cannot be operated in U.K.)

NEW 50 VOLT SERVO SYSTEM



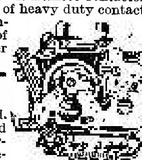
A unique offer of pair of 50v, 50 cycle servos enabling remote indication of angular position to be made. Ideal for monitoring Wind Directions, or position of aerial system for amateur broadcasting enthusiasts. It should be noted that 50v is readily obtainable by using the 200-250v tap on any mains transformer. Size of Magslip Motor: 3½″ x 7″. Cost of pair: **75/-** plus 5/- P. & P.

TIMER & REMOTE CONTACTOR



Timer: Circular panel mounting impulse operated contactor. 120 impulses drive ratchet operated cam through one revolution. Single pair of light duty contacts make every 1/4 revolution. Dial and pointer show position by means of knob on front dial. Resistance of solenoid 150 ohms, operating voltage 24. Remote Contactor: Spring motor driving heavy escapement which operates pair of heavy duty contacts at 120/min. Heater and bi-metal type thermostat provides temperature regulation. Fully suppressed. Uses: forms the basis of an impulse clock, lap counter for model cars, etc. Price **22/6** per set. Plus 5/- P. & P.

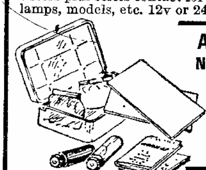
SELECTOR DRIVE



Numerous applications. Electro magnet and brass tooth wheel. A switch wafer and contacts are coupled to this and arranged to be on for 10 pulses and off for 15. An auxiliary contact is normally on butt off 1 in every 25. Complete with suppressor resistors plus series contact for continuous operation. Ideal window displays, switching lamps, models, etc. 12v or 24v D.C. Brand new and boxed. **12/6** incl. P. & P.

ANOTHER FIRST FOR LIND-AIR !

NEW EXPERIMENTAL PRINTED CIRCUIT KIT



"Etch your own" printed circuits brought within everyone's budget at only **10/6**. Etching chemicals, Copper Laminated boards plus 24, yes 24 different circuit diagrams for constructing everything from radio control receivers to metal locators and even a man/woman discriminator! The bargain of the month, **ONLY 10/6** for the kit, P. & P. 2/-. The plans are worth that alone!

MINIATURE DC MOTOR

Ideal for driving gear system or as a Tachometer. 10,900 R.P.M. at 230mA 6.3v. Black ebonite housing 1⅜″ x 1″ dia. Spindle ⅛″ x 3/64″ dia. **PRICE 9/6.** P. & P. 2/6.

CLOCK MOTORS

Synchronous, geared for 40 r.p.h. 230v 50 cycles. With mounting flanges. **OUR PRICE 29/6.** P. & P. 1/6.

FIELD TELEPHONES

Operate up to 17 miles. Built-in 100v hand generator for ringing current. 2 standard 1.5 "D" torch cells for talking current. Complete with sturdy carrying case and strap. 10″ x 8″ x 4″. Weight: 14lbs. Simple screw adjustment for use with common battery system.
PRICE £8.10.0 per pair P. & P. 10/-.
200 Yard Drums of TWIN FLEX **75/-**. Other quantities available on application.
Also: Portable hand sets operated by two 'S' cells, with hand generator in metal cases with webbing slings.
TELE-L: **PRICE 79/6** per pair. P. & P. 10/-.
TELE-F: **PRICE £6.10.0** per pair. P. & P. 10/-.

THIS MONTH'S LIND-AIR SPECIAL

MAKES THE WORLD'S SMALLEST TRANSISTOR RADIO

With this fantastic new kit. Complete with all components, printed circuit board, diagram, instructions etc. Easy to assemble and it works beautifully or you can send it back to the makers. Smaller than a matchbox, requires no external aerial or earth and gives a performance comparable to a six transistor super het. **PRICE 59/6** complete. P. & P. 2/6.
ALSO THE WORLD'S SMALLEST FM TUNER KIT. Size 3″ x 1⅝″ x ⅝″. **PRICE £5.19.6.** P. & P. 3/6 (including aerial).

SEND FOR OUR CURRENT LISTS OF TRANSISTORS DIODES ● VALVES, ETC.

MAIL YOUR ORDER TO:

LA

LIND-AIR Electronics Ltd. DEPT. PW.1.

53 TOTTENHAM COURT ROAD, LONDON W.1

LANgham 3653

MANY MORE INTERESTING BARGAINS AVAILABLE AT THE SHOP

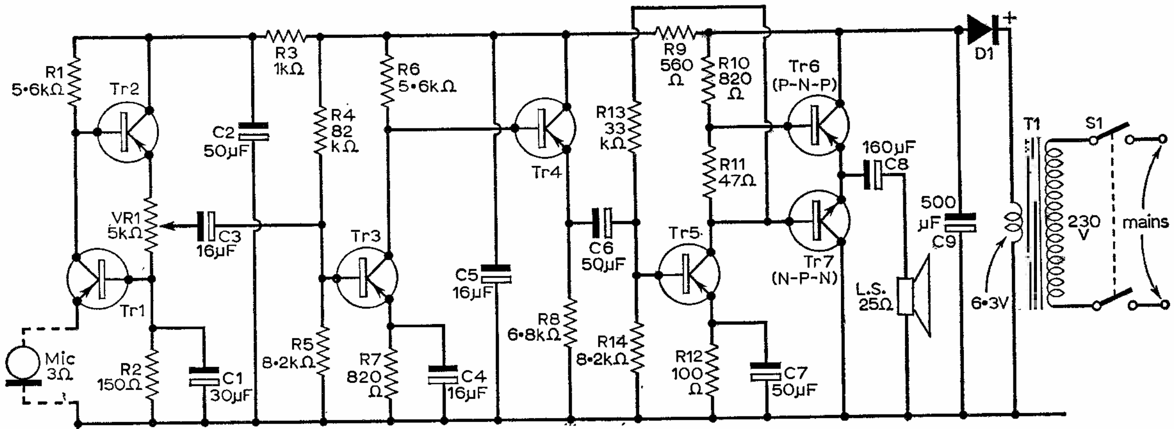


Fig 2: Circuit diagram of the alarm.

★ components list

Resistors:

R1	5·6kΩ	R6	5·6kΩ	R11	47Ω
R2	150Ω	R7	820Ω	R12	100Ω
R3	1kΩ	R8	6·8kΩ	R13	33kΩ
R4	82kΩ	R9	560Ω	R14	8·2kΩ
R5	8·2kΩ	R10	820Ω		

(all ½W 10% carbon)
VR1 5kΩ log with D.P. switch

Capacitors:

C1	30μF 6V	C4	16μF 12V	C7	50μF 12V
C2	50μF 12V	C5	16μF 12V	C8	160μF 12V
C3	16μF 12V	C6	50μF 12V	C9	500μF 25V

(all sub-min electrolytic)

Semiconductors:
Tr1, Tr5 OC71
Tr6 OC81
Tr7 NKT774 or similar n-p-n type
D1 Any small ½-wave silicon rectifier capable of passing current up to 200mA at 20 p.i.v.

Miscellaneous:
6·3V heater transformer; 3Ω moving coil speaker; 25Ω, 3in. round, moving coil speaker; Veroboard; wire; sleeving; speaker gauze; nuts; screws; control knob; etc.

hand side of the board and working through to the right. Heat shunts should be used when soldering transistors in place.

Once all wiring has been completed and a functional check carried out, drill the front panel to take the Veroboard, T1, VR1, etc. Drill the Veroboard at points 'A' and attach it to the front panel with a length of angle bracket. The front face of the front panel can be covered with a speaker gauze, securing it in place with Copydex. Bolt VR1 to the panel, and wire up as indicated. The speaker can be secured in place with Bostik, and then wired up. Finally, bolt mains transformer T1 in place, wire C9 and D1 in place and complete the rest of the wiring.

Since a low impedance 'microphone' is used, *a very long and un-screened* input lead may be used; a 20 yard input lead was used on the prototype.

The cabinet may be built from wood or metal, as preferred, but in either case corner brackets should be provided so that the front panel can be secured in place. When complete, the case can be covered with Fablon or a similar self-adhesive decorative plastic; a material with a dark wood grained finish was used on the prototype. ■

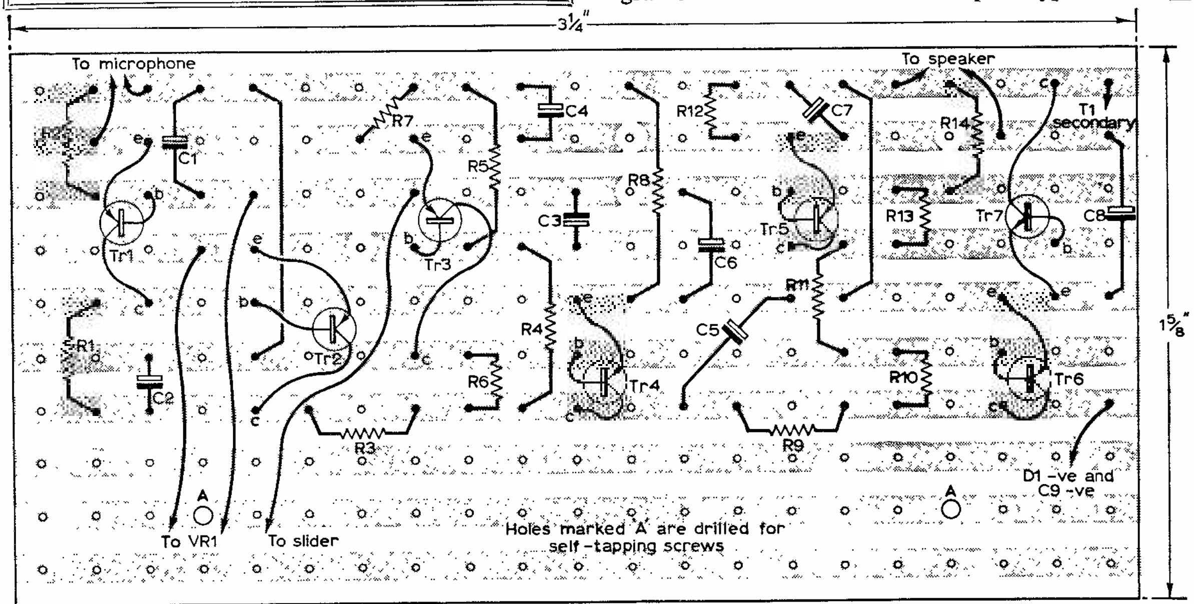


Fig. 3: Layout diagram of the Veroboard panel.

FREE NEXT MONTH!

SET OF 5 TRIMMER TOOLS

for adjusting Standard Coil Cores

Packed in handy Pochette

Also in Next Month's Issue:—

- AF and RF Transistor testers
- Converting the R1392
- Custom made dials and labels
- 3·5 Mc/s Phone Transmitter

NOVEMBER ISSUE ON SALE OCT. 6th

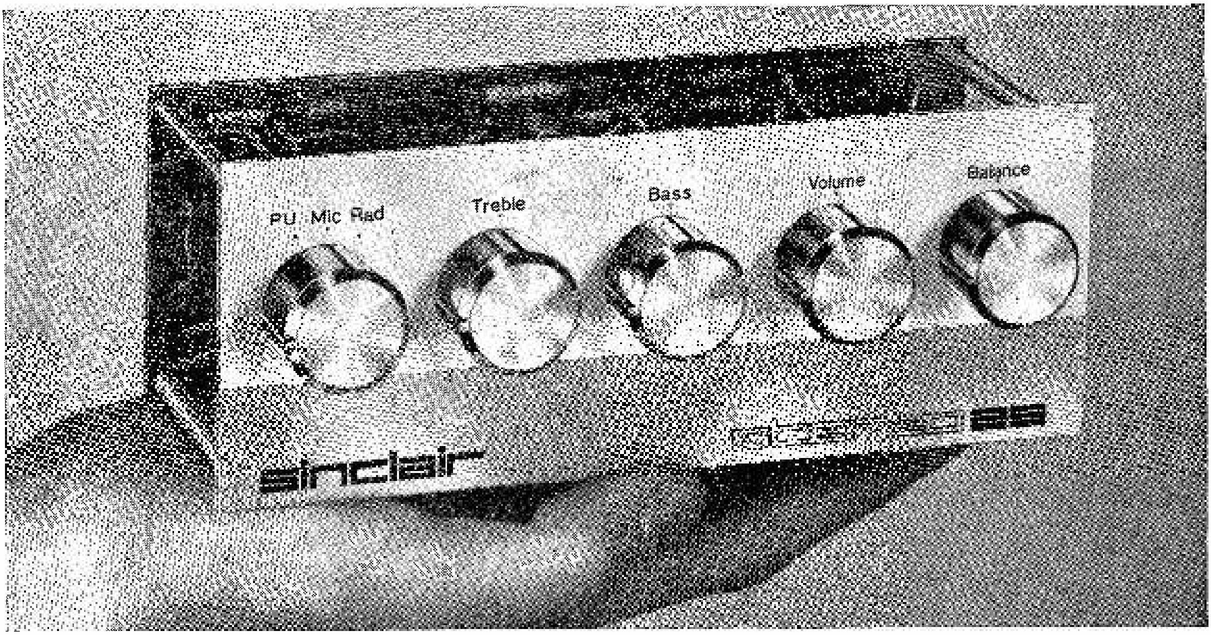
MAKE SURE OF YOUR COPY!

To . . . . (Name of Newsagent)
Please reserve/deliver PRACTICAL WIRELESS (2/6), dated November, on sale Oct. 6th and continue every month until further notice.

Name . . . .

Address . . . .

. . . . .



FOR THOSE WHO KNOW THE MEANING OF QUALITY

A Stereo pre-amp/control unit to ensure high fidelity at its best with a saving of pounds

Sinclair's newest unit, the Stereo 25 has been designed specially to obtain the very finest results used in conjunction with two Sinclair Z.12's for stereo reproduction. The best quality components, individually tested before acceptance are used in its construction, ganged controls are carefully checked for matching, whilst the overall appearance of this very compact de-luxe pre-amp control unit reflects the professional elegance which characterises all Sinclair designs. The front panel is in solid brushed and polished aluminium with beautifully styled solid aluminium knobs. Mounting and connecting the unit is simple, and the generous output of the P.Z.3 is more than enough to power the Stereo 25 together with two Z.12's for stereo. Hi-fi enthusiasts seeking the ultimate in equipment for domestic listening will find all they want from this combination of Sinclair units, and with a Micro FM to provide the radio, their installation will compare favourably with anything costing up to FOUR TIMES as much.

THE STEREO 25 MAY BE USED WITH ANY STEREO AMPLIFIER

A COMPLETE HIGH FIDELITY STEREO ASSEMBLY FOR £22.18.0

All you need is one **Stereo 25** Pre-amp Control Unit (£9.19.6). two **Z.12's** (£8.19.0) and one **PZ.3** Mains Power Supply Unit. (£3.19.6) to possess the finest possible hi-fi stereo installation. As a very desirable optional extra, you could include the **Micro FM** (£5.19.6) described on page 444 of our advertising. The overall saving to you in cash will be staggering, and you will have an installation second to none irrespective of price.

■ Technical Specification

Performance figures were obtained using the Sinclair Stereo 25 fed to two Z.12's and the entire assembly powered by a P.Z.3 Power Supply Unit.

■ **SENSITIVITY** for 10 watts into 1·5 ohms load per channel
Mic.—2 mV into 50 K ohms.
Pick-up—3 mV into 50 K ohms.
Radio—20mV into 4·7 K ohms.

■ **FREQUENCY RESPONSE** (Mic. and Radio)—25 c/s to 30 kc/s ±1dB extending to 100 kc/s ±3dB.

■ **EQUALISATION FOR P.U.**
Correct to within ±1dB on RIAA curve from 50 c/s to 20 kc/s.

■ **TONE CONTROLS**
Treble +12dB to —10dB at 10 kc/s.
Bass +15dB to —12dB at 100 c/s.

SIZE—6½ x 2½ x 2½ ins. overall, plus knobs.
FINISH—Front panel in brushed and polished solid aluminium with solid aluminium knobs. Black figuring on front panel.

Ready built, tested and guaranteed, with manual. **£9.19.6**

ORDER FORM AND MORE SINCLAIR DESIGNS WILL BE FOUND ON PAGES FOLLOWING

SINCLAIR STEREO 25
DE-LUXE PRE-AMPLIFIER AND TONE CONTROL UNIT

sinclair

SINCLAIR RADIONICS LTD., 22 NEWMARKET ROAD, CAMBRIDGE Telephone (OCA3) 52731

Comment

from around the world

AUSTRALIA

"Congratulations on your F.M. set. You certainly are the leaders in miniature electronics."
P.K., Vaucluse, N.S.W.

"The Micro-6 is tremendous and all 7 local stations here in Melbourne are easy to tune. I wish to congratulate you on your excellent design."
L.M.C., Bentleigh, Victoria.

"I've found your Micro-6 excellent. The volume is more than adequate, with fantastic tone."
S.M., Box Hill, Victoria.

JAMAICA

"The reception and sound is superb (Micro-6), and I found the instructions very clear."
R.R., Kingstown.

NEW ZEALAND

"I have received your Z.12 amplifier. I am extremely pleased with its performance, and it is well worth the cost. Thank you for your prompt delivery."
B.R.L., Howick, Auckland.

SWAZILAND

"May I congratulate you on the Micro F.M. The performance of this tiny radio has amazed friends who just cannot believe it works until demonstrated. I am roughly thirty miles from the station in mountainous terrain, and without any extra aerial a good signal is produced."
D.J.B., Mhlambanyat.

SOUTH AFRICA

"Much to my delight, the tuner (Micro FM) performs splendidly, fully justifying the modest outlay called for. The tuner picks up all the F.M. programmes. I am now anxious to purchase two Z.12 amplifiers.
P.E.R., Florida, Transvaal.

U.K.

"I am extremely pleased with the Z.12 amp. (connected to the tape head). The firm of Sinclair will always rate highly in my esteem."
B.C., Glasgow.

"The finish and general quality is very good (Micro 6). It is fantastic that a transistor radio can be so compact."
N.R.C., Bishop's Stortford.

35,000 CONSTRUCTORS CAN'T BE WRONG

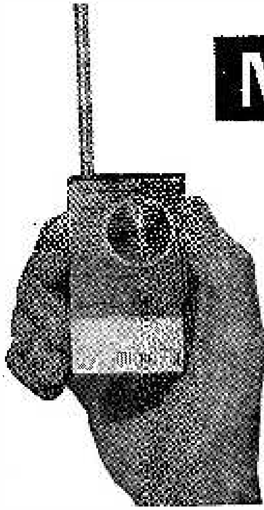
Something like thirty-five thousand Micro-6 kits have been bought and assembled by constructors ranging in experience from beginners to experts, for in size, design and performance there is just nothing like it in the world. We have simply lost count of the number of enthusiastic letters received from Micro-6 constructors for this set, together with the Micro FM, have firmly established entirely new trends in radio design which are fast becoming the things that every constructor should possess.

START BUILDING WITH SINCLAIR TO-DAY

TWO SETS THAT HAVE CHANGED THE FACE OF RADIO

MICRO FM

7 TRANSISTOR SUPERHET F.M.



WITH BRUSHED AND POLISHED ALUMINIUM FRONT PANEL AND SOLID ALUMINIUM TUNING CONTROL

The world's only combined pocket-sized F.M. Tuner and personal receiver

This unique, superbly engineered superhet FM will give you enormous satisfaction in building and using it. It is the only set in the world which can be used both as an FM tuner and as an independent FM pocket receiver just whenever you wish and its performance is fantastic used either way. Problems of alignment which have previously made it almost impossible for a constructor to complete an FM set have been completely eliminated in the Micro FM. It is ready to 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. Use it with your Z.12 assembly !

Technical Specification

THE SINCLAIR MICRO FM is a completely self-contained double-purpose F.M. superhet. It uses 7 transistors and 2 diodes. The R.F. amplifier is followed by a self-oscillating mixer and three stages of I.F. amplification which dispense with I.F. transformers and all problems of alignment. The final I.F. amplifier produces a square wave which is converted so that the original modulation is reproduced exactly. A pulse-counting discriminator ensures better audio quality. One output is for feeding to amplifier or recorder and the other enables the Micro FM to be used as an independent self-contained pocket portable. A.F.C. "locks" the programme tuned in. The telescopic aerial included is sufficient in all but the worst signal areas. Case size—$2\frac{15}{16} \times 1\frac{11}{16} \times \frac{3}{4}$in. plus aerial.

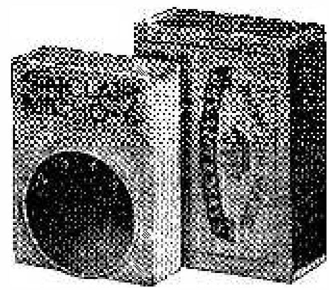
- **FASCINATING TO BUILD**
- **NO ALIGNING NECESSARY**
- **SUPER QUALITY AND SENSITIVITY**

Complete kit of parts inc. transistors, case, front panel assembly, all parts earpiece and instructions. **£5.19.6**

MICRO-6

The smallest radio set on earth

A minutely sized receiver which will slip into a waistcoat pocket without even showing. It is the smallest set in the world, yet the Micro-6 is completely self-contained including aerial and batteries and it virtually plays anywhere. Its clever six-stage circuit (2 R.F., double diode detector, 3 A.F.) ensures all you want in a radio today—power, range, quality and selectivity. A.G.C. counteracts fading from distant stations, bandspread brings in Luxembourg like a local station. There is a great pleasure to be had in building the Micro-6, and it makes a highly acceptable gift once others have seen its white, gold and black case and heard its amazing performance.



- **BUILD IT IN AN EVENING**
- **AMAZING POWER, RANGE AND SELECTIVITY**

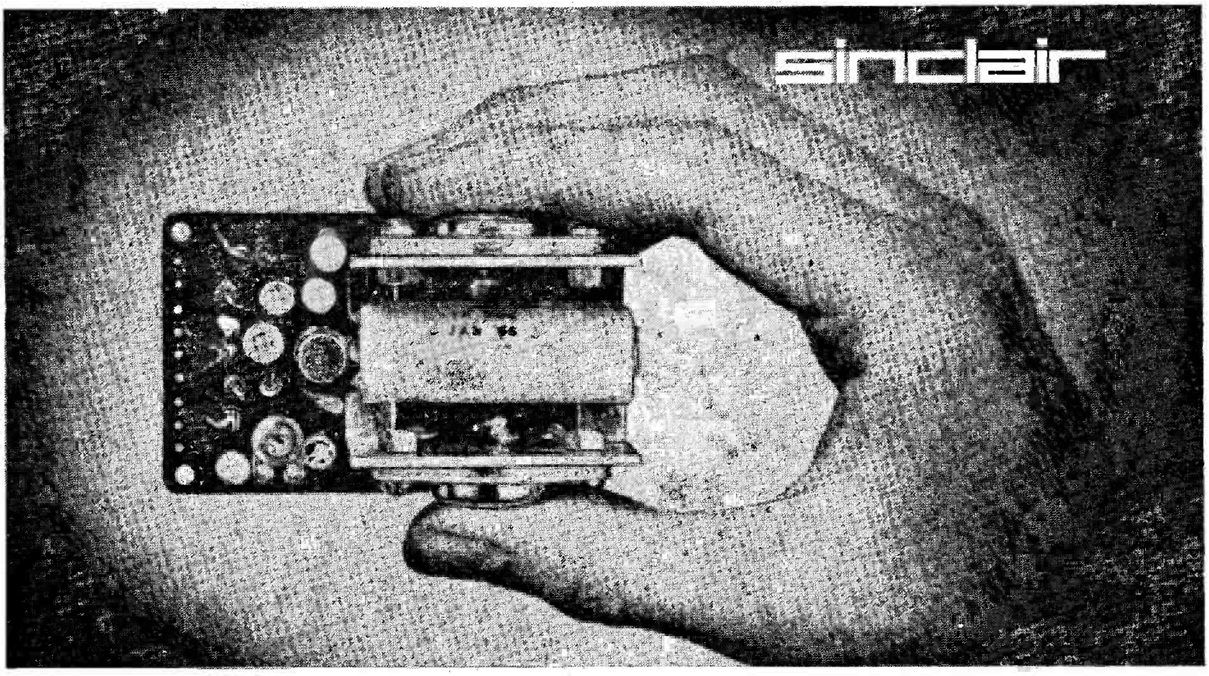
Complete kit of parts inc. transistors, case, earpiece and instructions. **59/6**

FULL SERVICE FACILITIES AVAILABLE TO ALL SINCLAIR CUSTOMERS

sinclair

SINCLAIR RADIONICS LTD, 22 Newmarket Rd., CAMBRIDGE

Telephone (OCA3) 52731

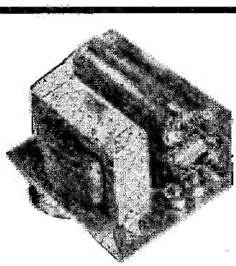


More power per square inch than any other amplifier in the world!

The Sinclair Z.12 is a powerful high fidelity amplifier of exceptional compactness complete with its own high gain pre-amplifier and ready to connect to any input. Its great power gives you an output equal to **SIX WATTS PER SQUARE INCH** of its total size—a standard of performance unsurpassed by anything in its class. And because of its size and unique circuitry, you can now use quality amplification in applications never before possible.
8 special H.F. transistors are used in a circuit in which generous negative feed back and ultra-linear class B push-pull output achieve the highest possible standards of quality ● The unit will operate from 6 to 20v. d.c., and when not using a battery, the P.Z.3 will be found ideal ● Response—15 to 50,000 c/s ± 1dB ● Input sensitivity 2mV into 2 K ohms ● Signal to noise ratio is better than 60dB and the output may be fed directly into any load from 3 to 15 ohms, or two 3 ohm speakers may be used in parallel ● The manual included with the Z.12 gives full details of matching tone and volume control circuits for mono and stereo together with multi-input switching facilities.

- SIZE—3″ x 1¾″ x 1¼″
- *FANTASTIC POWER!* 12 WATTS RMS CONTINUOUS SINE WAVE (24 W. PEAK) 15 WATTS R.M.S. MUSIC POWER (30 W. PEAK)
- REQUIRES FROM 6 TO 20V.
- FOR HI-FI, RADIO TUNER, ELECTRIC GUITAR, P.A. ETC.
- HI-FI PERFORMANCE AT A FRACTION OF THE USUAL COST

sinclair Z.12 combined 12 watt hi-fi amplifier and pre-amp



SINCLAIR P.Z.3 POWER SUPPLY UNIT

This is an entirely new design using original circuitry based on advanced transistorised techniques to achieve phenomenally good smoothing, thus assuring ideal operating conditions for the Z.12 for which it was designed. Ripple is a barely measurable 0.05V. The PZ.3 will power two Z.12's and the Stereo 25 with ease. For A.C. mains, 200/250V. 50-60 c/s. **79/6**

Ready-built, tested and guaranteed, with Z.12 manual

89/6

Guarantee

Should you not be completely satisfied with your purchase when you receive it from us, your money will be refunded in full and at once without question.

STEREO 25 de luxe pre-amp and control unit See page 443

If you prefer not to cut coupon from page, please mention P.W.10 when writing your order.

ORDER FORM

To SINCLAIR RADIONICS LTD.
22 NEWMARKET ROAD, CAMBRIDGE

Please send.....................
....
....
for which I enclose
....
CASH/CHEQUE/MONEY ORDER
for £ s. d.
NAME ....
ADDRESS ....
.... P.W.10

Practical Wireless Classified Advertisements

The pre-paid rate for classified advertisements is 1/6d. per word (minimum order 18/-), box number 1/6d. extra. Semi-displayed setting £4. 12s. 6d. per single column inch. All cheques, postal orders, etc., to be made payable to PRACTICAL WIRELESS and crossed "Lloyds Bank Ltd." Treasury notes should always be sent *registered post*. Advertisements, together with remittance, should be sent to the Advertisement Manager, PRACTICAL WIRELESS, George Newnes Ltd., Tower House, Southampton Street, London, WC2, for insertion in the next available issue.

SITUATIONS VACANT

A.M.I.Mech.E., A.M.I.E.R.E., City and Guilds G.C.E., etc. Become a Technician or Technologist for high pay and security. Thousands of passes. For details of Exams and Courses in all branches of Engineering, Building, Electronics, etc., write for 156-page handbook—FREE. B.I.E.T. (Dept. 169K), London, W.8.

ROMSEY, Hants. Van Driver with Technical interest, wishing to learn or improve repairing ability, required by Radio & Television Engineer. Box No. 63.

RADIO AND TV Exam. and Courses by Britain's finest Home-study School. Coaching for Brit.I.R.E., City and Guilds Amateur's Licence, R.T.E.B., P.M.G. Cert., etc. FREE brochure from BRITISH NATIONAL RADIO SCHOOL, Russell Street, Reading.

SERVICE ENGINEERS. Due to re-organisation and expansion vacancies exist for a number of Radio and Tape Recorder Engineers in the Service Department. A varied range of equipment is handled which will offer plenty of scope for experienced men to use their knowledge and initiative. Good starting rates are offered to suitable applicants who will progress to Staff status.
Apply: Service Manager, ELIZABETHAN ELECTRONICS LIMITED, Bridge Close, Romford, Essex.

TV AND RADIO: A.M.I.E.R.E., City and Guilds R.T.E.B. Cert., etc., on "Satisfaction or refund of fee" terms. Thousands of passes. For details of Exams. and Home-training Courses (including practical apparatus) in all branches of Radio, TV and Electronics, write for 156-page handbook—FREE. B.I.E.T. (Dept. 137K), 29 Wright's Lane, London, W.8.

RADIO TECHNICIANS

A number of suitably qualified candidates will be required for training, leading to permanent and pensionable employment. (In various parts of the UK, including London, but primarily Cheltenham. Also opportunities for service abroad.)

Applicants must be 19 or over and be familiar with the use of Test Gear and have had Radio/Electronic workshop experience. They must offer at least "O" level GCE passes in English Language, Maths and/or Physics, or hold the City and Guilds Telecommunications Technician Intermediate Certificate or equivalent technical qualifications.

Pay according to age, e.g. at 19 £747, at 25 £962 (highest age pay on entry) rising by four annual increments to £1,104.

Prospects of promotion to grades in salary range £1,032-£1,691. There are few posts carrying higher salaries.

Annual Leave allowance of 3 weeks 3 days, rising to 4 weeks 2 days.

Normal Civil Service sick leave regulations apply.

Apply
Recruitment Officer (RT 54)
Government Communications Headquarters
Oakley, Priors Road
CHELTENHAM, Glos.

Transistor Radio Service Engineers

can earn £20 plus per week

Applicants must have practical experience in all types of Transistor Receivers

write or phone for appointment to

Mr. H. Gee
Perdio Products Limited
Lowther Road
Stanmore Middlesex

Telephone Wordsworth 0020

SERVICE SHEETS

SERVICE SHEETS for all makes, Radio, T/V, Tape Recorders, 1925-1966. Prices from 1/-. Catalogue 6,000 models 2/6d. Free fault-finding guide with all Sheets. All types of valves, components, books, S.A.E. lists. Please send stamped addressed envelope with all orders/enquiries. HAMILTON RADIO, Western Road, St. Leonards, Sussex.

SERVICE SHEETS, Radio and Television, 4/- post paid. VEST AND EMERY, 17 Hallgarth Street, Durham.

SERVICE SHEETS, Radio TV, 5,000 models. List 1/-. S.A.E. inquiries. TELRAY, 11 Maudland Bank, Preston.

SERVICE SHEETS (75,000), 4/- each. Callers welcome. Always open. 5 South Street, Oakenshaw, Bradford.

SERVICE SHEETS

4/- each, plus postage

We have the largest display of Service Sheets for all makes and types of Radios and Televisions, etc., in the country. Speedy service.
To obtain the Service Sheet you require please complete the attached coupon.

Name: ....

Address: ....

....

....

To: **S.P. DISTRIBUTORS**
44 Old Bond Street, London, W.1

Please supply Service Sheets for the following:

Make: ....
Model No. .... Radio/TV

Make: ....
Model No. .... Radio/TV

Make: ....
Model No. .... Radio/TV

I require the new **1966** List of Service Sheets at **1/6** each plus postage.

(*please delete items not applicable*)

I enclose remittance of ....
(which includes postage)

MAIL ORDERS ONLY (Oct.) PW

NO WAITING. Service Sheets for all makes of Radio and TV despatched by return post. 4/- each and S.A.E. GRIMSDYKE RADIO, 77 Merion Avenue, Stanmore, Mddx.

RECEIVERS & COMPONENTS

SILICON TRANSISTORS, ultra high gain, NPN, 25V, ß400-800, 2N3390 at 7/6. Economy multipurpose 15V, NPN at 2/9. 5 x 2½in. Veroboard 5/-. ELECTROVALUE, 6 Mansfield Place, Ascot, Berkshire.

BUMPER BARGAIN PACKS ! !

A Transistors (all sorts, mainly Ge)
B Diodes (zener, rectifier, signal)
C Resistors (mainly carbon 100mW–1W)
D Capacitors (all sorts 1p–1000u)
E Pot Luck (All useful brand new stuff)

One pack **10/-** Two packs **18/-** Post. paid.
No Rubbish. **Money-Back Guarantee**

J. C. WOODWARD
94 Great Brickkiln Street, Wolverhampton

"HEATHKITS" can now be seen in London and purchased on easy terms. Free brochure. DIRECT TV REPLACEMENTS LTD., Dept. PW7-9, 126 Hamilton Road, West Norwood, S.E.27. GIPsy Hill 6166.

TRANSISTORS, UNMARKED, UNTESTED, 40 for **10/-**, p. and p. 1/-, 4 packets post free. Relays, thousands of types, special catalogue free. General catalogue of Mechanical and Electrical Gear, Tools, etc. (5,000 items), free. K. R. WHISTON (Dept. PRW), New Mills, Stockport.

---

31 Set WTs, complete with 15 valves and 2 crystals. Operate up to 48 MEG tunable with circuit and details. **25/-** each. Part post 5/-.
Spare Set Valves and Crystals, **12/6.**
Chassis less valves, **12/6.** P. & P. 5/-.
No other spares available.
Assorted High Stab Resistors, **7/6,** 100.
Assorted Syflex P.F. Condensers, **7/6,** 100.
Paxolin Sheet, 1/16" x 12" x 12", **3/-.**
Thin Paxolin Sheet, approx. 1/64" x 12" x 12", 6 sheets for **5/-.**
White Plastic Sheet, approx. 1/32" x 6½" x 24". Suitable dials, insulation, case fronts, etc. 4 sheets for **5/-.**
Small E.M. Counters, 5 digit, 500 ohm, **6/6.**
Bulgin Extra Sensitive Micro Switch, **5/-.**
P.O. Relay 2000 ohm, 1B, **5/-, 1M,** 1B **6/-.**
Key Switches, 4 pole, 2 throw, **3/6.** 3 position DP+DP centre off, **5/-.** 3 c/o+4 c/o centre off, **6/-.** DP+DP 2 for **5/-.**
Plessey Plugs and Sockets, 12 way, **3/-** pr. 6 way, **5/-** pr.
6 or 12 way screened cable to match, **3/-** yd. Breast Mike, **6/-.** Carbon Inserts, **1/6.**
Power Pack and L.F. Amplifier for 38 Set, **15/-.**
Battery Ever-Ready, 90v+7½v, **4/6,** 12 for **30/-.**
Small Component Boxes, **12/6,** for 60 samples **6d.**
Mμ Metal Screen for 5μP7 with fittings **6/6.**
250mA Fuses 1¼" x ¼", **5/-,** 100.
100 volt Hand Generator, **7/6.**
Valves New Boxed 6V6, **4/6.** EF91, **3/-.** 6AL5, **3/-.**
Rheostat WW Rotary, 15 ohms, 3.6 amp, **12/6.**
Details of Instrument Case Assembly. Free, send large addressed envelope.
Elac Speakers, 5", **5/-.** 7" x 4", **7/-.** 8", **8/-.**
Terms Cash with Order. Post **2/-** on orders under 20/-.
Rotary Transformer. Input 12 volts, output 250v at 125mA, **9/-.**
Rotary Transformer. Input 12 volts, output 490v at 65mA, **9/-.**
Seimens H.S. Sealed Relay. One c/o, 1700+1700 ohms, **6/-.**
Rotary Transformer. 12v. input, 300v output, at 0.2 amp., **35/-.**
Elephantide Insulation Board, 4 pieces, 12" x 12" **5/-.**
Thin Ebonite Insulation Board, 12" x 12", 4 sheets for **5/-.**
Modern lightweight Breast Mikes, Polythene fittings. New, **7/6,** spare insert **2/6.**
Ebonite Tube, 7/16" OD x 12", 5 for **4/-.**

E. R. NICHOLLS

Mail Order and Retail Shop
46 LOWFIELD ROAD
Off SHAW HEATH, STOCKPORT
CHESHIRE

NEW — BIGGER — BETTER
"EXPERIMENTAL"

PRINTED CIRCUIT KIT

(1) 2 Copper Laminate Boards 4¼ x 2½in.
(2) 1 Board for Matchbox Radio.
(3) 1 Board for Wrist-Watch Radio, etc.
(4) Resist. (5) Etchant. (6) Resist Solvent.
(7) Cleanser/Degreaser. (8) 16-page booklet.

PRINTED CIRCUITS FOR AMATEURS

containing full etching instructions

(9) 2 Miniature Radio Dials SW/MW/LW. also free with each kit. (10) Circuits and Plans of easy-to-build transistorised

30 SUGGESTED PROJECTS

which you can build with your own components on a chassis made from this kit. Drawings. Photographs. Many recently developed very efficient designs you probably haven't heard of yet. (1) Crystal set with biased detector. (2) Crystal set with voltage-quadrupler detector. (3) Crystal set with dynamic loudspeaker. (4) Crystal tuner with audio amplifier. (5) Carrier Power Conversion Receiver. (6) Split-Load Neutralised Double Reflex. (7) Matchbox or Photocell Radio. (8) "TRIFLEXON" Triple Reflex with self-adjusting regeneration (Patent Pending). (9) Solar Battery Loudspeaker Radio.

3 SUBMINIATURE RADIO RECEIVERS

The smallest 3 designs yet offered to the Home Constructor anywhere in the World. Based on the "Triflexon" circuit. Let us know if you know of a smaller design published anywhere. (10) Postage-Stamp Radio. Size only 1.62 x .95 x .25in. (11) Wrist-watch Radio, 1.15 x .80 x .55in. (12) Ring-Radio, .70 x .70 x .55 in. (13) Bacteria-powered Radio. Runs on sugar or bread. (14) Radio Control Receiver. (15) Transistor P/P amplifier. (16) Intercom. (17) 1-valve amplifier. (18) Reliable Burglar Alarm. (19) Light-Seeking Animal. Guided Missile. (20) "Perpetual Motion" Machine, Atmospheric Engine. (21) Metal Detector. (22) Simple Transistor Tester. (23) Human Body Radiation Detector. (24) Electronic Man/Woman Discriminator. Thermal Proximity Fuse. (25) Pocket Signal Injector. (26) Pocket Transceiver (Licence Required). (27) Constant volume Intercom. (28) Remote Control of Models by Induction. (29) Inductive Loop Transmitter. (30) Pocket Triple Reflex 6-transistor sensitive receiver with transformer-less push-pull output.

P.C. Kit Price **8/6.** Post and Packing 1/6.
Extra Laminate Board available.

STOP PRESS !

PHOTOELECTRIC
PRINTED CIRCUIT KIT

Build 10 EXCITING PHOTOELECTRIC DEVICES

on a Printed Circuit Chassis. Basic Kit: **39/6.** Post and Packing 2/6. Contents: 2 Copper Laminate Boards and all chemicals required. Etching Manual. Latching Relay and Bracket. Infra-red sensitive Photocell and Hood. 2 high-gain Transistors. Resistors, cond. Terminal Block. Elegant Plastic Case. Essential Data, Circuits and P.C. chassis plans of

10 PHOTOELECTRIC PROJECTS

(1) Simple Photo-switch. (2) Modulated Light Alarm. (3) Long-Range Stray-Light Alarm. (4) Relay-less Alarm. (5) Warbling Tone Electronic Alarm. (6) Closed-Loop Alarm. (7) Projector Lamp Stabiliser. (8) Electronic Projector Modulator. (9) Mains Power Supply Unit. (10) Car Parking Light Controller. BASIC KIT enables you to build an efficient unmodulated light Photo-Switch/Burglar Alarm, Counter etc. (Project No. 1) which can be modified for modulated light operation by the addition of a few extra components obtainable separately. (No. 2, 3.)

OPTICAL KIT

2 lenses, 2 mirrors, Infra-Red Filter Low-consumption bulb and holder (for Projects No. 8 and 9). Plans for making straight and folded-beam Projectors and Photocell Receivers. Details of home-made long-life batteries for B/A Projectors etc., etc. Price **19/6.** Post and Packing 1/6.

"YORK ELECTRICS"
181a YORK ROAD, LONDON, S.W.11
Send S.A.E. for details and photographs

RECEIVERS & COMPONENTS
(continued)

BI-PAK SEMICONDUCTORS
8 RADNOR HOUSE
93/97 REGENT STREET
LONDON, W.1

LOW COST SILICON CONTROLLED RECTIFIERS
50 PIV 1 amp, **8/6** 400 PIV 7 Amp, **30/-**
100 PIV 7 Amp, **10/6** 100 PIV 16 Amp, **16/6**
Free Circuit Diagrams with SCR orders.

FREE One 10/- Pack of your own choice with orders valued £4 or over. **FREE**

50 Trans. mixed untested	10/-
3 OC139 Trans. NPN Mullard	10/-
2 Drift Trans. 2N1225 100 M/cs	10/-
6 Matched Trans. OC44/45/81/81D	10/-
4 OA10 Diodes Mullard	10/-
15 Red Spot AF Trans. PNP	10/-
15 White Spot RF Trans. PNP	10/-
4 Sil. Rects. 3A, 100/400 PIV	10/-
4 NPN Trans. OC139, 2N1308	10/-
2 10 Amp Sil. Rect. 50/100 PIV	10/-
8 Diodes 4 OA70, 4 OA79	10/-
1 12 Amp SCR 100 PIV	10/-
3 Sil. Trans. 2S303 PNP	10/-
10 Assorted Computer Diodes	10/-
4 Zeners 5, 6·8, 10, 12 Volts	10/-
4 2G417 Trans. Eqvt. AF116/7	10/-
2 200 M/cs Sil. Trans. BSY26/7	10/-
2 Bi-directional Trans. ASY66	10/-
4 High Current Trans. OC42	10/-
2 Power Trans. OC26/35	10/-
5 Sil. Rects. 400 PIV 250mA	10/-
3 OC71 Trans. Mullard	10/-
3 OC75 Trans. Mullard	10/-
3 NPN Sil. Trans. 70 Mc/s	10/-
1 Power Trans. OC20 100 Volts	10/-
5 OA47 Gold Bonded Diodes	10/-
4 OA202 Sil. Diodes Sub-Min.	10/-
8 OA81 Diodes Sub-Min.	10/-
3 Sil. Rects. 400 PIV 500mA	10/-
Tunnel Diodes IN3720	15/-
Unijunction Trans. 2N2646	15/-
6 BY100 Sil. Rects.	20/-

100s of semiconductor bargains incl. **Logic Modules** send 2/6 for 3 months mailing. **Add** 1/- p. & packing per order. CASH WITH ORDER PLEASE. MAIL ONLY.

TRANSISTORS, ETC.

OC71, OC72, OC44, OC45, OC81, OC81D, **3/-** each. OC83, **6/-**+4d. P.P. Any quantity AF116, AF117, **3/6** each. AF114, AF115, **4/-** each. BY100 800v. at 550 m/a, **5/-** each. Sil. rec. 800v. at 400 m/a, **4/-** each. 4 for **12/6.** OC26, **7/6.** 1 OC44+2 OC45+1 OC81D+1 OA81+2 OC81, **12/6**+4d. P.P.

AC126, **8/-.** ASY28, **8/6.** AF186 cut of freq. 800 M/cs. **27/6** each. Texas GM290, cut of freq., 700 Mc/s, **19/6** each, BYZ13 Silicon Rectifiers, 200 P.I.V., 6 amps, **5/4** each. ORP12, **7/9** each. ORP60, **7/9** each.

ZENER DIODES

Voltage (Max)	Zener Current (Max)	Power Dissipation (Max)
4.1v	50 M/A	300MW
4.5v	50 M/A	300MW
9.5v	45 M/A	300MW
4.9v	250 M/A	1.5W
5.4v	250 M/A	1.5W
	All 3/6 each	
25.5v	55 M/A	1.5W
31.6v	45 M/A	1.5W
37.8v	30 M/A	1.5W
45.2v	30 M/A	1.5W

BYZ15 200 P.I.V. 40 amps., **£2.17.0d.** each.
OA81, **1/6** each. OA90, **1/6** each. OA10, **2/6** each.
Plus 4d. P.P. Mullard OAZ207 Zener 9.1 volt 260 m/w, **10/6.**

TEXAS TRANSISTORS

2N1302=ASY28, **6/6** each.
2G302=GET872, **7/6** each.
2G301=GET873, **6/6** each.
2S301 Audio, **3/-** each.

MAT TRANSISTORS

MAT 100, **7/9** MAT 120, **7/9**
MAT 101 MAT 121, **8/6**
S.T.C. BSY 95A Sil Planer, **10/6** each.
LF60 Erase Head, **£2.10.0d.**

Radio, Television Industrial Tube, Diode and Transistor Equivalents Manual, **10/6d.** + 6d. P.P.
BTY-79-400R Thyristor **£1.16.9.**

J. ROBINSON (RADIO & TV)
4, Highcliffe Road, Blackley
Manchester 9
Mail Order only

RECEIVERS & COMPONENTS
(continued)

R & R RADIO & TV SERVICE

Dept. P.W.
MARKET STREET, BACUP, LANCS.
Telephone 465

SALVAGE VALVES Tested before despatch

6F13	4/6	U329	5/-	PL36	6/-	20P4	6/6
6L18	4/6	10P14	5/-	PL82	3/6	30P16	5/-
EF80	1/6	20P5	6/6	U801	7/6	PCC84	4/-
ECC82	3/-	30P	7/-	10F1	1/6	PY81	3/6
ECL80	3/6	6F15	5/-	20F2	5/3	U301	6/-
30F5	5/-	EB91	1/-	30FL1	5/-	10P13	5/6
PL38	6/-	EF85	5/-	PY32	6/-	20D1	2/-
PCF80	4/-	6/30L2	4/-	6U4GT	5/-	30P12	5/-
PL81	5/-	20P3	6/-	6F1	2/6	PY83	5/-
PZ30	5/-	30PL1	4/-	EY86	4/-		

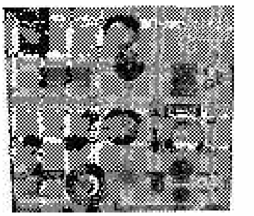
Speakers. Ex.TV. 5in. round 6 x 4in., **3/6**; 8in. round **6/-**; post 2/-.

Line Output Transformers available. State set model No.

Turret Tuners, 8/-, post 2/-.

Scan Coils, etc. Quote set model No. with all enquiries and S.A.E. for prompt reply. All goods subject to satisfaction or money refunded.

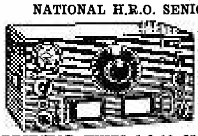
MARCONI CANADIAN RECEIVER No. 52



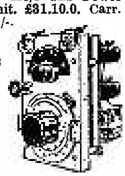
Shipping Amateur, & Broadcast. Magnificent 10-valve receiver in three switched wavebands covering 1.75-16 Mc/s (19 - 170 metres), plus 3 valve crystal calibrator, employing dual crystal to provide marker check at 10-100-1000 kc/s. One RF and two IF stages. Other refinements: valve, HT, and Signal check meter. Internal 3in. speaker and two H/Phone outputs with switched control. FR-AF Gain, Noise Limiter, Filter, BFO, Heterodyne pitch control. Wide and Narrow Bandwidth Man. or AVC on CW & RT. Fast and Slow tuning with lock. Additional OSC Tuning (plus & minus). Size 15 x 14 x 12in. Fully tested and working. A.C. Mains 200/240v. **£14.** Carr. £1.

No. 52 GROUND-STATION comprising **Receiver, Transmitter** and 12v. **D.C. Power Unit, £27.10.0.** Carr. £2.10.0. (Mainland only).

NATIONAL H.R.O. SENIOR RECEIVERS 5T MODEL

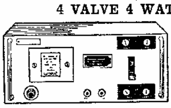


In excellent tested condition. **Complete with 9 coils 50 Kc/s-30 Mc/s and Power Unit. £31.10.0.** Carr. 30/-.



REJECTOR UNITS 1.2-10 Mc/s Switched, 4 ranges. Primarily designed as station rejector for R.C. Suitable for harmonic suppression and many other uses with slight alteration. Tuning dial with lock. Aerial in and out sockets. Brand New **25/-**. P. & P. 5/-.

4 VALVE 4 WATT AMPLIFIER



"C" Core transformers A.C. Mains 110/230 volts 600 ohms of high impedance input. Output 3 or 600 ohms (state choice) Controls: On/Off switch Gain control. Indicator light. Valve inspection panel. 19 x 7 x 7in. Brand New in maker's carton, **79/6**, Carr. **10/-**.

TELESCOPIC AERIAL MASTS. Tubular steel copperised, spray finish, ring cam locking on each section provides for full or any height required. Suitable all fixings and base locations. Bottom section 1¾in. diameter, 20ft. (4 section). Closed 5ft. 9in. Weight 16lb. **55/-**, Carr. 5/-. 34ft. (6 section). Closed 6ft. 6in. Weight 20lb. **75/-**, Carr. 5/-. Further height by adding 3-4ft. Whip sections **13/6**, Carr. **4/-**. Special price for quantities.

ROTARY TRANSFORMER. 12v. D.C. input, 250v. D.C. output at 125 mA. Size 3½ x 5½in. Brand new **17/6**. P. & P. 5/-. Many other types.

R.F. ANTENNA TUNER (A.T.U.) Calibrated scale, ideal 160/80/40 metres. Limited number only. Brand new with instructions, **17/6**. P. & P. 7/6.

Complete list of other bargains. 1/-.
S.A.E. all enquiries. Credit Terms Available.

A. J. THOMPSON (Dept. P.W.)
"EILING LODGE", CODICOTE, HITCHIN, HERTS.
Phone: CODICOTE 242

RECEIVERS & COMPONENTS
(continued)

CQ ALL HAMS. 3 gang 500 pf tuning capacitors new and boxed **8/6**. Number 10 moving coil headphones and mike, new **15/-**. Number 19 morse keys **7/6**. Dynamotors 24 Volts in 170 or 350 out dimensions 5 x 3 inches **9/6**. 0–500Ua meters **6/-**. Head phones with throat mikes **12/6**. 100 assorted capacitors **7/6**. 100 assorted resistors some hi-stab **6/-**. S.A.E. for lists. G. WEBSTER (ELECTRICAL), 9a Greyfriars Road, Coleham, Shrewsbury, Shropshire.

TAPE RECORDERS, TAPES, Etc.

TAPES TO DISC — using finest professional equipment 45 rpm—**18/-**. S.A.E. leaflet. DEROY, High Bank, Hawk Street, Carnforth, Lancs.

AMPEX SERIES 600 Professional Recording Tape. Type 641. 1,800ft. Mylar on 7in. spool. Complete with leader. Brand new in maker's boxes. Usual price £3. Limited quantity available at **67/-** for two spools, P. and P. 2/- (or 37/- singly, P. & P. 1/6). E. C. KINGSLEY & Co., 93 Tottenham Court Road, London W.1. EUSton 6500.

FOR SALE

HAMMERITE HAMMER PATTERN BRUSH PAINT FOR PANELS, METALWORK

3/6 TIN ● JUST BRUSH ON ●
WITHSTANDS 150°C, OIL, WATER ETC.

2½ oz. tins	**3/6**	½ gallon......	**35/-***
½ pint	**7/6**	1 gallon	**58/-***
1 pint	**15/-**	(* sent by road)	

Carriage: Orders up to **5/-**, 9d.; up to **10/-**, 1/9; over **10/-**, 2/9. Colours: blue, silver, black or bronze. Return of post service, Monday to Friday.

From your component shop or direct from the manufacturer:

FINNIGAN SPECIALITY PAINTS (PW)
Mickley Square, Stocksfield, Northumberland.
Tel. Stocksfield 2280.

FOR SALE. 10,000 small 2-pole change-over relays, contacts rated at 5 amps, 250V DC, suitable for operation from mains voltages. The relays, brand new and unused, are the product of a reputable British relay manufacturer. Box No. 64.

ELECTRIC SOLDERING-IRON

FANTASTIC BARGAIN OFFER

Lightweight Pistol Grip handle 40 watt. 240/250v. A.C. Detachable handle forms cover for iron when not in use. With 4½ft. Safety 3-core flex. Indispensable for every home handy-man. A boon to model makers and a necessity for every wireless enthusiast. Offered to you at this new amazing price.

ONLY **10/-** Post Free

C. H. SERVICE (Dept P.W.)
Lusted Hall Lane, Tatsfield, Kent.

FOR SALE
(continued)

MORSE MADE EASY !

The Famous RHYTHM RECORDED COURSE cuts the practice time down to an absolute minimum.

One student, aged 20, took only 13 DAYS, and another, aged 69, took under a week to read 18 wpm. If you wish to read Morse easily and naturally please enclose 8d. in stamps or two international reply coupons for full explanatory leaflet to:

G3CHS, 45 Green Lane, Purley, Surrey.

ADHESIVE STRIP LABELS. ⅜″ embossed Glossy. P.V.C. various colours. 1½d. letter. C.W.O. & S.A.E. to:—MR. BROWN, 1 Effie Place, London, S.W.6.

SPECIAL OFFER
GEVAERT TAPE. New, Boxed, 5¾, 600ft. with Stop and Leader Tapes, 9/- or 6 for 50/-, post paid.
GRUNDIG MA1. 2 Transistor Pre-amps for Tape Monitoring or Microphone Boosters, 57/6, post paid.
LIST PRICE 4 GNS.
LEE ELECTRONICS
400 Edgware Road, Paddington 5521
Send for Free Lists and details of above

TRANSISTORS
SPECIAL OFFER

1 watt S.T.C. 300 mc/s N.P.N. Silicon Planar, Transistors limited stocks £1 for 6.
WITH DATA

3/- each. OC44, OC45, OC70, OC71, OC81, OC81D, OC200, GET16, GET20.

4/- each. AF114, AF115, AF116, AF117, OC170, OC171.

5/- each. OC139, OC140, GET7, GET8, GET9, XC141, BY100, OA211.

ZENER DIODES
All volts between 3.9v. and 26v. ¼w **3/6** each, 1.5w **5/-** each, 7w **6/-** each.

Send 6d. for full lists:—
inc., S.C.R., Zeners.

CURSONS
78 BROAD STREET
CANTERBURY, KENT

YUKAN SELF-SPRAY

GET THIS AIR DRYING
HAMMER FINISH *NOW!*
So professional—the YUKAN aerosol way!

YUKAN Aerosol spraykit contains 16 ozs. fine quality, durable, easy instant spray. No stove baking required. Available in Grey, Blue, Gold, Bronze at **14/11** at our counter, or **15/11** carriage paid, per push button self-spray can. SPECIAL OFFER: 1 can plus optional transferable snap-on trigger handle (value 5/-) for **18/11**, carr. paid. Choice of 13 self-spray plain colours and primer (motor car quality) also available. Please enclose cheque or P.O. for total amount to:

YUKAN Dept. P.W.10 307a Edgware Road, London W.2 (Open all day Saturday, Closed Thurs. afternoon).

WANTED

VALVES WANTED, brand new popular types boxed. DURHAM SUPPLIES (C), 175, Durham Road, Bradford 8, Yorkshire.

WE BUY New Valves and Transistors. State price. A.D.A. MANUFACTURING CO., 116 Alfreton Road, Nottingham.

DAMAGED AVO METERS wanted. Models 7 and 8. Any condition. Any quantity. HUGGETTS LTD., 2-4 Pawson's Road, West Croydon.

WANTED *NEW* VALVES ONLY

Must be new and boxed
Payment by return

WILLIAM CARVIS LTD
103 North Street, Leeds 7

WANTED: Popular Brand New Valves. R.H.S. Stamford House, 538 Great Horton Road, Bradford 7.

WE BUY New Valves for cash, large or small quantities, old types or the latest by return. Send details. Quotations by return. WALTON'S WIRELESS STORES, 15 Church Street, Wolverhampton.

BOOKS & PUBLICATIONS

SURPLUS HANDBOOKS

19 set Circuit and Notes	4/6 p/p 6d.
1155 set Circuit and Notes	4/6 p/p 6d.
H.R.O. Technical Instructions	3/6 p/p 6d.
38 set Technical Instructions	3/6 p/p 6d.
46 set Working Instructions	3/6 p/p 6d.
88 set Technical Instructions	5/- p/p 6d.
BC.221 Circuit and Notes	3/6 p/p 6d.
Wavemeter Class D Tech. Instructions	3/6 p/p 6d.
18 set Circuit and Notes	3/6 p/p 6d.
BC.1000 (31 set) Circuit and Notes	3/6 p/p 6d.
CR.100/B.28 Circuit and Notes	8/6 p/p 9d.
R.107 Circuit and Notes	5/- p/p 6d.
AR.88D Instruction Manual	15/- p/p 1/6
62 set Circuit and Notes	4/6 p/p 6d.

Circuit Diagrams 3/- each post free. R.1116/A, R.1224/A, R.1355, R.F. 24, 25 and 26, A.1134, T.1154 (all models), BC.312, BC.342, BC.348J, BC.348 (E.M.P.), BC.624.

Resistor colour code indicator, **1/6** p/p 6d.

S.A.E. with all enquiries please.
Postage rates apply to U.K. only.

Mail order only to:

INSTRUCTIONAL HANDBOOK SUPPLIES

DEPT. PW, TALBOT HOUSE, 28 TALBOT GARDENS, LEEDS 8

SOUND RECORDINGS

A UNIQUE TAPE BUY! Top brand 7in., 2,400ft., 25/-; 5¾in., 1,200ft., 15/-. P. and P. 1 at 2/-, 2 at 2/9, 3-6 at 3/6. Bargains in all sizes. S.A.E. for list. E.C. KINGSLEY AND CO. LTD., 93 Tottenham Court Road, London, W.1. EUSton 6500.

MISCELLANEOUS

BERNIESOUND (AUDIO ENGINEERS)
DESIGN—BUILD—REPAIR—MODIFY
ELECTRONIC EQUIPMENT, write for estimate.
Mr. BROWN
1 Effie Place, London, S.W.6.

PRINTED CIRCUIT BOARDS only 6d. sq. in. Component Bargains. S.A.E. lists. BEEJAY ELECTRONICS (P.W.) 106 Reddicap Heath Road, Sutton Coldfield, Warwickshire.

ELECTRONIC MUSIC?

Then how about making yourself an electric organ? Constructional data available—full circuits, drawings and notes! It has 5 octaves, 2 manuals and pedals with 24 stops—uses 41 valves. With its variable attack you can play Classics and Swing. **Write NOW** for free leaflet and further details to **C & S., 20 Maude Street, Darlington, Durham.** Send 3d. stamp.

CONVERT ANY TV SET into an Oscilloscope. Diagrams and instructions 12/6. REDMOND, 42 Dean Close, Portslade, Sussex.

EDUCATIONAL

TRAIN FOR SUCCESS WITH ICS

Study at home for a progressive post in Radio, TV and Electronics. Expert tuition for I.E.R.E., City & Guilds (Telecoms and Radio Amateurs') R.T.E.B., etc. Many unique diploma courses incl. Colour TV, Electronics, Telemetry & Computers. Also self-build kit courses—valve and transistor.

Write for FREE prospectus and find out how ICS can help you in your career.

ICS DEPT. 541 PARKGATE ROAD LONDON, S.W.11.

EDUCATIONAL
(continued)

RADIO OFFICER training courses. Write: Principal, Newport and Monmouthshire College of Technology, Newport, Mon.

RADIO OFFICERS see the world! Sea-going and shore appointments. Trainee vacancies during 1967. Grants available. Day and Boarding students. Stamp for prospectus. Wireless College, Colwyn Bay.

OCEAN LINERS and other ships require Radio Officers. State if Attendance or Postal Course desired. Approved Training Centre: Radio School, 91 Lancaster Road, Preston, Lancs.

BARKING REGIONAL COLLEGE OF TECHNOLOGY
Longbridge Road, Dagenham, Essex

Courses for MARINE RADIO OFFICERS

Training for P.M.G. Certificates and for the B.o.T. Radar Maintenance Certificate is provided on a two year full-time basis Those wishing to enter should have attained the age of 16 years and should have passed the G.C.E. 'O' level examination in four subjects. More mature students may enter through a College qualifying examination. Those already possessing P.M.G. Certificates may enter at the appropriate stage of the course to complete their qualifications.

Apply to the Principal at the College

City and County of Bristol
BRISTOL TECHNICAL COLLEGE
Principal: E. Poole, B.Sc.Eng., M.I.Mech.E., M.I.Prod.E.

CAREERS IN RADIO & RADAR

Marine Radio Officers

2-year full-time course for young men aged 16 upwards, leading to 1st and 2nd class P.M.G. Certificates and B.O.T. Radar Maintenance Certificate.

Conversion Course (2nd Class to 1st Class).

R.T. Course (for Full or Restricted Licence).

Licensed Aircraft Radio Engineers

2-year, full-time course for A.R.M.E. Licences, categories A & B, and 6-months courses for Radar Rating in association with the above.

Training given on the latest types of Marine and Aircraft Equipment in newly equipped Laboratories at

THE SCHOOL OF MARINE RADIO AND RADAR

Senior Lecturer: F E. BARLTROP

For details write to:

THE REGISTRAR
BRISTOL TECHNICAL COLLEGE
ASHLEY DOWN, BRISTOL 7

EDUCATIONAL
(continued)

CITY AND GUILDS (Electrical, etc.) on "Satisfaction or refund of fee" terms. Thousands of passes. For details of modern courses in all branches of Electrical Engineering, Electronics, Radio, TV Automation, etc., send for 156-page handbook—FREE. B.I.E.T. (Dept. 168K), 29 Wright's Lane, London, W.8.

METAL WORK

METAL WORK: All types cabinets, chassis racks, etc., to your specifications. PHILPOTTS METAL WORKS LTD., Chapman Street, Loughborough.

2 METRES 4

The thrills of VHF Amateur Radio! Complete Kit, 70-150 Mc/s, costs only **42/6** (by post, UK, 3/3 extra) also now available, new transistor Short-Wave kit model TR2 10—180 metres, ideal for beginners to Ham radio via simplified "Easy-Build" step-by-step instructions from **79/6**. Write today enclosing a stamped addressed envelope for literature and full details. Overseas enthusiasts note we despatch to all parts of the world—local stamp OK for literature. "GLOBE-KING" (Regd.) precision standard products tried and trusted by Amateurs everywhere.

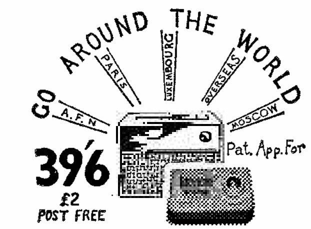
JOHNSONS (Radio)
St. Martins Gate, Worcester

TAPE RECORDING SERVICING MANUAL
by HELLYER 63/- P. & P. 2/6

ABC's of Silicon Controlled Rectifiers by Lytel. **16/-**. P. & P. 1/-.
Circuits for Audio and Tape Recording by Judd. **7/6**. P. & P. 9d.
ABCs of Electronic Organs by Crowhurst. **16/-** P. & P. 1/-.
Electronic Guitar Amplifier Handbook by Darr. **24/-**. P. & P. 1/-.
Transistor Pocket Book by Hibberd. **25/-**. P. & P. 1/-.
101 Ways to Use Your Signal Generator. 18/-. P. & P. 1/-.

Where possible 24-hour service guaranteed.

UNIVERSAL BOOK CO.
12 LITTLE NEWPORT STREET,
LONDON, W.C.2
(Leicester Square Tube Station)



On your own
TRANSISTOR PORTABLE!

★ Boosts Pirate and distant stations.
★ No Plugs—No Connections! Just place Dewtron Wave Trap near radio.
★ Extends Battery life — reduces 'fading'.
★ Use in car, caravan, without aerial. With PP3 battery (life several months).

D.E.W. LTD., Dept. P.W., Ringwood Road, FERNDOWN, Dorset.

PADGETTS RADIO STORE
OLD TOWN HALL, LIVERSEDGE, YORKS.
Telephone: Cleckheaton 2866

Reclaimed Tubes. Six months' guarantee. AW43/80, **30/-**. MW43/80, **30/-**. MW43/69, **30/-**. CRM172, **30/-**. CRM142, **17/-**. 12" Tubes, **10/-**. 17" tubes perfect but without guarantee, **17/-** each. Carriage on any tube in G.B., **10/-**.

Specially Selected Nearly New Valves with 6 months' guarantee. Single valves. Post 7d.

PY33	6/-	ARP12	1/6	5U49	4/-
PCC84	5/6	ECL80	3/6	6K7	1/9
PCF80	5/6	ECC83	5/-	6K8	2/-
PL36	6/-	ECC82	4/3	6V6	1/9
PL81	5/6	EF91	2/-	185BT	8/6
807	5/-	EL38	5/-		

VALVE LIST

Ex. Equipment, 3 months' guarantee.
Single Valves Post 7d.

EF80	1/6	KT36	5/-	6F14	5/-
ECL80	1/6	PCF80	2/-	10C2	5/-
EF91	9d.	PC84	2/-	10P13	2/6
EB91	9d.	PCL82	4/-	10P14	5/-
EBF80	3/-	PCL83	3/-	20D1	2/-
ECC81	3/-	PCL84	3/-	20L1	5/-
ECC82	3/-	PCL85	3/-	20P1	4/-
ECC83	4/-	PZ30	5/-	20P4	8/6
EL84	5/-	PY81	1/6	U801	8/6
EY51	2/6	PY82	1/6	U329	5/-
EF50	1/-	PL81	4/-	U301	5/-
EY86	5/-	PL36	5/-	U191	5/-
6K25	5/-	PY33	5/-	U281	5/-
6U4	5/-	6B8	1/6	U282	5/-
6P25	5/-	6F1	1/-	U25	5/-

Special Offer. Bush TV56 17" 13-channel TV Sets in good working order fitted with good tube. Cabinet condition fair. **£8.** Carriage 10/-. Untested 17" TV Sets, complete fitted with all BBC and ITV coils **50/-**. Carriage 10/-.

Bush TV24C 12in. 13 channel. Fitted with good tube. Set in good working condition, has cleaned-out cabinet, condition fair. **55/-**. Carriage 10/-.

Perfect Speakers removed from TV sets. Round 8", **6/-**. Rola 6 x 4, **3/-**. Goodmans 7 x 4, **5/-**. 6" Round, **3/-**. Philips 5" Round, **3/-**. Plus Post on any Speaker 2/9. 6 x 4, 6" and 5" Round Speakers, 6 for **20/-**. Post Paid.

Motors, Single Phase. 240v., quarter H.P. **26/-**. 1400 revs. Fully guaranteed, ex washing machines. Carriage 8/6.

Special Offer. Garrard Record Players. Auto Changers. Model AT60, **£8.2.6.** Model 1000, **£5.12.0.**
Single Player. Model SP25, **£8.2.6.**
Carriage and insurance on any model, **10/-**. All complete with cartridge and maker's guarantee.

Breaking up 19 Sets. Receiver section complete with valves. Parts removed, 500 micro-amp meter. All transmitter parts, Relay and 807 valve. Condition Fair, no dry rot, **10/-**. Carriage 10/-.

KEY BOOKS Paperbacks

ELECTRONICS IN THE HOME *A. T. Collins*

Unit for Remote Control—Recording Radio Receivers—Home Audio System—M.W. and L.W. Mast Head Pre-Amp—Home Intercom Unit—Variable Voltage Transformer—Electronic Timer—Mains Filter Unit—Extension Loudspeakers etc.
63 line illustrations, 96 pages.

MORE SIMPLE RADIO CIRCUITS *A. T. Collins*

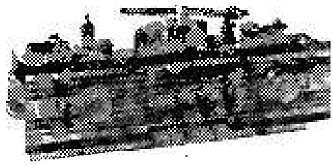
Two Station Radio and Amplifier—Transistorised Converter for Short Waves—Double Triode Receiver with Power Unit—Beginner's Three Transistor Reflex—Modern Three Valve T.R.F.—F.M. Tuner—Two Transistor Portable—Four Valve Superhet—Mains Power Supply for Transistor Sets, etc.
61 line illustrations, 96 pages.

Each 3s. 6d. *or by post 4/-. from:*

GEORGE NEWNES LTD.
Tower House, Southampton St., WC2.

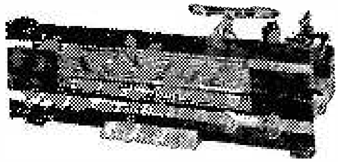
½ PRICE
SPECIAL RADIO CHASSIS OFFERS

HI-FI CONTINENTAL STEREOPHONIC RADIOGRAM CHASSIS



Magnificent 'Continental' Stereophonic Radiogram Chassis with piano key switches, built-in ferrite rod aerial. Comes complete with two 10" elliptical loudspeakers, plus a mono/stereo 4-speed automatic record changer. **Complete £29.19.6.** (Units available separately if required. **Chassis only 19½ gns.**).
Special terms available of £10.0.0 deposit followed by 18 monthly payments of £1.6.5 (total H.P. of £33.15.6)+15/- P. & P. Send £10.15.0 now.

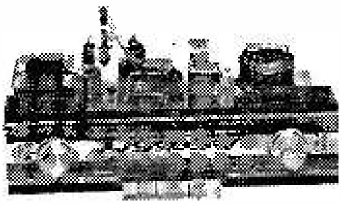
IMPERIAL HI-FI STEREOPHONIC RADIOGRAM CHASSIS



The Imperial Stereophonic 4 waveband chassis has the most advanced specifications yet offered in this country. There is a built-in ferrite rod aerial, seven piano key buttons, controlling mono/stereo selection. Gram Long-Medium-Short-FM-ON/OFF. The unit comes complete with two 10" elliptical loudspeakers plus a mono/stereo 4 speed automatic record changer. **Complete £41.9.6. Chassis only 29½ gns.**

Special terms available of £13.16.6 deposit followed by 24 monthly payments of £1.8.10 (total H.P. £48.8.6)+17/6 P. & P. Send £14.14.0 now.

EMPRESS HI-FI AM/FM STEREOPHONIC CHASSIS

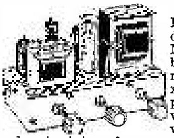


This most advanced radiogram chassis with automatic push button selection covers short, medium and long wavebands plus V.H.F./F.M. Offered complete with 2 10 x 6 speakers 4 speed Stereo/Mono autochanger only **£35.19.6. Chassis only 25½ gns. Special terms available of £12 deposit followed by 18 monthly payments of £1.11.7. (total H.P. £40.8.6)+15/- P. & P. Send £12.15.0 now.**

All Lewis Radio equipment including valves are fully guaranteed for one year free of charge. Send your cheque or P.O. today while stocks last to Dept. P.106.

LEWIS radio
LEWIS RADIO, 100, CHASE SIDE, SOUTHGATE
LONDON, N.14. Telephone: PAL 3733/9666

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/-.

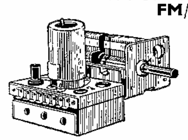
QUALITY RECORD PLAYER AMPLIFIER

This top quality amplifier (was used in a 29 gn. 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 5¼in. 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.

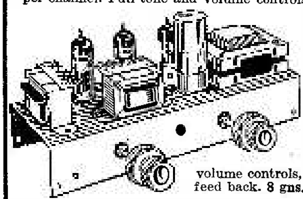
SPECIAL OFFER! FM/AM TUNER HEAD



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/-.

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 sep. bass, treble & volume controls, full negative feed back. **8 gns.** P. & P. 6/6.

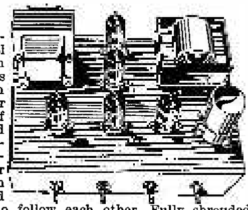
HSL 'FOUR' AMPLIFIER KIT

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 7½in. wide x 4in. deep. Overall height 4¾in. All components and valves brand new. Very clear and concise instructions enable even the inexperienced amateur to construct with 100% success. Supplied complete with 3 ohm output transformer. (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 is similar in appearance to HA34 but employs entirely different and advanced circuitry.

HIGH GAIN 4 TRANSISTOR PRINTED CIRCUIT AMPLIFIER KIT Type TAI

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.

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.

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 **£12.10.6.** 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 Autoslim **£5.10.0**
GARRARD AT6...... **£9.10.0.** 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.

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

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

HARVERSON SURPLUS CO. LTD.

170 HIGH STREET, 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.

10/- BARGAIN SALE 10/-

- 10/- 20 Assorted Transistor Electrolytics.
- 10/- 3 Television Smoothing Condensers. 200/100, 200/200, 125/300/50µf., 275 V.
- 10/- 50 assorted ¼ Watt 5% Resistors. (Long leads).
- 10/- 100 assorted low wattage types (including printed circuit).
- 10/- 100 assorted ½ watt to 3 watt (10 cards each of 10 resistors).
- 10/- 100 assorted Silver Mica/Ceramic Condensers (mixed).
- 10/- 50 ASSORTED PAPER CONDENSERS .001 to .5µf. 500 volt.
- 10/- 100 miniature paper condensers (mixed).
- 10/- 50 untested transistors.
- 10/- 6 Switching Transistors NPN type. Min. 200 m/cs.
- 10/- 6 Switching Transistors PNP type.
- 10/- ACOS mono pick-up head.
- 10/- 3 miniature earpieces.
- 10/- 20 DIODES. VERY HIGH QUALITY.
- 10/- Magnetic Lapel Microphone with plug and lead.
- 10/- 3", 4" or 5" loudspeaker. Low impedance.
- 10/- Signal Injector. Parts and Circuit to make.
- 10/- Motor Car Rev. Counter. Parts and circuit (excl. meter).
- 10/- 12 pre-set pots. 10 ohm., 50K ohm., 1K. ohm., mixed.
- 10/- FREE! 10/- FREE! 10/- FREE!
- 10/- ANY ELEVEN ITEMS FOR £5/-/-! 10/- FREE!

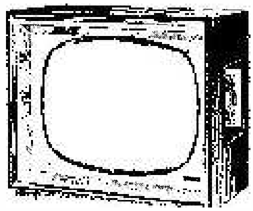
Rush your order now! These prices cannot be repeated!

G. F. MILWARD

17 Peel Close, Drayton Bassett, Nr. Tamworth, Staffs.
Phone: TAMWORTH 2321 **POST ONLY**

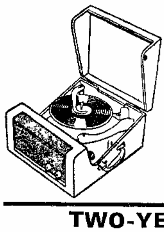
TWO-YEAR GUARANTEE EX-RENTAL TELEVISIONS

17 in. — £11.10.0



12 months' 3 star Guarantee
★Tube ★Valves ★Components
FREE ILLUSTRATED LIST
Channels for all areas
Demonstrations daily from Large Selection.
Personal collection or Insured 17in. 30/-

LATEST RADIOGRAM CABINETS £9.10.0

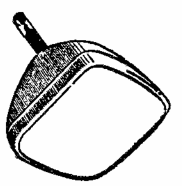


Brand new long low design in veneered English walnut, dia. 40 x 16 x 15½ in. Carr. 30/-. Also Mini Gram Cabinets £3.0.0. Radiogram/Cocktail Cabinets (Personal Shoppers.) Free List.

TV Turret Tuners, 2/6. New less valves. Slim models, **5/-.** Press button models, **19/6.** P & P. 2/6.
VALVES, £1 per 100. Assorted TV and Radio. Surplus ex-rental dismantled receivers. Post 4/6. Send for list.
RECORD PLAYER CABINETS, 49/6. Latest designed covered cabinets. Takes any modern Autochanger.
SINGLE PLAYER CABINETS, 19/6. P. & P. 5/6.

TWO-YEAR GUARANTEED TUBES

14 in.	**59/6**
17 in.	**79/6**
21 in. and all Slimline Tubes	**99/6**



100 % REGUNNED
Add 10/- or old tube.
Carr. 10/6.

Ex-Maintenance Tested Tubes
17" 35/- 14" 15/-
Most makes and Types Carr. 5/-

DUKE & CO. (LONDON) LTD.
621/3 Romford Road, E.12 ILF 6001-2-3

R.S.T. VALVE MAIL ORDER CO.

144-146 WELLFIELD ROAD, STREATHAM, S.W.16

All valves brand new and boxed

Mon.—Sat. 9 a.m. —5.45 p.m.
No Early Closing
Open Daily to Callers

Tel. STR 0199, 1649

OA2 5/8	6BH6 7/-	6K7G 1/6	7Y4 5/-	20F2 11/-	78 4/6	DK32 7/9	ECH21 19/-	EM84 6/-	PCC189 10/-	S130 12/6	UL84 5/6
OC3 5/-	6BJ6 7/6	6K7GT 4/6	9BW6 8/-	20L1 15/-	80 5/-	DK91 5/-	ECH35 13/-	ESU150 27/6	PCF80 6/6	SP4 9/-	UM80 7/-
1A7 7/9	6BQ7A 7/6	6K8M 8/6	10C1 12/6	20P4 14/-	85A2 8/6	DK92 7/9	ECH42 8/-	EY51 6/-	PCF82 6/-	SP41 1/6	UU6 13/6
1D5 6/-	6BR7 10/6	6K8G 3/-	10C2 12/-	20P5 12/-	150B2 14/6	DK96 6/6	ECH81 5/6	EY86 6/3	PCF84 8/-	SP61 1/-	UU7 13/6
1H5 7/6	6BR8 7/6	6K8GT 8/3	10F1 12/6	25A6 6/6	150C4 12/6	DL70 7/-	ECH83 6/6	EZ35 4/9	PCF86 8/6	SU25 19/6	UU9 8/-
1LD5 5/-	6BS7 15/-	6K25 20/-	10F3 12/-	25L6GT 4/6	801 5/-	DL92 4/9	ECL80 6/-	EZ40 5/6	PCF801 9/9	SU2150 12/6	UY21 7/6
1N5GT 8/-	6BW6 8/6	6L1 9/6	10F9 9/9	25Y5 6/-	807 7/9	DL93 3/6	ECL82 6/6	EZ41 6/-	PCF802 9/9	T41 9/-	UY41 4/6
1R5 5/-	6BW7 8/6	6L6G 7/-	10F18 9/-	25Z4 6/3	813 80/-	DL94 6/-	ECL83 9/-	EZ80 5/6	PCF805 10/6	TDD4 7/-	UY85 4/9
1S4 5/-	6C4 1/9	6L18 7/6	10L1 10/-	25Z5 7/-	866 10/-	DL95 6/6	ECL86 8/6	EZ81 3/6	PCF806 12/-	TH41 25/-	VMP4G 17/-
1S5 3/3	6C5G 4/-	6Q7G 5/6	10LD11 10/-	25Z6 8/6	954 4/-	DL96 6/-	EF9 20/-	GZ30 8/6	PCF808 12/6	U10 7/-	VP4B 27/6
1T4 2/6	6C6 3/9	6Q7GT 9/-	10P13 12/6	28D7 5/-	1625 5/-	DM70 5/-	EF36 3/-	GZ32 9/-	PCL82 6/6	U14 7/-	VR105/30 5/-
3A4 3/6	6C8G 6/-	6SA7 7/-	12AT6 4/6	30C1 6/6	4022AR 15/-	DY86 7/-	EF37A 9/6	GZ34 9/9	PCL83 8/-	U19 30/-	VR150/30 5/-
3Q4 6/6	6CD6G 22/6	6SC7 6/6	12AT7 3/3	30C15 9/6	5763 10/6	DY87 7/9	EF39 5/-	KT36 22/6	PCL84 7/-	U25 10/-	VT25 29/-
3Q5 6/6	6CH6 8/-	6SG7 4/-	12AU6 5/9	30C17 12/-	7193 1/6	E88CC 14/-	EF41 6/6	KT61 17/6	PCL85 7/3	U26 10/-	VT31 59/-
3S4 4/9	6CW4 14/-	6SH7 2/6	12AU7 5/-	30F5 9/-	7475 2/6	EA50 2/-	EF50 2/-	KT66 20/-	PCL86 3/9	U78 3/6	VU111 6/-
3V4 6/-	6D6 2/9	6SJ7 5/-	12AX7 4/6	30FL1 10/6	ATP4 1/9	EABC80 5/6	EF80 4/6	KT81 10/-	PENA4 20/-	U191 11/-	VU120 9/-
5R4G 8/-	6E5 5/9	6SK7GT 4/9	12BA6 6/-	30L15 12/-	ATP5 7/-	EAF42 7/6	EF85 4/6	KT88 28/-	PENB4 20/-	U251 11/6	VU508 25/-
5U4G 4/-	6F1 9/-	6SL7GT 4/9	12BE 4/9	30L17 12/6	ATP7 4/6	EB41 4/6	EF86 6/6	KTW61 4/3	PEN45 6/-	U301 12/-	W81M 5/-
5V4G 8/-	6F5G 5/-	6SN7GT 4/-	12BH7 5/9	30P12 10/-	AU2 30/-	EB91 3/-	EF89 4/-	KTZ41 8/-	PEN46 2/9	U403 6/6	X78 26/6
5Y3GT 4/6	6F6G 4/-	6SQ7 6/-	12C8GT 7/6	30P19 14/-	AU5 6/-	EBC33 6/-	EF91 2/9	ML4 17/6	PL36 9/6	U801 18/6	X79 41/-
5Z4 10/6	6F8G 4/6	6U4GT 10/-	12E1 19/6	30PL1 11/-	AZ1 8/9	EBC41 6/6	EF92 2/6	ML6 12/6	PL81 7/-	UABC80 5/6	XH1-5 5/-
6/30L2 10/-	6F11 12/6	6U5G 7/6	12J5GT 2/3	30PL13 12/6	AZ31 7/9	EBC90 3/6	EF98 10/-	MSP4 12/6	PL82 5/-	UAF42 7/-	XP1-5 5/-
6A7 15/-	6F13 5/-	6V6M 8/-	12J7GT 7/3	30PL14 12/6	CBL31 28/6	EBF80 5/-	EF183 6/6	MU14 4/-	PL83 6/-	UBC41 6/6	XSG1-5 10/-
6A8G 12/6	6F14 12/6	6V6G 6/6	12K7GT 3/-	35A5 17/-	CK502 5/-	EBF83 7/3	EF184 6/6	MX40 12/6	PL84 6/3	UBC81 7/-	Y63 7/6
6AC7 3/-	6F23 9/6	6V6GT 7/-	12K8GT 8/3	35L6 5/9	CL33 12/6	EBF89 5/9	EL32 3/-	N37 10/-	PL500 14/6	UBF80 5/9	Tubes
6AK5 4/6	6G6 2/6	6X4 3/6	12Q7GT 3/-	35W4 4/9	CY31 10/-	EBL1 17/6	EL33 17/6	N78 15/-	PX4 18/6	UBF89 6/3	3EG1 40/-
6AL5 3/-	6H6 1/3	6X5G 4/9	12SA7 6/6	35Z3 10/-	DAC32 7/6	EBL21 10/6	EL34 9/6	N108 15/-	PY33 8/6	UCC84 8/6	3FP7 12/6
6AM5 2/6	6J5M 6/6	6X5GT 7/6	12SG7 3/6	35Z4GT 3/9	DAF91 3/3	EBL31 27/6	EL41 7/3	NGT1 3/-	PY81 5/6	UCC85 6/6	5CP1 30/-
6AM6 2/9	6J5G 2/6	7B6 11/-	12SH7 2/9	35Z5 5/6	DAF96 6/-	ECC81 3/3	EL42 7/6	NGT7 25/-	PY82 5/6	UCF80 8/6	CV1526 40/-
6AQ5 6/-	6J5GT 4/6	7B7 7/-	12SJ7 3/9	37 5/-	DCC90 8/-	ECC82 5/-	EL84 4/6	OZ4 4/-	PY83 6/-	UCH42 7/-	ACR13 £3.0.0
6AS7 22/6	6J6 3/-	7C5 10/-	12SK7 2/9	42 4/6	DF33 8/-	ECC83 4/6	EL90 6/-	PC86 10/-	PY800 5/9	UCH81 6/3	VCR97 27/6
6AT6 3/6	6J7M 8/6	7C6 6/-	12SR7 5/-	50B5 6/6	DF70 5/-	ECC84 5/6	EL95 6/-	PC88 9/3	PY801 6/3	UCL82 7/9	VCR517B 30/-
6AU6 6/-	6J7G 4/3	7D5 8/-	12S7 20/-	50C5 6/3	DF91 2/6	ECC85 5/9	EM34 12/6	PC97 7/-	R2 4/-	UCL83 8/9	VCR517C 30/-
6B8G 2/-	6J7GT 8/6	7H7 5/-	19AQ5 7/6	50CD6G 35/-	DF92 2/6	ECC88 8/9	EM80 6/-	PCC84 5/6	R19 7/-	UF41 7/-	
6BA6 4/9	6K6GT 5/-	7R7 19/6	20D1 10/-	50L6GT 6/-	DF96 28/-	ECF80 6/6	EM81 7/-	PCC89 8/6	RG5/500 59/-	UF89 6/-	
6BE6 4/9	6K7M 5/-	7S7 18/6		75 5/-	DH77 3/6	ECF82 6/-				UL41 6/8	

SPECIAL 24 HOUR SERVICE
OBSOLETE TYPES A SPECIALITY
QUOTATIONS FOR ANY VALVE NOT LISTED
Postage 6d. per Valve C.W.O. No C.O.D.
Send S.A.E. for list
Manufacturers and Export Inquiries Welcome

Special 24 Hour Express Mail Order Service

SETS OF VALVES

DAF91, DF91, DK91, DL92, DL94 .. .. Set of 4, 19/-
DAF96, DF96, DK96, DL96 .. .. .. Set of 4, 25/-

BRAND NEW TRANSISTORS

AF114	9/-	OC35	9/6	OC77	8/-	OC82D	6/-
AF115	7/-	OC44	4/6	OC81	4/-	OC83	6/-
AF116	8/-	OC45	3/6	OC81m/pr	12/6	OC170	7/6
AF117	5/6	OC71	4/6	OC81D	4/-	OC200	8/-
OC25	11/-	OC72	6/-	OC82	6/-		
OC28	16/-	OC75	6/-				

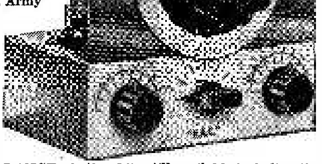
PLEASE NOTE OUR NEW ADDRESS

FAMOUS FOR THIRTY YEARS of SHORT-WAVE EQUIPMENT of QUALITY

H.A.C. SHORT-WAVE KITS

H.A.C. were the original suppliers of Short-Wave Receiver Kits for the amateur constructor. Over 10,000 satisfied customers —including Technical Colleges, Hospitals, Public Schools, R.A.F., Army Hams, etc.

IMPROVED 1966 RANGE



1-Valve model "CX", complete kit, Price 34/6. Customers say: "Definitely the best one-valve S.W. kit available at any price". This kit contains all genuine Short-Wave components, a drilled chassis, accessories and full instructions. Ready to assemble and of course, as all our products, fully guaranteed. FULL RANGE of other kits still available including the famous model 'K', price 77/-. Before ordering call and inspect a demonstration receiver or send for a descriptive catalogue and order form to:—

"H.A.C." SHORT-WAVE PRODUCTS (Dept. P.W.), 29 Old Bond St., London, W.1.

OUTLINE OF RADIO AND TELEVISION

J. P. Hawker

This introductory manual gives clear explanations of electric currents, radio and audio waves and electronic components and continues through the most advanced items of equipment such as u.h.f. television tuners, multiplex stereo systems and colour television receiver techniques.

This is an important new introduction to the subject.

400 pages, over 300 diagrams including numerous circuits. **30s.** *Or 32s. by post from:*

GEORGE NEWNES LTD.
Tower House, Southampton St., WC2

Marconi V.H.F. Mobile Receivers. 11 Valve Superhet. Crystal controlled. Fixed frequency 42/6

Ex-Services A.T.V. 4 switched frequencies 1·2·2, 2·3·5, 3·5·6, 6·10 Mc/s. 16/-

19 Set Variometers 16/-

19 Set Amplifiers with 2 x 807 output. Excellent condition. Own power pack £4. All post free.

CALLERS ONLY

Good selection Oscilloscopes £8 upwards. AR 88's L.F. £32.10.0.

M.A.C. Ltd.

38 MEADOW LANE, Leeds 11
Phone Morley 2334 or Leeds 26026

MULTIMETERS

TK20A, 35/-, p.p. 1/6; EP10K 71/6, p.p. 2/-; EP20K, 91/-, p.p. 2/-; EP30K 112/-, p.p. 2/9; EP50K 155/-, p.p. 2/9.

SPECIAL OFFER
A few EP100K, only £8.5.0 p.p. 2/9. Leather cases EP10K/20K 24/-; EP50K/100K 32/- p.p. 1/6 (post free with meter). All brand new and guaranteed. S.A.E. for further details.

NOUGHTS AND CROSSES MACHINE
Uses standard miniature switches and lamps only. This machine cannot be beaten. Full circuit, wiring diagram and instructions 3/6.

DIGITAL ADDER/SUBTRACTOR
Using standard switches and lamps only. A fascinating demonstration of Binary arithmetic. Full circuit, wiring diagram and notes on the Binary system, 3/6.

SIMPLE ANALOGUE CIRCUITS
Available shortly, an old favourite, Multiplying/Dividing and Football Pool Computer circuits with two new circuits for the solution of simultaneous and quadratic equations. A schoolboy's dream, well worth waiting for!

PLANET INSTRUMENT CO.
25 (W) DOMINION AVENUE, LEEDS 7.

Meters, Mini 1K, 35/6. EP. 10K, 70/-. 30K, £6
Intercom/Baby Alarm. TI-206, 67/6.
Microphones, Xtal, hand, 10/6, Stick, 200C, 39/6, Lapel 7/- Dynamic, dual Imp, DM. 18. HL. £5.19.0. DM. 17. HL. £5.15.0.
Soldering Irons, 40 watt, bargain, 8/-.
FM. Tuner. FMT 41, Transistorised, £7.18.0.
Electric Carving Sets, 2 blades, 30/6.
Electric Back Scratcher. Have Fun. 9/6.
Car Aerial. 5 sect, lockable, wing mtg 35/-.
Tape Splicers, T635 and similar, 13/6.
Headphones, Hi-Imp. SF.20. 12/6, foster 16/6.
Mike Mixers, type MM-4, 50/-.
Jack Plugs, Std, 2/6, screened 3/3. 3.5 mm. min PJM-3 plug and Skt 1/10. Phono 3/6 pkt. 10.
Key Ring Torches, mercury cell, 4/6.
High Intensity Table Lamp. HL. 107, 46/6.
Tape Head Demagnetizers. TD.79. 25/-.
Terms, C.W.O. add 1/- p.p. under 10/-.

CHARLES MARSHALL
42 Rushley Road, Dore, Sheffield.

BROADWAY ELECTRONICS

92 MITCHAM ROAD · TOOTING BROADWAY · LONDON S.W.17 · Tel: BALham 3984

(four minutes from Tooting Broadway Underground Station)

GARRARD 4 SPEED DECKS WITH CARTRIDGE
Autochangers: AT6 MK II, **£9.19.6.** AT60 with heavy turntable, **£12.10.0.** 3000, **£8.8.0.** 2000, **£6.19.6.** 1000, **£5.19.6.** Autoslim de luxe with Plug-in-head, **£5.15.0.** Autoslim **£5.5.0.**
P. & P. all changers 6/-.

Last chance to purchase famous Garrard RC.210 quality changer. Mono, £5.10.0 with stereo head/diamond Stylus 15/- extra. P. & P. 6/-. EDE Plinth for above changers size 16½" x 14½" x 3½", 45/-. P. & P. 3/6.

SINGLE PLAYERS:
SP 25 with cartridge stereo or mono, £9.19.6. SRP 12, £5. P. & P. 6/-.

CARTRIDGES: Ronette, Stereo, 25/-, Acos GP67, 15/-, Garrard EV26, 25/-. GC2 or GC8, 15/-. A.T.6 shells 5/-. P. & P. all 6d.

SPEAKER ENCLOSURES
TONY Corner Cabinet 20" x 10" x 7" takes 10" x 6" speaker covered in Rexine and Vynair, 45/-. P. & P. 5/-.
BLAKE De LUXE, veneered with woodgrain formica and standing on smart 6" legs, cabinet size 18" x 24½" x 9½" £6.5.0. P. & P. 10/-.
HAYDON 16½" x 15" x 7½" fabric covered suitable for 12" speaker, 45/-. P. & P. 7/6.

Corner Ext. speaker complete with volume control, covered woodgrain fabric, 45/-. P. & P. 4/6.

Ext. speaker complete with 8" speaker and volume control. Size 13" x 10" x 6" covered woodgrain formica, £3. P. & P. 4/6.

SPEAKERS.
ELAC Heavy Duty Ceramic Magnets 11,000 line. 10" round 10" x 6". 3 ohm or 15 ohm, 42/6. P. & P. 3/6. 8" round 15 or 3 ohm, 38/6. P. & P. 3/6. E.M.I., 13½" x 8" 15 or 3 ohm, 42/6. P. & P. 3/6. E.M.I. Tweeter, 12/6. P. & P. 1/6. R.T.C. 12" 20 watt 15 ohm, Ceramic magnet, £5.5.0. P. & P. 3/6. 8" x 4" Eliptical 30 ohm, 30/-. All other speakers supplied—Goodmans, Bakers, W.B., Wharfedale, Eagle, Tripletone.

BARGAINS IN TRANSISTORS.
AC127, AF114, 115, 116, 117, 118, 119, OC169, 170, 171, 172, 5/6. OC72, 75, 82, 83, 3/6. OC71, 81M, 3/-.
R.F Packs 1 OC44, 2 OC45, 8/6.
AF Packs 1 OC81D, 2 OC81M, 6/6. 1 OC81D, 2 OC81 (Mullard), 8/6.
AF Pack 1 GET118, 2 GET119, 5/6. GET113, Red Spot, 2/-.
OC26, 28, 29, 9/6. ORP12 Light Cell, 8/6.
Diodes OA81, 2/3. OA91, OA95, 1/9. P. & P. on above 6d.

TRANSISTOR ELECTROLYTICS.
1, 2, 4, 5, 8, 16, 25, 32, 50, 100 mfd 15 volt working, 1/3. P. & P. 6d.
250 mfd 25v DC, 3/-. 1,000 mfd 50v DC, 5/6.
500 mfd 12v DC, 3/-. 1,500 mfd 10v DC, 4/6.
500 mfd 50v DC, 5/-. 5,000 mfd 12v DC, 6/6. P. & P. 1/-.

RESISTORS. ½ watt 10% from 3.3 ohm to 10 meg 5d. each. 4/- doz. P. & P. 6d.

EARPIECES WITH CORD AND 3.5 mm. plug. 8 ohm magnetic, 3/-. 250 ohm, 4/-. 180 ohm with clip, 6/6. Xtal 4/-. P. & P. 6d.

TRANSISTOR SPEAKERS 8 ohm 2" 8/6; 3" 10/6; 3½" 12/6. P. & P. 1/-

PANEL LIGHTS. Neon 200–250v, 2/6. 6v Red, Blue, Green, Yellow, White (uses Lilliput bulbs) 3/- each. P. & P. 6d.

Paper Condensers for Cross-Over Units, 2 Mfd, 2/6. P. & P. 6d.

MAKE YOUR OWN PRINTED CIRCUITS.
Complete kit, Hayato P.K.1, 22/6. P. & P. 1/- (with full instructions).

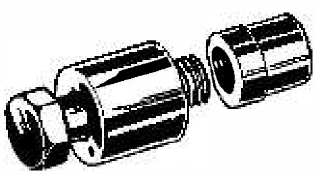
ROTARY SWITCHES
2 pole Mains Switch, 3/-.
1 pole 12 way, 2 pole 6 way, 2 pole 2 way, 3 pole 3 way, 3 pole 4 way, 4 pole, 3 way, 3/6 each. P. & P. 6d.

MICROPHONES.
Xtal Hand Mikes.
BM3 and 200C, 30/-. P. & P. 2/-. Stand for same 9/6 & 12/6. P. & P. 1/9
ACOS Mike 45, 21/-. ACOS Mike 40, 18/6. Dyn. Mike DM-391, 22/6. CM21 Xtal, 12/6. CM20 Xtal, 9/6. Magnetic Hm 63C with remote control switch, 15/-. Telephone Pick-up 10/6. P. & P. 1/-.
XTAL LAPEL MIKE, 7/6. GUITAR MIKE, 12/6. P. & P. 6d.

PUSH BUTTON SWITCHES, 4 button. 2 banks of 6 S.P.C.O. 1 bank of 5 S.P.C.O. 1 off button, 5/6. P. & P. 6d.

BATTERY CHARGER KITS. 6 volt and 12 volt with circuit.
4 amp. GEC Rect., 15/-. Heavy Duty Transformer, 25/-. P. & P. 3/6.
3 amp. Westinghouse Rect., 10/6. Heavy Duty Transformer, 20/-. P. & P. 3/6. 1 amp Westinghouse contact cooled rect., 7/6. Transformer 12/6. P. & P. 3/-. Large Croc. Clips, 2/6 per pair. P. & P. 6d.

Stockists for Eagle Products, Goodmans, W.B., Wharfedale, Bakers, Tripletone, Linear, all makes of amplifiers and speakers supplied. Let us quote for your requirements. S.A.E. please. Trade terms to bona fide dealers.



The PUNCH you need!

HOLE PUNCHES

Instant Type

⅜" diameter..		6/10 ea

Screw-up Type

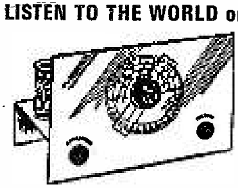
15/32" diameter Toggle switch	..	8/6 „
½"	„ ..	8/6 „
⅝"	„ B7G ..	9/- „
¾"	„ B8A, B9A ..	9/6 „
13/16"	„ ..	10/2 „
⅞"	„ ..	10/8 „
1"	„ ..	11/8 „
1⅛" diameter Int. Octal	..	13/4 „
1¼"	„ ..	16/2 „
1⅜"	„ ..	18/10 „
1½"	„ B9G ..	21/8 „
1¾"	„ ..	24/4 „
2 3/32"	„ Meter..	33/2 „

Complete Set **£9.3.6.**
No extra charge for postage and packing In the U.K.

Now supplied by

TOMPKINS & LONGMAN LTD.
237 GIPSY ROAD
WEST NORWOOD, S.E.27
Tel. Gipsy Hill 5000

LISTEN TO THE WORLD on TELSTAR our 1-VALVE SHORT WAVE RADIO



Receives speech and music from all over the world. Price includes valve and one coil covering 40-100 metres. Can be extended to cover 10-100 metres. Can be converted to 2 or 3 valve and all-mains speaker use.
Total building costs 35/- P. & P. 2/-
All parts available separately.

READY TO USE POCKET RADIO

Covers Medium waveband. No batteries needed. Complete with earpiece.
Only 12/6 P. & P. 2/-

Mains POWER PACKS

The ideal economical and safe way of running any Transistor Radio, Record Player, Tape Recorder, Amplifier etc. from A.C. Mains.
The MAJOR "Power Plus" for 9v.; 6v.; 4½v.; Single Output. P. & P. 2/6 **39/6**
For 9v. + 9v.; 6v. + 6v.; 4½v. + 4½TV. Two separate outputs. P. & P. 2/6 **42/6**
Please state outputs required
The BIJOU "Power Plus". For the smaller set using PP3 type battery. Supplied complete with special adaptor enabling you to reactivate your existing PP3 type battery. P. & P. 2/6 **17/6**
All units are completely isolated from mains by double wound transformer ensuring 100% safety.

R.C.S. PRODUCTS (RADIO) LTD.
(Dept. P.W.), 11 Oliver Road, London, E.17

4-STATION INTERCOM

£6/9/6

Solve your communication problems with this new **4-Station Transistor Intercom (1 master and 3 Subs),** in de-luxe plastic cabinets for desk or wall mounting. Call/talk/listen from **Master** to **Subs** and **Subs to Master.** Ideally suitable for Business, Surgery, Schools, Hospital, Office and Home. Operates on one 9v battery. On/off switch. Volume control. Complete with 3 connecting wires each 66ft. and other accessories. P. & P. 3/6.

INTERCOM/BABY ALARM

Usually ~~£6GNS~~ *Our Price ONLY* **55/-**

Modernise business or home with this new two-way **Portable Transistor Intercom.** Consisting of **Master** and **Sub.** in strong plastic cabinets, with chromium stands. Designed as a two-way instant communication system. Call/talk/listen from Master to Sub and Sub to Master. Operates on one 9V battery. Complete with 60ft. wire. Battery 2/6, P. & P. 2/6.

Transistor TELEPHONE AMPLIFIER

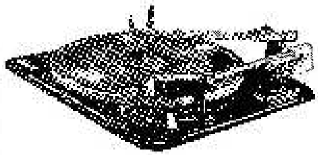
Usually ~~£6GNS~~ *Our Price Only* **55/-**

Why not boost business efficiency with this incredible De-luxe **Telephone Amplifier.** Take down long telephone messages or converse without holding the handset. A status symbol? Yes. but very useful one. On/off switch. Volume Control. Operates on one 9V battery. P. & P. 2/6. Battery 2/6 extra. Full price refunded if returned in 7 days.

WEST LONDON DIRECT SUPPLIES (PW/10)
169 KENSINGTON HIGH STREET, LONDON, W8.

DANE Electronics
39 Barrack Rd. Northampton

SOUND BARGAINS



LAB.80 Transcription Player
Made for the connoisseur, with advanced features including record changing facilities, low-resonance wood pick-up arm, anti-static turntable mat, heavy alloy turntable, magnetic repulsion auto-trip pick-up arm bias compensator and cueing facilities on manual. Less cartridge.
£26.10.0

SP.25
High quality single player, features include integral cueing device which raises or lowers pick-up at any point on record, wired for stereo. Less cartridge.
£10.15.0.

AT.60
Accepted as the automatic turntable foremost in its class. Manual and auto. Less cartridge.
£11.19.0.

3000
Low mass tubular pick-up arm designed for use with high compliance cartridges is special feature of this most efficient model. Stereo with sonotone 9 T.H. cartridge, and Diamond stylus.
£10.10.0.

All above models wired for STEREO.

High Quality Cartridges

Acos GP.83	Stereo	11/6
Acos GP.73	Stereo	10/-
Acos GP.67	Mono	9/-

EV.26 shell and cartridge with Diamond stylus **25/6.**
As above with Sapphire Stylus **18/6.**

TAPE BARGAIN
OR WO Tape 5¾" long play (350 metres) **14/6.**

All goods fully guaranteed. Post and packing paid.

To **DANE ELECTRONICS**
39 Barrack Rd. Northampton
Please send me
....
Cheque/PO enclosed for......
PO No.
NAME ....
ADDRESS ....
....

NEW RANGE U.H.F. AERIALS FOR BBC 2 (625) line transmissions

All U.H.F. aerials now fitted with tilting bracket and 4 element grid reflectors. **Loft Mounting Arrays,** 7 element, **35/-.** 11 element, **42/6.** 14 element, **50/-.** 18 element, **57/6.** **Wall Mounting** with **Cranked Arm,** 7 element, **60/-.** 11 element, **67/-.** 14 element, **75/-.** 18 element, **82/6.** **Mast Mounting** with 2in. clamp, 7 element, **42/6**; 11 element, **55/-**; 14 element, **62/-**; 18 element, **70/-.** **Chimney Mounting Arrays, Complete,** 7 element, **72/6**; 11 element, **80/-**; 14 element, **87/6**; 18 element, **95/-.** Complete assembly instructions with every unit. **Low Loss Cable, 1/6 yd. U.H.F. Preamps,** from **75/-.** State clearly channel number required on all orders.

BBC · ITV · F.M. AERIALS

BBC (Band 1). Telescopic loft, **21/-.** External S/D, **30/-.** "H" **£2.10.0**
ITV (Band 3). 3 Element loft array, **25/-.** 5 element **35/-.** Wall mounting, 3 element, **35/-.** 5 element, **45/-.**
Combined BBC/ITV. Loft 1+3, **41/3**; 1+5, **48/9**; Wall mounting 1+3, **56/3**; 1+5, **63/9**; Chimney 1+3, **63/9**; 1+5, **71/3.**
VHF transistor pre-amps **75/-.**
F.M. (Band 2). Loft S/D, **12/6,** "H", **30/-,** 3 element, **52/6.** External units available. Co-ax cable, **8d.** yd. Co-ax plugs, **1/3.** Outlet boxes, **4/6.** Diplexer Crossover Boxes, **12/6.** C.W.O. or C.O.D. P. & P. 4/6. Send **6d.** stamps for illustrated lists.
Quotations for special arrays available on request

K.V.A. ELECTRONICS (Dept. P.W.)
27 Central Parade, New Addington
Surrey
LOD 2266

N E W V A L V E S !

Guaranteed Set Tested
24-HOUR SERVICE

1R5	4/-	DK91	4/-	EF85	5/-	PY33	8/9
1S5	3/9	DK92	7/9	EF86	6/6	PY80	4/9
1T4	2/9	DK96	6/3	EF89	4/3	PY81	5/-
3S4	4/3	DL33	6/6	EL33	6/3	PY82	4/9
3V4	5/-	DL35	4/9	EL41	7/6	PY83	5/3
5Y3GT	4/6	DL92	4/3	EL84	4/3	PY800	5/11
6K7G	1/3	DL94	5/-	EY51	5/11	R19	6/6
6K8G	3/3	DL96	5/11	EY86	5/3	U25	8/3
6L18	7/3	DY86	6/3	EZ40	5/6	U26	8/6
6V6G	3/-	DY87	6/9	EZ80	3/6	U191	9/6
10C2	11/-	EABC80	5/6	EZ81	4/-	U301	10/6
10F1	9/6	EAF42	7/-	KT61	6/3	U801	15/6
10P13	8/3	EBC41	6/6	N78	14/6	UABC80	5/-
20F2	8/9	EBF80	5/9	PCC84	5/3	UAF42	6/11
20L1	11/-	EBF89	5/9	PCC89	8/6	UBC41	6/6
20P1	8/9	ECC81	3/3	PCF80	6/3	UBF80	5/6
20P3	10/6	ECC82	4/6	PCF82	5/9	UBF89	5/9
20P4	12/9	ECC83	4/6	PCF805	8/-	UCC85	6/-
30F5	7/-	ECC85	5/3	PCL82	6/3	UCH42	8/-
30P4	11/6	ECH35	5/9	PCL83	8/9	UCH81	6/-
30P19	11/6	ECH42	8/-	PCL84	7/3	UCL82	7/-
DAC32	6/9	ECH81	5/6	PCL85	7/3	UCL83	8/6
DAF91	3/9	ECL80	5/9	PL36	9/3	UF41	7/-
DAF96	5/11	ECL82	6/3	PL81	6/6	UF89	5/6
DF33	7/6	ECL86	7/6	PL82	5/-	UL41	7/9
DF91	2/9	EF39	3/6	PL83	5/11	UL84	5/3
DF96	5/11	EF41	5/9	PL84	6/-	UY41	4/9
DK32	7/-	EF80	4/3	PY32	8/9	UY85	4/9

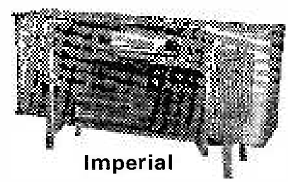
Postage on 1 valve 9d. extra. On 2 valves or more, postage 6d. per valve extra. Any parcel insured against damage in transit 6d. extra. Office address, no callers.

GERALD BERNARD
83 OSBALDESTON ROAD
STOKE NEWINGTON
LONDON N.16

Please mention "Practical Wireless" when replying to Advertisements

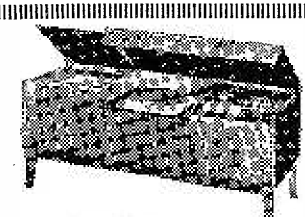
HI FI

EQUIPMENT CABINETS OF DISTINCTION



Imperial

- Illustrated in this advertisement are two fine cabinets from the Lewis Radio Range.
- These cabinets are just two of a really extensive range.
- Each one carefully made by British Craftsmen and soundly constructed from the best materials available.
- Fill in coupon below to obtain FREE catalogue showing this wonderful range of cabinets.

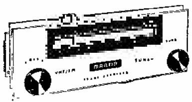


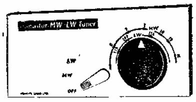
Lowflex

FREE THE NEW LEWIS RADIO CATALOGUE

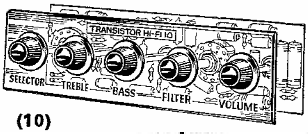
Designed to assist your choice of Cabinet.
The New Lewis Radio Cabinet Catalogue—the most comprehensive ever prepared. Sent absolutely FREE!
Please send your FREE cabinet catalogue.
NAME ....
ADDRESS ....
.... (Dept. P106)
Capitals please

LEWIS radio
100 Chase Side, Southgate, London
Tel.: Palmer's Green 3733 9666

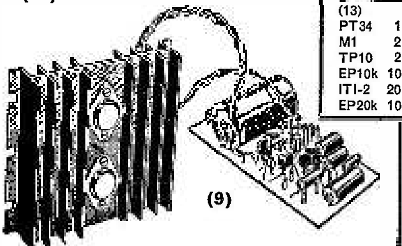

(14)



(12)



(10)


(9)

10 AND 20 WATT MONO AND STEREO TRANSISTOR AMPLIFIERS

(9) POWER AMPLIFIERS. 10 watts RMS output. 100mV input. 30 c/s to 20kc/s ± 1dB. 6-Transistor Push-pull. Panel size 4 x 2¼ x 1 in. H/S 4 x 4in.
TPA10/3 3-5 ohm spkr. **£4.10.0**, pp. 2/6.
TPA10/15 12-16 ohm spkr., **£5.5.0**, p.p. 2/6
(Mains unit for 1 or 2 amplifiers, **59/6**, p.p. 2/6)

The Finest High Fidelity at Unbeatable Prices

(10) **PREAMPLIFIERS.** 8 input selector. Treble, bass, volume, filter controls. 1½mV to 300mV inputs. Battery operated or from Mains Unit. Output up to 150mV RMS.

MP2 Mono 9½ x 2½ x 2in. **£5.10.0**, p.p. 2/6 (grey and gold front panel 8/6).

SP4 Mono/Stereo, 9 x 3¼ x 1⅝in., **£10.19.6**, p.p. 3/6 (front panel plate 12/6).

● ALL UNITS BUILT AND TESTED

25 WATT AMPLIFIER
New 8-Transistor design. Push-pull output for 7½ to 16 ohm speaker. 150mV input. 30c/s to 20k/cs ± 1dB. For use with valve or transistor preamplifiers as item (10) above. Size 2⅝ x 2⅞ x 6¼in.

PRICE BUILT AND TESTED £7.19.6 P.P. 3/-
(Mains unit **79/6**, p.p. 2/6)

(13) **MULTI-METERS**

PT34	1kV	**39/6**	TP5S	20kV	**£5.19.6**
M1	2kV	**49/6**	EP30k	30kV	**£6.10.0**
TP10	2kV	**75/-**	EP50k	50kV	**£8.15.0**
EP10k	10kV	**79/6**	500	30kV	**£8.17.6**
ITI-2	20kV	**69/6**	EP100k	100kV	**£10.10.0**
EP20k	10kV	**99/6**			

(15) **GARRARD BATTERY 2-SPEED TAPE DECK**
Brand New with R/P head, erase/osc. head, tape cassette and instructions. 2 speed 2-track 9 volt operated. List Price 13gns.
PRICE £8.19.6 P.&P. 3/6.

COMPONENTS AND EQUIPMENT. The largest range in the country. **6/-** buys 150-page catalogue with discount vouchers.

(12) MW/LW QUALITY TRANSISTOR RADIO TUNER
Fully tunable superhet with excellent sensitivity and selectivity. Output up to ½ volt peak. Complete with front panel, etc. 9 volt operated. For use with any amplifier or tape recorder.

TOTAL COST TO BUILD £3.19.6 P.P. 2/6

(14) **VHF FM TUNER**
Supplied as 2 Preassembled Panels, plus metal work Superhet design, 88-108 Mc/s, 9 volt operated.
Total cost to assemble **£12.17.6**, p.p. 2/6.

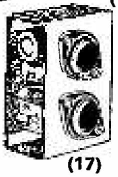
(16) **NOMBREX TEST UNITS**
★ 150 kc/s—350 m/cs RF Generator **£10.10.0**. All Transistor.
★ 10 c/s—100 kc/s Transistor. **£16.19.6** Audio Generator.

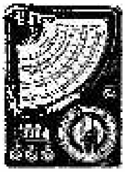
(17) **5 WATT AMPLIFIER**
6-Transistor Push-pull, 3 ohms. 6mV into 1K. 12/18V supply. 2⅞ x 2 x 1½in.

BUILT AND TESTED 69/6 P.P. 2/-
(optional mains units 54/-)
1½ watt version **59/6**.
Matching Preamplifier, 6 Inputs, treble/bass/selector/volume controls. 6-10mV o/put. 9-18V supply. **79/6**, p.p. 2/-.
For use with any Transistor Amplifier

HR


(16)


(17)

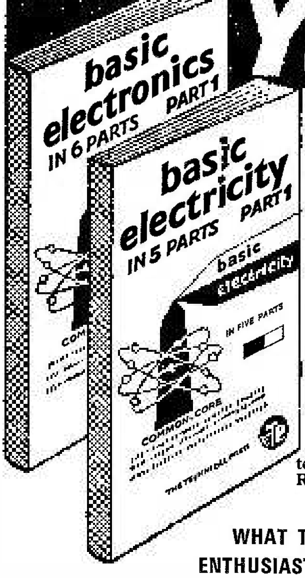

(13)


(15)

HENRY'S RADIO LTD.
303 EDGWARE RD., LONDON, W.2
PADdington 1008/9
Open Mon. to Sat. 9-6. Thurs. 1 p.m.
Open all day Saturday.

SEE BACK COVER FOR MORE ITEMS OF INTEREST

YOURS FREE FOR 7 DAYS



The New 'Picture-Book' way of learning BASIC ELECTRICITY (5 VOLS.) ELECTRONICS (6 VOLS.)

You'll find it easy to learn with this outstandingly successful new pictorial method—the essential facts are explained in the simplest language, one at a time; and each is **illustrated** by an accurate cartoon-type drawing.

The books are based on the latest research into simplified learning techniques. This has proved that the **Pictorial Approach** to learning is the quickest and soundest way of gaining mastery over these subjects.

The series will be of exceptional value in training mechanics and technicians in electricity, Radio and Electronics.

WHAT THIS MONTH'S ENTHUSIASTIC READERS SAY

" . . . Every page is presented in such a way that interest is increased with each stage . . . " B. C., Norwich.

" . . . thanks for the book which my son thought the best birthday present he ever had . . . " A. L., Doncaster.

POST NOW FOR THIS OFFER!!

TO SELRAY BOOK CO.
60 HAYES HILL, HAYES, BROMLEY, KENT

Please send me **Without Obligation to Purchase**, Basic Electricity/Basic Electronics on **7 Days Free Trial**. I will either return set, carriage paid, in good condition within 8 days or send down payment of 15/- (Basic Electricity) followed by 6 fortnightly payments of **10/-**. Down payment of **15/-** (Basic Electronics) followed by 6 fortnightly payments of **12/6**. Alternatively, I will send **68/-** (Basic Electricity—5 parts), **81/-** (Basic Electronics—6 parts) post free. This offer applies to United Kingdom only.

Tick against set required (*only one set allowed on free trial*).

BASIC ELECTRICITY ☐ BASIC ELECTRONICS ☐

Signature ....
(*If under 21, signature of parent or guardian*)

NAME..
BLOCK LETTERS BELOW

FULL POSTAL
ADDRESS..

Head Office and Warehouse
44A WESTBOURNE GROVE
LONDON W2
Tel. PARK 5641/2/3
Over 2500 Types in stock. Please send s.a.e. (foolscap) for full Catalogue.

Z & I AERO SERVICES LTD.

Please send all correspondence and Mail-Orders to the Head Office

When sending cash with order, please include 2/6 in £ for postage and handling

MINIMUM CHARGE 1/6. No C.O.D. orders accepted

Retail Shop
85 TOTTENHAM COURT ROAD
LONDON W1
Tel. LANgham 8403
Open all day Saturday

First Quality Fully Guaranteed

ELECTRONIC VALVES

OA2	6/-
OA3	10/-
OB2	6/-
OC3	6/-
OD3	6/-
OZ4A	5/-
1A3	4/-
1A5GT	5/-
1A7GT	8/-
1B3GT	8/-
1C5GT	5/-
1D6	8/-
1D8GT	6/-
1G4GT	8/-
1G6GT	7/-
1H5GT	7/-
1L4	2/6
1N5GT	8/-
1R4	6/-
1R5	6/-
1S4	5/-
1S5	4/6
1T4	3/-
1T5GT	6/-
1U4	5/-
1U5	6/-
1V2	10/-
1X2B	7/-
2C26A	7/-
2C34	7/6
2C51	12/-
2CW4	12/-
2D21	6/-
2E24	40/-
2E26	22/6
3A4	4/-
3A5	7/-
3A8GT	8/-
3AV6	6/6
3B28	40/-
3E29	60/-
3Q4	7/-
3Q5GT	6/6
3S4	5/-
3V4	6/-
4-65A	80/-
4E27	60/-
4THA	8/-
4TSP	8/-
4X150A	100/-
4X250B	120/-
5B/254M	40/-
5B/255M	35/-
5R4GY	9/-
5U4GB	6/6
5U8	8/-
5V4G	8/6
5Y3GT	5/-
5Z3	7/6
5Z4G	7/-
6/30L2	10/-
6A3	12/-
6A7	10/-
6A8	8/-
6AB4	6/6
6AB7	4/-
6AC5GT	10/-
6AC7	4/-
6AF4	10/-
6AF6G	11/-
6AG5	2/6
6AG7	6/-
6AH6	10/-
6AK5	5/-
6AL5	3/-
6AM5	2/6
6AM6	4/-
6AN8	10/-
6AQ4	5/-
6AQ5	5/6
6AR5	6/-
6AR6	6/-
6AR8	17/6
6AS5	5/-
6AS6	6/-
6AS7G	15/-
6AT6	4/6
6AU6	6/6
6AU8	9/-
6AV5GTA	11/-
6AV6	5/-
6AW8A	12/6
6B4G	17/-
6B8	7/-
6B8G	2/6
6BA6	4/6
6BA7	15/-
6BE6	4/6
6BF6	6/-
6BF7	15/-
6BG6G	15/-
6BH6	7/6
6BJ6	7/6
6BK4	22/6
6BK7A	9/-
6BL7GTA	10/-
6BN6	7/6
6BQ7A	7/-
6BR7	11/-
6BR8	5/-
6BS7	17/-
6BW6	7/-
6BW7	10/-
6BZ6	6/-
6BZ7	11/-
6C4	2/6
6C5	8/-
6C5GT	6/-
6C6	4/-
6C9	11/-
6C31	12/-
6CB6	5/-
6CD6GA	17/-
6CG7	10/-
6CH6	6/-
6CL6	9/-
6CU6	11/-
6CW4	12/-
6CY5	10/-
6CY7	11/-
6D4	15/-
6D6	3/-
6DC6	12/6
6DK6	8/-
6DQ6G	11/-
6F1	14/-
6F4	30/-
6F5G	8/-
6F6G	5/-
6F7	5/-
6F8G	5/-
6F11	6/-
6F12	4/-
6F13	6/6
6F14	15/-
6F15	11/-
6F17	6/-
6F18	7/6
6F23	10/-
6F24	12/-
6F25	12/-
6F28	10/6
6H6	2/-
6J4	9/-
6J5G	4/-
6J6	3/6
6J7G	5/-
6K6G	6/-
6K7GT	5/-
6K8	8/-
6K8G	4/-
6L6GC	7/6
6L17	9/-
6L18	6/-
6LD20	5/-
6N7GT	7/-
6P25	12/-
6P28	12/6
6Q5G	15/-
6Q7	7/-
6SA7	7/-
6SC7	9/-
6SF5	8/-
6SF7	7/-
6SG7	6/-
6SH7	4/-
6SJ7	7/-
6SK7	6/-
6SL7GT	6/-
6SN7GT	4/6
6SQ7	7/-
6SR7	7/-
6T8	6/6
6U4GT	10/6
6U8	7/6
6U8A	9/6
6VG6T	6/6
6X4	4/-
6X5GT	5/6
6Y6G	9/-
7B6	11/-
7B7	7/-
7B8	8/-
7C5	11/-
7C6	6/6
7C7	5/-
7Y4	8/-
7Z4	6/-
9BW6	7/-
10C1	9/6
10C2	13/-
10D1	7/-
10F1	9/-
10F3	8/-
10F9	10/-
10F18	9/-
10L1	7/6
10P13	12/-
10P14	13/-
11D3	7/-
11D5	7/-
11E3	42/-
12AC6	8/-
12AD6	9/-
12AE6	7/6
12AL5	7/-
12AQ5	7/-
12AT6	5/-
12AT7	4/-
12AU6	6/-
12AU7	5/6
12AV6	5/6
12AV7	8/-
12AW6	20/-
12AX7	6/-
12AY7	10/-
12B4A	9/-
12BA6	6/-
12BE6	5/6
12BH7	6/-
12BY7	10/-
12C8	4/6
12E1	20/-
12K7GT	7/-
12K8	8/-
12Q7G	4/-
12SA7	7/-
12SC7	4/-
12SG7	5/-
12SH7	4/-
12SJ7	4/-
12SK7	5/-
12SL7GT	7/6
12SN7GT	7/6
12SR7	5/-
14S7	18/-
20D1	9/-
20F2	13/-
20L1	13/-
20P1	12/-
20P3	12/-
20P4	13/-
20P5	11/-
25L6GT	6/6
25Z4G	8/-
25Z5	8/-
25Z6GT	11/-
28D7	7/-
30A5	7/-
30C1	6/3
30C15	10/-
30C17	11/6
30C18	11/-
30F5	10/-
30FL1	10/6
30FL12	11/-
30FL13	6/-
30FL14	11/-
30L1	5/6
30L15	11/-
30L17	11/-
30P12	9/-
30P16	7/-
30P18	6/6
30P19	13/-
30PL1	10/6
30PL13	12/-
30PL14	10/6
30PL15	12/-
35A3	10/-
35A5	10/-
35B5	12/-
35C5	6/6
35D5	12/-
35L6GT	6/-
35W4	4/6
35Z3	10/-
35Z4G	4/-
35Z4GT	8/6
35Z5GT	5/6
42	6/-
43IU	8/-
50A5	12/-
50B5	6/3
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/-
150B2	10/-
150B3	8/-
185BTA	15/-
807	9/-
832	20/-
866A	14/-
872A	40/-
955	3/-
956	2/-
957	5/-
958A	4/-
959	8/-
991	7/-
2050	12/-
4313C	20/-
5651	7/6
5670	10/-
5718	10/-
5749	10/-
5965	5/-
6080	25/-
6146	25/-
6360	30/-
6939	45/-
7551	30/-
8136	15/-
9002	5/6
9003	9/-
A1820	20/-
AC/HL/DD	8/-
AC/HL/DDD	10/-
AC/SG	13/-
AC5/PEN	10/-
AC6/PEN	6/-
AR8	6/-
ARP12	3/6
ATS25	9/-
AW6	5/-
AZ11	6/-
AZ12	9/-
AZ31	9/-
AZ41	7/-
C1C	12/-
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/-
DY86	6/6
E88CC	12/6
E90CC	10/-
E92CC	7/-
E180CC	8/-
E180F	17/6
EA50	2/-
EABC80	6/6
EAC91	4/-
EAF42	8/6
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/-
ECC804	10/-
ECF80	7/-
ECF82	7/6
ECF83	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/-
EF54	6/-
EF55	8/-
EF80	5/-
EF83	10/-
EF85	6/6
EF86	6/3
EF89	5/6
EF91	4/-
EF92	2/6
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
EK90	4/6
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/-
EM34	13/-
EM35	8/-
EM80	7/-
EM81	7/-
EM84	7/-
EM87	7/-
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/-
EZ81	5/-
EZ90	4/-
GS10H	40/-
GTE175M	12/-
GU50	25/-
GZ30	7/6
GZ32	10/-
GZ34	10/-
GZ37	12/-
HABC80	8/-
HBC90	5/-
HBC91	5/6
HF93	6/-
HF94	6/-
HL2	4/-
HL2K	4/-
HL23	6/-
HL23DD	6/-
HL41	4/-
HL92	6/6
HL94	7/-
HL132D	4/-
HL133DD	10/-
HN309	15/-
HY90	4/6
KT2	7/-
KT32	6/6
KT36	17/6
KT41	7/6
KT44	5/-
KT45	15/-
KT66	16/-
KT67	45/-
KT88	23/-
LP2	7/-
MH4	5/-
MH41	9/-
MHL4	5/-
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	11/-
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/-
PEN36C	8/-
PEN45	7/-
PEN45DD	12/-
PEN46	6/-
PEN220A	7/-
PEN383	10/-
PEN384	7/-
PEN453DD	10/-
PENA4	7/6
PF86	7/6
PF818	10/-
PFL200	14/-
PL36	9/-
PL38	16/-
PL81	6/-
PL82	7/-
PL83	6/6
PL84	6/6
PL302	13/-
PT15	15/-
PX25	15/-
PY32	8/6
PY33	8/6
PY80	5/6
PY81	6/-
PY82	5/6
PY83	6/-
PY88	8/-
PY301	11/-
PY800	7/-
PY801	7/-
PZ30	8/6
QP21	5/-
QP25	5/-
QP230	5/-
QQVO2-6	45/-
QQVO3-10	30/-
QQVO6-40	90/-
QS83/3	7/6
QS92/10	4/-
QS95/10	5/6
QS150/15	8/-
QS1200	10/-
QS1202	8/6
QS1203	8/6
QS1215	12/-
QVO3-12	10/-
QVO5-25	9/-
R1	8/-
R2	8/-
R10	15/-
SP2	4/-
SP41	5/-
SP42	8/-
SP61	4/-
SU45	15/-
SU2150A	12/-
TP22	7/-
TP25	5/-
TP2620	7/6
TZ40	40/-
U10	8/-
U12/14	8/-
U17	5/-
U18/20	8/6
U21	7/-
U22	6/-
U25	9/6
U26	8/6
U27	7/6
U37	20/-
U50	5/-
U52	6/6
U70	4/6
U76	4/-
U78	4/-
U191	11/-
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/-
UY21	9/-
UY41	6/6
UY82	9/6
UY85	6/-
VP23	3/6
VP41	5/-
VU39	8/-
W81M	6/-
W729	10/-
X65	7/-
X66	7/-
X76M	7/6
X81M	18/-
XC12	6/6
XC15	4/6
XC16	7/-
Y63	8/-
Y65	5/-
Z22	5/6
Z62	5/-
Z63	9/-
Z66	10/-
Z759	23/-
Z803U	15/-
Z900T	13/-

MULTIMETERS

Type 108-IT; 24 range precision portable meter, 5000 o.p.v; D.C. Volts: 2.5-10-50-250-500-2500V. A.C. Volts: 10-50-100-250-500-2500V; D.C. current 0.5-5-50-500mA Resistance 2000-20,000 ohms; 2-20 megohms. Power output calibration in A.C. for 600 ohms line. Complete with prods and batteries, £5.5.0. P. & P. 5/-.

TRANSISTOR CIRCUIT COMPONENTS

Set of three 450 kc/s I.F. Coils 10/6
Variable Twin Gang Miniature Tuning Capacitor, two section, 4-165 pF. and 3-65 pF., with 1-8 pF. trimmer, complete with Broadcast Band Oscillator Coil 6/6
Driver Transformer, impedance ratio 2 : 1 ...... 3/6
Output Transformer for push-pull output, 250 mW. 3/6
5,000 Ω Edgewise volume control with switch .. 4/9
WEYRAD RA2W FERRITE ROD AERIAL, LW/MW winding with Car Aerial Coupling 12/6
P50/1AC OSCILLATOR COIL, MW/LW 5/4
P50/2CC, 470 kc/s., 1st and 2nd I.F. 5/7
P50/3CC. 470 kc/s., 3rd I.F. 6/-
OSMOR Subminiature Transformer for Mains-to-Transistor supply conversion, Type MT9, Output 9-0-9 v. at 80 mA. 10/-
Suitable Germanium Diode GJ7M 3/6
Packing and postage 2/- per order.

HEADPHONES No. 10 ASSEMBLY

Moving Coil Headphones with moving coil Hand Microphone fitted with press-to-talk switch. Rubber earpads. Cord terminated with army type 5-point moulded connector. Low impedance. Brand new. 20/- each.
Small quantities available of second hand assemblies, checked in perfect order. 8/6 each.
P. & P. 3/6 per set.

DECADE COUNTER TUBES

GC10B—scale-of-ten counter (I.O.) 35/-
GC 10/4B—bi-directional 10-way computing (I.O.) 45/-
GC10D scale-of-ten counter for single pulse operation (I.O.) 47/6
GS10C bi-directional 10-way selector tube (B12E) 42/-
GS10D bi-directional 10-way selector tube (B12E) 50/-
GS10E bi-directional 10-way selector tube (B12E) 55/-
GS10H bi-directional 10-way selector tube with routing guides (B17E) 40/-

RADIO FREQUENCY THERMOCOUPLE METERS

Scaled 0 to 1AMP, 2½" round projecting 12/6
Packing and postage 2/6 per order.

PLESSEY ELECTROLYTIC CAPACITORS

24µF at 275 V 2/-
200µF at 275 V 2/6
20-20µF at 450 V. 3/-
50-100µF at 275 V. 3/-
100-400µF at 275 V 3/6
100-20-5-25µF (100-20 at 350 V.; 5µF at 50 V., 25µF at 25 V.)............3/6
All voltages are D.C. working. Postage 2/- per order.

POWER UNITS TYPE 234

19in. rack mounted fully smoothed and fused for 230 v. A.C. input. H.T. output adjustable from 180 v. to 270 v. at 80 mA. by means of primary taps and high-low switch in the secondary winding. L.T. output 6.3 v. A.C. at 4 amps. Fitted with M.1 meter to read A.C. input and D.C. output volts. Second-hand tested, in good condition £3 19 6
DITTO model without meter £3 10 0
Packing and carriage 15/-.

"ELECTRON" OUTDOOR AERIAL"

3 strong tubular light alloy sections 3ft. long each on an insulated aerial base fitted with wall mounting bracket. Complete with down lead. PRICE, brand new, 15/-. P.P. 5/-.

STC SILICON JUNCTION RECTIFIERS, HALF WAVE 3 AMPS D.C.

RS320, 280 piv, 5/-
RS330, 420 piv 6/-
RS340, 560 piv, 7/-
RS350, 700 piv, 7/6
RS360, 840 piv, 8/-
RS370, 980 piv, 9/-
RS380, 1120 piv, 10/-

TEXAS SILICON FULL-WAVE BRIDGE RECTIFIERS

1B20K10 100 piv, 2 amps., dimensions 1.4 x 1.4 x .6in. 25/-
1B40K10 100 piv, 4 amps, dimensions 1.4 x 1.4 x .6in. 30/-
1B100M10, 100 piv 10 amps, dimensions 2¼ x 2¼ x 1in. 85/-
Postage 1/6 per rectifier.

GERMANIUM JUNCTION STUD MOUNTED POWER RECTIFIERS

GJ3M, 200 piv, 500mA/1 amp 3/6
GJ5M, 300 piv, 500mA/1 amp 3/6
GJ6M, 150 piv. 800mA/1 amp 3/6
GJ7M, 80 piv, 500mA/1 amp 3/6
Higher ratings refer to cooling fin mounting.

SPECIAL OFFER OF MINIATURE MOVING COIL METERS

1¼" Round flush, with clip mounting, made by G.E.C Scaled 0-1mA 15/-; scaled 0-75mA or 0-100mA or 0-150mA 10/- each.
1" Round flush, with ring nut mounting, made by INTERNATIONAL, 500µA F.S.D., scaled 0 to 1 15/- ea.
Packing and postage 2/6 per order.

Our new catalogue of valves, tubes and semiconductors is now ready. It contains technical data of special tubes, cathode ray tubes and semiconductors. Supplied free of charge provided a foolscap stamped and addressed envelope is sent.

PRACTICAL WIRELESS *blueprints*

The following blueprints are available from stock. ***Descriptive text is not available*** *but the date of issue is shown for each blueprint. Send, preferably, a postal order to cover cost of the blueprint (stamps over 6d. unacceptable) to Blueprint Department, Practical Wireless, George Newnes Ltd., Tower House, Southampton Street, London, W.C.2.*

The Strand Amplifier; The PW Signal Generator	(Oct. 1962)	**5/-**
The Berkeley Loudspeaker Enclosure; The Luxembourg Tuner	(Dec. 1962)	**5/-**
The PW Troubadour; The PW Everest Tuner	(June 1962)	**7/6**
The PW Britannic Two; The PW Mercury Six	(May 1962)	**6/-**
Beginner's Short Wave Two; S W Listener's Guide	(Nov. 1963)	**5/-**
Beginner's 10-watt Transmitter; Transmitting and Aerial Data	(Dec. 1963)	**5/-**
PW "Sixteen" Multirange Meter; Test Meter Applications Chart	(Jan. 1964)	**5/-**
The Celeste 7-transistor Portable Radio; The Spinette Record Player	(June 1963)	**5/-**
Transistor Radio Mains Unit; 7 Mc/s Transceiver	(June 1964)	**5/-**
The Citizen (December 1961)		**5/-**
The Mini-amp (November 1961)		**5/-**
The PT Multimeter (October 1961) PT		**5/-**
The Beginner's Short Wave Superhet (Dec. 1964)		**5/-**
The Empire 7 Three-band Receiver (May 1965)		**5/-**
Electronic Hawaiian Guitar (June 1965)		**5/-**
Progressive SW Superhet (February 1966)		**5/-**

★ PLEASE NOTE THAT WE CAN SUPPLY NO BLUEPRINTS OTHER THAN THOSE SHOWN IN THE ABOVE LIST. NOR ARE WE ABLE TO SUPPLY SERVICE SHEETS FOR COMMERCIAL RADIO, TV OR AUDIO EQUIPMENT. ★

PRACTICAL WIRELESS *query service*

Before using the query service it is important to read the following notes:

The PW Query Service is designed primarily to answer queries on articles published in the magazine and to deal with problems which cannot easily be solved by reference to standard text books. In order to prevent unnecessary disappointment, prospective users of the service should note that:

(a) We cannot undertake to design equipment or to supply wiring diagrams or circuits, to individual requirements.

(b) We cannot undertake to supply detailed information for converting war surplus equipment, or to supply circuitry.

(c) It is usually impossible to supply information on imported domestic equipment owing to the lack of details available.

(d) We regret we are unable to answer technical queries over the telephone.

(e) It helps us if queries are clear and concise.

***(f)* We cannot guarantee to answer any query not accompanied by the current query coupon and a stamped addressed envelope.**

QUERY COUPON

This coupon is available until 7th October, 1966 and must accompany all queries in accordance with the rules of our Query Service.

PRACTICAL WIRELESS, OCTOBER 1966

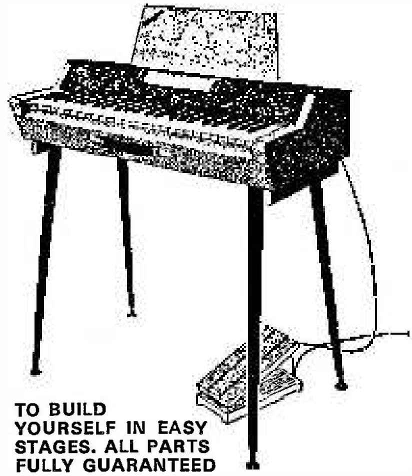
Published on or about the 7th of each month by GEORGE NEWNES LIMITED, Tower House, Southampton Street, London, W.C.2, and printed in England by WATMOUGHS LIMITED, Idle, Bradford; and London. Sole Agents for Australia and New Zealand: GORDON & GOTCH (A/sia) Ltd. South Africa: CENTRAL NEWS AGENCY LTD. Rhodesia, Malawi and Zambia: KINGSTONS LTD. East Africa: STATIONERY & OFFICE SUPPLIES LTD. Subscription rate including postage for one year: To any part of the World £1.16.0.

BUILD THE WORLD'S FIRST ALL TRANSISTOR PORTABLE ORGAN KIT

MAYFAIR PORTABLE ELECTRONIC ORGAN

CALL IN AND HEAR ONE PLAYED

- ★ EASY TO BUILD WITH PRINTED CIRCUITS AND FULLY COMPREHENSIVE HANDBOOK
- ★ CIRCUITS USE 170 TRANSISTORS AND DEVICES
- ★ 10 SELECTED TONE COLOURS PLUS VIBRATO
- ★ PORTABLE TWO COLOUR CABINET WITH DETACHABLE LEGS, MUSIC STAND, SWELL PEDAL
- ★ THE ONLY COMPLETE KIT AVAILABLE IN THE WORLD.



TO BUILD YOURSELF IN EASY STAGES. ALL PARTS FULLY GUARANTEED

SPECIFICATIONS:

- ● TONE COLOURS (ROCKERTABS) 10 DIFFERENT TONES CAN BE SELECTED
- ● SWITCHED VIBRATO.
- ● 49 NOTE C-C FULLY SPRUNG KEYBOARD ● 6 OCTAVES OF GENERATORS
- ● PRESET VOLUME CONTROL ● TONE COLOUR BLEND CONTROL
- ● FOOT SWELL PEDAL ● OUTPUT UP TO ½ VOLT ● 110/250 VOLT MAINS OR 18 VOLT BATTERY ● FULLY POLYPHONIC.
- ● PLUG-IN PRINTED CIRCUIT PANELS ● SIMPLE LOCKED-IN TUNING
- ● DETACHABLE LEGS WITH STOWAGE ● CABINET SIZE 30½ x 15½ x 9in.
- ● WEIGHT 35lb. ● FULLY DETAILED INSTRUCTION HANDBOOK WITH PHOTOS, DRAWINGS AND CIRCUITS.

UNBEATABLE FOR PRICE PERFORMANCE AND QUALITY

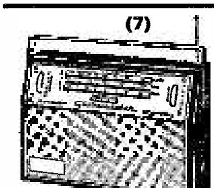
- ★ COMPLETE KIT WITH CABINET, ALL COMPONENTS AND HANDBOOK
- ● ALSO SOLD SEPARATELY PACKET BY PACKET
- ● H.P. AVAILABLE FOR COMPLETE KIT
- ● HANDBOOK SEPARATELY, 20/- POST PAID

99 gns. (CARRIAGE AND PACKING 30/- EXTRA)

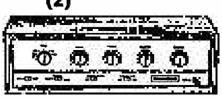
DETAILED LEAFLET FREE ON REQUEST

FOR GROUPS - YOUTH CLUBS - SCHOOLS - HOBBYISTS - HOME ENTERTAINMENT

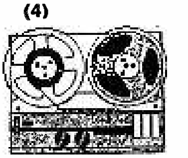
(7)



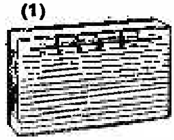
(2)



(4)



(1)



(1) REGENT-6 MW/LW POCKET RADIO TO BUILD
6- Transistor superhet. Geared tuning. Push-pull speaker output. Moulded cabinet 5 x 3 x 1¼in. Phone socket.
TOTAL COST TO BUILD 69/6 P.P. 2/-
Full tuning on both bands.

(2) HI-FI EQUIPMENT
Complete range in stock. Send list of requirements for special price quote. Hi-fi demonstration room open.

(3) DEAC CELLS
Rechargeable Batteries
● 3·6 volt 500 mA/H. *Size:* 1⅛" x 1⅜" dia. .. 12/6, p.p. 1/6
● 9·6 volt 225 mA/H. *Size:* 2 3/16" x 1" dia. .. 20/-, p.p. 1/6
BRAND NEW.– Offered at a fraction of normal retail price.

(4) BUILD A QUALITY 2 OR 4 TRACK TAPE RECORDER
New 3-speed version using new '363' decks
★TWO-TRACK. Deck £10.10.0. Amplifier £14.19.6. Cabinet and speaker 7gns. Complete kits with FREE 7in. 1200ft. tape, spare spool. **27 gns** P.P. 10/-
★FOUR-TRACK. Deck £13.10.0. Amplifier £15.19.6. Cabinet and speaker 7gns. Complete kits with FREE 7in. 1200ft. tape, spare spool. **30 gns** P.P. 10/-

DEAC CHARGER
To charge 3·6 volt and 9·6 volt packs. Fully mains isolated in moulded case. **45/-** P.P. 2/-

(5) VHF FM TUNER TO BUILD
87/105 Mc/s Transistor Superhet. Geared tuning. Terrific quality and sensitivity. For valve or transistor amplifiers. 4 x 3½ x 2¼in. Complete with dial plate. (FM Decoder available shortly.
TOTAL COST TO BUILD **£6.19.6** P.P. 2/6
(Cabinet Assembly 20/- extra)

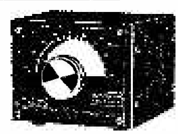
(6) GARRARD DECKS—BRAND NEW FULLY GUARANTEED

1000 mono	£5 19 6	SP25 stereo	£10 19 6	401 less cart./arm	£27 10 0
1000 stereo	£6 6 0	SP25 Deram	£13 10 0	AT6 mono	£8 19 6
2000 mono	£6 6 0	AT60 less cart.	£9 19 6	AT6 stereo	£9 10 0
2000 stereo	£6 6 0	AT60 mono	£10 10 0	AT6 deram	£11 19 6
3000lm stereo	£7 19 6	AT60 stereo	£10 19 6	Deccadec Mk. II	£17 17 0
SP25 less cart.	£9 19 6	AT60 Deram	£13 10 0	A70 less cart.	£19 19 0
SP25 mono	£10 10 0	LAB80 less cart.	£27 0 0	*(P. & P. 5/- any type)*	

All other makes of decks and cartridge in stock

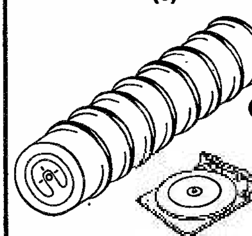
(7) GLOBEMASTER MW/LW/SW PORTABLE RADIO TO BUILD
Special purchase reduces price
Full 3-waveband tuning. Pushbutton wavechange. Superhet printed circuit. Black-chromed cabinet 11 x 7¼ x 3¼in. (SW 17-50 metres). Ear/Record sockets. 1 watt Push/Pull output.
TOTAL COST TO BUILD **£7.19.6** P.P. 3/6

(8) TOURMASTER CAR RADIO
7-Transistor MW/LW Car Radio. 12 volt operated. 3 watt output. Push-button wavechange. RF stage. Supplied built, boxed, ready to use with Speaker and Baffle. Car fixing kit and manufacturers' current guarantee. Special Bargain Offer. Buy Now! List Price 13gns.
PRICE **£9.9.0** P.P. 3/6



(5)

(8)



(3) (6)

S.C.R.'s (TRANSISTORS)
100PW 1 amp., 7/6. 100PW 3 amp., 9/6. 400PW 7 amp., 25/-.

New 14-page Transistor/Rectifier catalogue now ready. Many new devices—plenty of price reductions. *Send 3d. stamp for free copy.*

WE CAN SUPPLY FROM STOCK MOST OF THE PARTS SPECIFIED ON CIRCUITS IN THIS MAGAZINE. SEND LIST FOR QUOTATION. ASK FOR NEW 4-PAGE CATALOGUE SUPPLEMENT ALSO LIST OF SPECIAL HI-FI COMBINATIONS.

HENRY'S RADIO LTD.

303 EDGWARE RD., LONDON, W.2
PADdington 1008/9
Open Mon. to Sat. 9-6. Thurs. 1 p.m.
Open all day Saturday

LATEST 1966 CATALOGUE
Have you a copy?
Fully detailed and illustrated. 150 pages of components, equipment, etc. Over 5,000 stock items. PRICE 6/-, post paid. Free discount vouchers with every catalogue.

You cannot afford to be without a copy of this catalogue

SEE PAGE 455 FOR MORE ADVERTS

SUPPLIERS OF QUALITY COMPONENTS AND EQUIPMENT